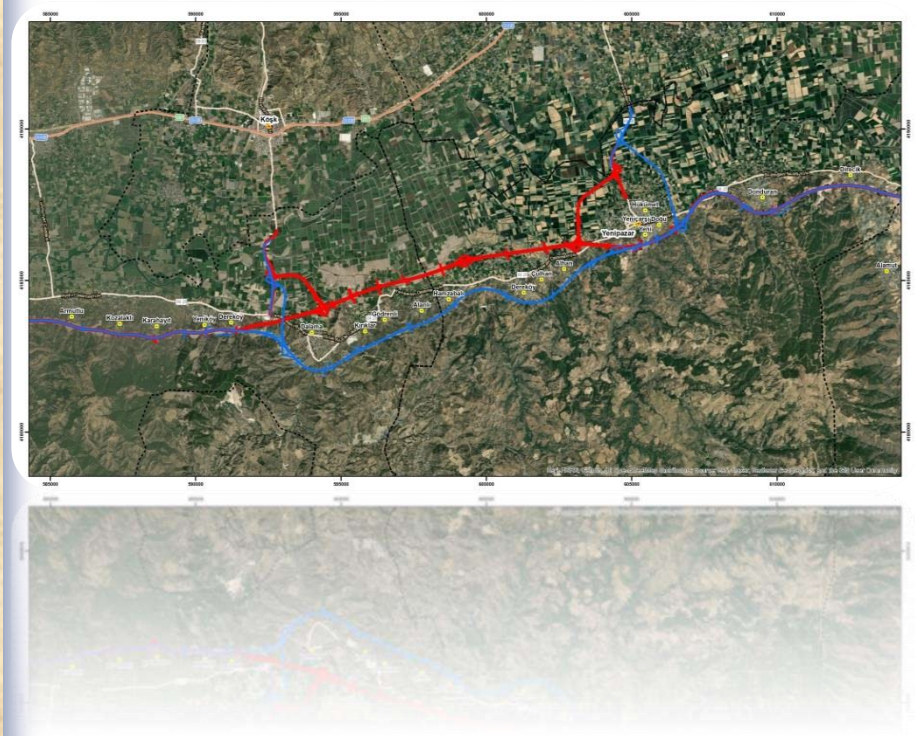
SUPPLEMENTARY LENDERS INFORMATION PACKAGE

AYDIN – DENİZLİ MOTORWAY

SOUTH ALTERNATIVE: KM 15+856 – 34+630



SUPPLEMENTARY

ESIA FINAL REPORT

REV 0

ENVIRONMENTAL CONSULTANCY CO.

MARCH, 2024

AYDIN – DENİZLİ MOTORWAY

REVISION NUMBER	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
A	OCTOBER, 2023	SUPPLEMENTARY ESIA REPORT	ENCON	T. H. B.
0	MARCH, 2024	SUPPLEMENTARY ESIA FINAL REPORT	ENCON	T.H.B.

SUPPLEMENTARY

ESIA FINAL REPORT

ENVIRONMENTAL CONSULTANCY CO.

MARCH, 2024

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LIST OF ABBEVIATIONS

AADT	Annual Average Daily Traffic
AA-EQS	Annual Average Environmental Quality Standard
AASHTO	American Association of State Highway and Transportation Officials
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AoI	Area of Influence
ASKI	Water and Sewerage Administration
BOD	Biochemical Oxygen Demand
BOT	Build, Operate and Transfer
BTEX	Benzene, Toluene, Ethylbenzene And Xylene
CCS	Construction Camp Site
CHC	Central Hunting Commission
CIA	The Cumulative Impact Assessment
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CDM	Clean Development Mechanism
CLRTAP	Convention on Long Range Transboundary Air Pollution
CMS	Conservation of Migratory Species of Wild Animals
COD	Chemical Oxygen Demand
COP	Conferences of the Parties
CORINE	Coordination of Information on the Environment
COVID-19	Coronavirus Disease of 2019
CPT	Cone Penetration Test
CR	Critically Endangered
dBA	Decibels adjusted
DD	Data Deficient
DSI	State Hydraulic Works
EAFZ	East Anatolian Fault Zone
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EFTA	European Free Trade Association
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EN	Endangered
ENCON	ENCON Çevre Danışmanlık Ltd. Şti.
EPA	Environmental Protection Agency
EPFIs	Equator Principles Financial Institutions
EPs	Equator Principles
ERL	European Red List
ES	Ecosystem services
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESIF	Environmental and Social Impact Assessment Framework
ESMAP	Energy Sector Management Assistance Program
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESR	Ecosystem Services Review

LIST OF ABBEVIATIONS (CONTINUED)

EU	European Union
EUNIS	European Nature Information System
Eurostat	The Directorate General of the European Commission
EW	Extinct in Wild
EX	Extinct
FOIAS	Fernas Otoyol İşletmesi A.Ş.
FPS	Free Passage System
GBIF	Global Biodiversity Information Facility
GD	General Directorate
GDP	Gross Domestic Product
GDRS	General Directorate for Rural Services
GHG	Green House Gas
GIIP	Good International Industry Practices
GIS	Geographical Information System
GLC	Ground Level Concentration
GMFZ	Great Menderes Fault Zone
GW	Gigawatt
HC	Hydrocarbons
HCM 2000	Highway Capacity Manual 2000
HEPP	Hydroelectric Power Plant
HGS	Fast Passage
HV	Heavy Vehicle
IAIA	International Association for Impact Assessment
IAIS	International Association for Impact Assessment
IAPCR	Industrial Air Pollution Control Regulation
IBA	Important Bird Area
IESC	The Independent Environmental and Social Consultant
IFC	International Finance Corporation
ILO	The International Labor Organization
IPA	Important Plant Areas
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ITS	Intelligent Traffic System
IUCN	International Union for Conservation of Nature
JASPERS	Joint Assistance to Support Projects in European Regions
KBA	Key Biodiversity Areas
KGM	General Directorate of Highways
KUDEB	Aydın Municipality Board of Protection of Cultural Heritage
LC	Least Concern
LR	Low Risk
LV	Light Vehicle
MAF	Ministry of Agriculture and Forestry
MAX-EQS	Maximum Environmental Quality Standard
MIGEM	General Directorate of Mining Affairs
MoEUCC	Ministry of Environment, Urbanization and Climate Change
MoTI	Ministry of Transportation and Infrastructure

LIST OF ABBEVIATIONS (CONTINUED)

MSDS	Material Safety Data Sheets
NAFZ	North Anatolian Fault Zone
NE	Not Evaluated
NGOs	Non-Governmental Organizations
NOx	Nitrogen Oxides
NT	Near Threatened
OGS	Automatic Passage
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Management Systems
PAH	Polycyclic Aromatic Hydrocarbons
PAPs	Project Affected People
PCB	Polychlorinated Biphenyls
PCE	Passenger Car Equivalents
PCM	Public Consultation Meetings
PCU	Passenger Car Unit
PFC	Perfluorocarbons
PID	Project Identification Document
PM	Particulate matter
PM_{10}	Particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than 2.5 microns
POPs	Persistent Organic Pollutants
PPD	Personal Protective Device
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
Project	Aydın-Denizli Motorway Project
PS	Performance Standard
PSs	Performance Standards
RENC	Regulation on Environmental Noise Control
RAMSAR	Convention on Wetlands of International Importance, Especially as Waterfowl Habitat
RMR	Rock Mass Rating
RQD	Rock Quality Designation
SCC	Species Conservation Concern
SE-NW	Southeast - Northwest
SEP	Stakeholder Engagement Plan
SSP	Shared Socioeconomic Pathways
SPT	Standard Penetration Test
SPV	Special Purpose Entities
SPV	Special Purpose Entities
TBMM	Grand National Assembly of Turkey
TCFD	Task Force on Climate-related Financial Disclosures
TEEB	The Economics of Ecosystems and Biodiversity
TL	Turkish Lira
TOPRAKSU	General Directorate for Soil and Water
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TurkStat / TUIK	Turkish Statistical Institute

LIST OF ABBEVIATIONS (CONTINUED)

UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
USGS	United States Geological Survey
VAT	Value Added Tax
VEC	Valued Ecosystem Component
VOC	Volatile Organic Compound
VU	Vulnerable
WBCSD	World Business Council for Sustainable Development
WBG	World Bank Group
WHO	World Health Organization
WWTP	Wastewater Treatment Plant

CHAPTER 1

INTRODUCTION

1. CHAPTER – INTRODUCTION

This Supplementary ESIA Report has been prepared by ENCON Environmental Consultancy Co. ("the Independent Environmental and Social Consultant (IESC)" or "ENCON") in the scope of the Supplementary Lenders Information Package (SLIP), for the "South Alternative", the redesigned part of the Aydın-Denizli Motorway Project ("ADMP").

In accordance with the Law on Implementation of Some of the Investments and Services in the Framework of Build, Operate and Transfer Model (Law No: 3996), the Ministry of Transportation and Infrastructure (MoTI), General Directorate of Highways (KGM or the Administration), has tendered for a contract in July, 2020 for the Aydın-Denizli Motorway Project (for which an EIA positive decision was taken in 2017). As a result of this tender, KGM has commissioned a special purpose entity (SPV) for the implementation of the ADMP under the related Build, Operate and Transfer (BOT) contract. In this regard, Fernas Group of Companies (Fernas Otoyol Işletmesi A.Ş. - FOIAS) has been awarded with a BOT Contract for the implementation of the project and referred as Project Sponsor in the scope of the studies.

FOIAS sought for potential financing for the ADMP, and granted the required finance from Ziraat Bankası, İş Bankası, Yapı Kredi Bankası and Akbank (four together, Lenders). To meet the environmental and social requirements of the lenders, who have required international environmental and social standards and guidelines to be adopted in the implementation of the projects that would be financed by them, a full-scale ESIA process has been completed for the ADMP in April, 2022.

However, during the construction phase of ADMP, considering the demands of local administrations and the local public mainly, *the motorway should pass outside the fertile agricultural lands and settlements*, a large-scale design changes have been made by KGM, as horizontally and vertically by the alternative route studies for a specific section of the ADMP, which might bring changes in the existing project components of said section and so environmental and social impacts. Also two interchanges have been redesigned. Thus, this Supplementary ESIA study has been conducted for the South Alternative in the scope of SLIP.

ADMP has a total length of 163 km including main carriageway and the access roads, and has two sections given below:

Section 1: Aydın-Kuyucak (Km 0+000 - 60+865), and
Section 2: Kuyucak-Denizli (Km 60+865 - 140+650)

As stated above, at the construction phase of the ADMP, KGM, as the owner of the project, has submitted an order for a design change of the main carriageway between Km 15+856 and 34+630 in Section 1 ("South Alternative"). Thus, project description and the assessments had been done in this report had been conducted in the scope of said section of the ADMP.

Table 1.1 provides the summary of the key information of actual design of the section that formed the basis of assessments.

Table 1.1 Summary of the Key Information of South Alternative

Section	Name	Location		Length (Km)		
		Start	End	Main Road	Access Road	TOTAL
Section 1	South Alternative	Km 15+856	Km 34+630	18.774	7.242	26.016

Figure 1.1 presents a map showing the route of South Alternative, redesigned part of the ADMP.

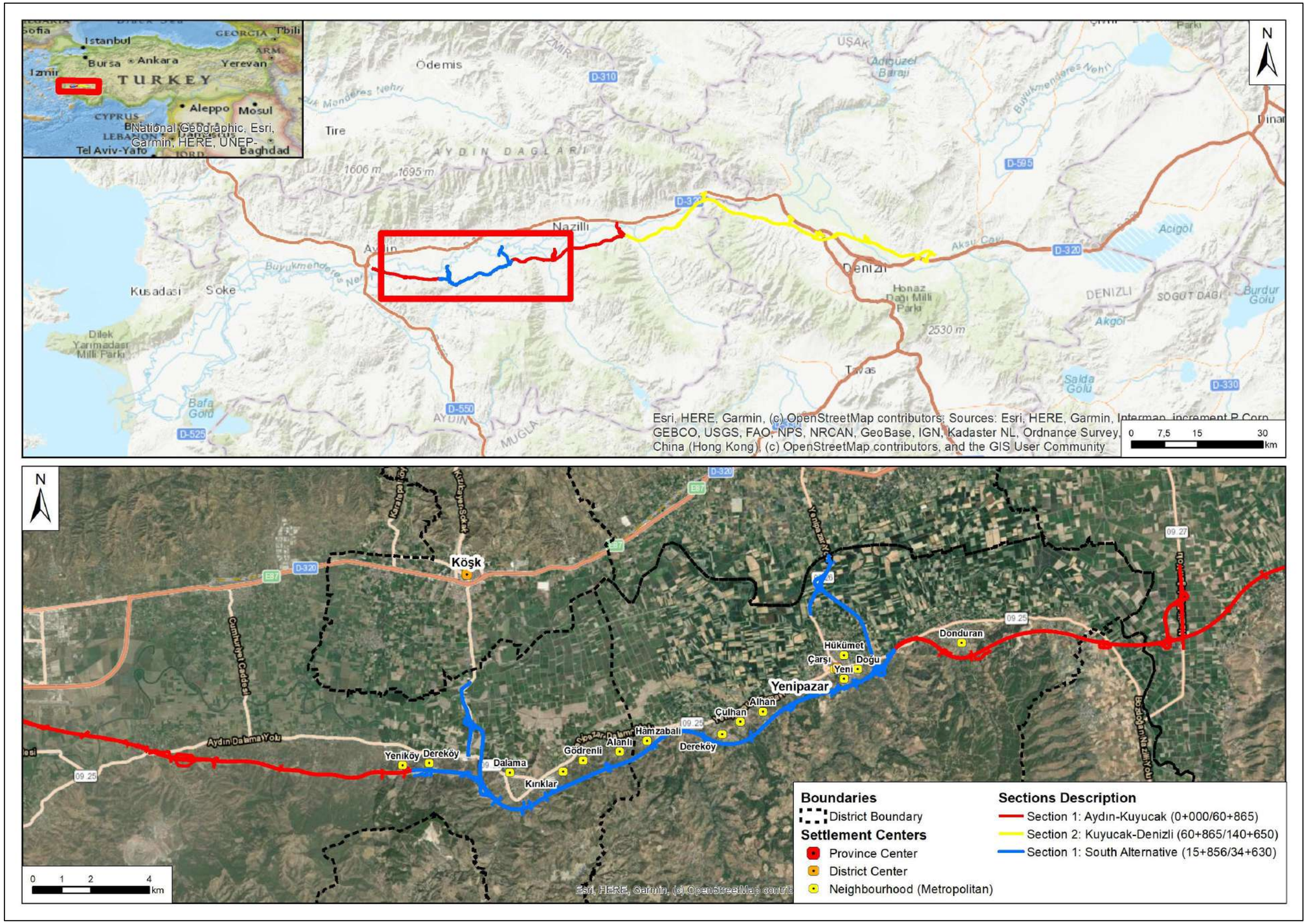


Figure 1.1 Route of the South Alternative

1.1 Aim of the ESIA and Supplementary ESIA Report

Expenditure on new development of roads is likely to be a major component of national budgeting. Due to high cost of construction and budget constraints, financing new motorway projects by national budget is difficult. Thus, in the recent years, build-transfer-operate (BOT) models, based on the project experience of the private sector and support of financial institutions, has been one of the most effective mechanisms in Turkey for realizing large-scale motorway projects without causing public burden (*KGM, June 2011*).

The Aydın-Denizli Motorway is a project that has been tendered out in the framework of BOT model. As the winning bidder, FOIAS seeks finance from financial institutions/potential lenders, who would require international environmental and social standards and guidelines to be adopted in the implementation of the project. In consideration of Equator Principles, World Bank policies and IFC's Sustainability Framework, the project is evaluated to be likely to include activities and components that are to be effectively managed to avoid or minimize significant environmental and social impacts. In this respect, the Aydın-Denizli Motorway Project would be classified as a Category A Project, for which the borrower is responsible for preparing an Environmental Impact Assessment (EIA) Report/full-scale ESIA. Similarly the EU's EIA Directive and the Turkish EIA Regulation, which has been harmonized with EU's EIA Directive also define the motorway construction projects as Annex I activities, for which an EIA is required ("EIA Positive Decision" taken in 2017). Thus, to meet the environmental and social requirements of the lenders, who would require international environmental and social standards and guidelines to be adopted in the implementation of the projects that are to be financed by them, a full-scale ESIA process has been completed for the ADMP in April, 2022.

As mentioned before, after completion of the ESIA study, it was stated by the Project Sponsor that there was an order from Administration for a change in the route design which might bring changes in the existing project components of the route and so that environmental and social impacts. Also two interchanges have been redesigned. Thus, this Supplementary ESIA study has been conducted for the South Alternative in the scope of SLIP.

According to internationally accepted and applied impact assessment procedures, the ESIA process started with the initial screening and scoping phases. Findings of the screening and scoping studies were documented in the Inception Report dated July, 2023. The primary aim of the Inception Report was the identification of the environmental and social issues and impacts that are likely to be important and the delineation of the scope of the Supplementary ESIA Report to be prepared.

Following the scoping phase, other key processes including examination of alternatives; stakeholder identification (focusing on those directly affected) and engagement; gathering of environmental and social baseline data by means of desk-based and field studies[1]; impact identification, prediction, and analysis; generation of mitigation or management measures and actions; evaluation of significance of impacts and residual impacts; and documentation of the assessment process, were conducted in accordance with the requirements of the relevant Turkish laws and regulations, Equator Principles and IFC's Sustainability Framework and the findings of the entire process have been compiled in this Supplementary ESIA Report, which has been prepared for the South Alternative.

The Supplementary ESIA Report has been structured as follows:

- **Chapter 1** Introduction
- **Chapter 2** Institutional and Legal Framework
- **Chapter 3** Project Description
- **Chapter 4** ESIA Methodology
- **Chapter 5** Land Use and Property
- **Chapter 6** Topography, Soils and Geology
- **Chapter 7** Use of Resources and Wastes

[1] Site surveys have been conducted for all relevant environmental and social subjects (i.e. water, soil, air, noise, flora and fauna, and social) to collect/gather up-to-date/valid baseline information characterizing the existing conditions. Due to the seasonal restrictions, baseline surveys were conducted at the most convenient time within the Supplementary ESIA period.

- **Chapter 8** Water Resources
- **Chapter 9** Ecology and Biodiversity
- **Chapter 10** Air Quality[2] and Climate Change
- **Chapter 11** Noise[2] and Vibration
- **Chapter 12** Protected Areas, Landscape and Visual Environment
- **Chapter 13** Archaeological and Immovable Cultural Heritage
- **Chapter 14** Socio-economic Environment
- **Chapter 15** Community Health and Safety
- **Chapter 16** Labor and Working Conditions
- **Chapter 17** Cumulative Impact Assessment
- **Chapter 18** Analysis of Alternatives
- **Chapter 19** Public Consultation
- **Chapter 20** Environmental and Social Management System
- **ANNEXES**

The assessments done in the scope of this Supplementary ESIA Report are based on the most current design and the information given in Chapter 3 ("Project Description").

1.2 Need for and Aim of the ADMP and South Alternative

Effective transportation infrastructure is a key to the development of countries. Today, transportation has become one of the basic needs of the mankind and a prominent driving force for the socio-economic development. In this respect, road transportation provides the most flexible transportation means as far as the topography, amount of the load to be transported and the time is concerned. Road transportation is usually preferred as it enables non-stop and fast transportation and thus most of the time is the most economical alternative when compared to other transportation systems.

Road transportation has become prominent in the 20th century following the Second World War. Once the 1970s energy crisis had been overcome, road transportation has risen and become the primary means of transportation in 2000s in many developed and developing countries. Currently, with continuing technological advancements, demand for transportation and number of vehicle ownership increases resulting in an upward trend in the preference for road transportation.

Playing a key role in economic development and enhancement of welfare, road transportation is not only an important economic activity on its own but it also paves ground for interaction between different sectors. The fact that time gains primary importance in the globalizing world raises the importance of road transportation as it provides the ability to compete and establish flexible relations.

Türkiye, being aware of its geographic importance, spends great effort to establish transportation connections between Europe, Asia and Africa. The system of highways network in the country is significant to provide national development, unity and general development in the region.

Motorways with non-stop tolling systems have been established by the KGM with the aim of preventing time loss and providing fast transportation (*http://www.kgm.gov.tr*). The ADMP is a project planned by KGM in this context and it will be integrated to KGM's other operational and/or planned transportation systems (i.e. highways, bridges, tunnels) in the Aegean region.

Aegean Region of Turkey is not only a fascinating tourism paradise with its natural beauties, but has the longest coastline in Turkey as well. Beside this, as being at the crossroads of a rich historical and cultural heritage, there are many museums in the Aegean region due to the existing cultural and tourism assets.

[2] Traffic projections have been obtained from the Independent Consultant and both air quality and noise modelings have been conducted by taking this data into consideration.

Therefore, there is always an intense demand for transportation both throughout and to the region. ADMP is aiming to facilitate and accelerate the transportation in the region in the most efficient way possible.

Also the urbanization rate of the region is high, and as a result of the rapid population growth, which brings together increased number of vehicle ownership, traffic problems (i.e. chronic congestion, frequent traffic jams) occur in the peak hours of the traffic especially in the large cities.

The primary aim of the ADMP is to ensure provision of comfortable transportation services by means of balancing the intense traffic stress that prevail on the existing road transportation infrastructure of Aegean Region. Additionally, the ADMP aims to build capacity that would be necessary for meeting the anticipated traffic loads in the future. This is planned to be achieved by separating the local traffic caused by the urbanization and industrialization growing near the main transportation lines located in the east-west direction in the Aegean Region from the intercity and international traffic to the extent possible.

Besides the benefits to be provided to the transportation networks and their users, ADMP is anticipated to create social and economic benefits, which would include creation of employment opportunities, local and regional development, increased access to employment, markets and education, health and cultural/tourism facilities and contribution to national budget through collection of taxes and to national security.

On the other hand, to maximize those benefits and ensure environmental and social acceptance of the project, effective management of the potential environmental and social impacts of the project, as described in the ESIA Report and the Supplementary ESIA Report, is a must.

Implementation of the ADMP together with South Alternative, which is subject to this Supplementary ESIA study, will provide a transit corridor (i.e. for freight transportation) that bypasses the busy city centers and enable connection of the roads between Aydın province and Denizli province in the Region.

As a result of these efforts, it is anticipated that the quality of transportation services would be increased and traffic-induced energy consumption, air emissions, time losses, etc. would be mitigated.

1.3 Background to the Project

The ADMP was put in the public investment program in 1994 by the former State Planning Organization with the number-91E040150. The preliminary projects and engineering services of the ADMP were tendered in 1996, and final project reports were published in 2005 and 2007.

Although the implementation of the ADMP was tendered and the contracts were signed in 1998, the contracts were canceled due to the financing problems (credit supply for the project) and the project was excluded from the investment program in 2001.

The implementation of the ADMP (for which an EIA positive decision was taken in 2017), was tendered out in the framework of BOT model in July, 2020.

Following the signing of BOT Contract, FOIAS has continued route and project optimization and design works in cooperation with KGM and other related state authorities. The design of the ADMP has progressed in parallel to the ESIA studies and route selection has reached an advanced level within the ESIA process for ADMP, however design and/or optimization of certain project components are still going on.

However, during the construction phase of ADMP, considering the demands of local administrations and the local public mainly, *the motorway should pass outside the fertile agricultural lands and settlements*, a large-scale design changes have been made by KGM, as horizontally and vertically by the alternative route studies for a specific section of the ADMP, which might bring changes in the existing project components of said section and so environmental and social impacts.

Also two interchanges have been redesigned. Thus, this Supplementary ESIA study has been conducted for the South Alternative in the scope of SLIP.

Since detailed engineering studies for the South Alternative have not been finalized yet, project optimization (e.g. change in the number, characteristic and locations of the engineering structures) may continue in the next phases of the construction. It should be noted that in case of any design change during and after the Supplementary ESIA study has been completed, the project would be managed in the scope of ESMS by means of Change Management Procedure (see Annex-6 Section E), and FOIAS will inform the relevant Ministry and fulfill the legislative requirements, if any required by the Ministry.

The expropriation[3] plans have been mostly completed for the current route and land use permits have been obtained for the project area. On the other hand, according to the information provided by the Project Sponsor, permits for construction activities are planned to be gradually obtained in due course as the work progress. Status of the permitting activities is provided in Chapter 2 ("Institutional and Legal Framework").

[3] According to the BOT Contract and in accordance with the relevant provisions of the Expropriation Law (Law No: 2942), expropriation works for the ADMP and so South Alternative are not under the control and authority of the Project Sponsor and will be conducted by the KGM (government) as the related administrative authority.

CHAPTER 2

INSTITUTIONAL AND LEGAL FRAMEWORK

2. CHAPTER - INSTITUTIONAL AND LEGAL FRAMEWORK

This Chapter describes the institutional framework in Türkiye and identifies the national environmental legislation, international agreements and protocols and international environmental and social standards including the Equator Principles (EPs) and International Finance Corporation's (IFC) Policy (2012) and related Performance Standards (PSs) on Environmental and Social Sustainability that would be applicable to the South Alternative.

2.1 Institutional Framework

Administrative structure in Türkiye is governed by central and local administrations. The central administration is organized so that the land mass of the country is divided into provinces and the provinces into further smaller divisions (i.e. districts, municipalities, villages/neighborhoods) according to geographic and economic conditions, and the need for public services. For the purpose of meeting collective local needs, the populations of provinces, municipalities, and villages/neighborhoods are administered by units of local government established by law (*Toksoz, F., 2006*). A general depiction of the institutional framework in Türkiye with relevance to the South Alternative is shown in Figure 2.1.

Ministries are the units of central administration. Local branches of ministries are composed of provincial organizations attached to governors and district organizations attached to the district governors (Hacettepe University, Department of Political Science and Public Administration, April, 2015). At the local level, municipality mayors and the headmen of the villages/neighborhoods (mukhtar) are the representatives of the administrative structure.

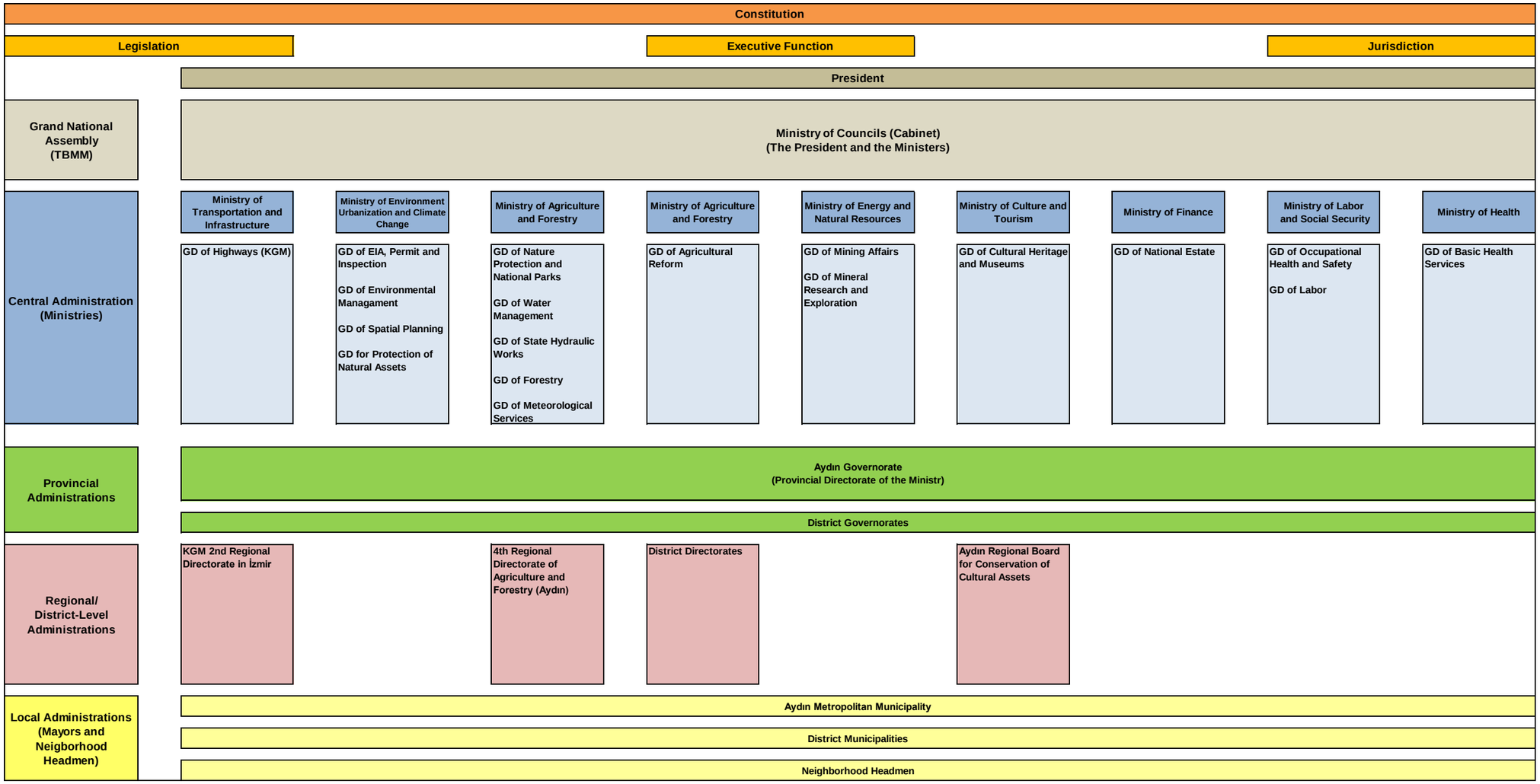


Figure 2.1 Institutional Framework in Türkiye (in consideration of South Alternative)

2.1.1 Central Administrations

Central administration is the core of the administrative structure. Each Ministry, being a unit of central administration, is headquartered in Ankara, with units at the provinces serving as their field organizations (Toksoz, F., 2006).

Ministry of Transportation and Infrastructure (MoTI) is the key central administration in the scope of the South Alternative. Under the Ministry, General Directorate of Highways (KGM) is the authority responsible from the implementation of the project.

In Türkiye, the Ministry of Environment, Urbanization and Climate Change (MoEUCC) is the responsible organization for the implementation of policies adopted for the protection and conservation of the environment and for sustainable development and management of natural resources. Thus, the MoEUCC will be the authority with which the MoTI (through the GD of KGM) and the Project Sponsor will collaborate regarding the assessment and management of environmental aspects of the South Alternative.

The Ministry of Environment was first established as an Under-secretariat of the Prime Minister's office in 1987 and was promoted to the rank of Ministry of Environment in August 1991 by the Establishment Law No. 2443. Then, the Ministry of Environment and Forestry was established in 2003 through a merger of the previously separate Ministry of Environment and the Ministry of Forestry. Recently, the environment part of the former Ministry of Environment and Forestry was separated and merged with the Ministry of Public Works and Settlement to form the Ministry of Environment and Urbanization. On October 11, 2021, it was renamed as the Ministry of Environment, Urbanization and Climate Change.

The MoEUCC has an overall coordinating role for the development and implementation of environmental policies in Türkiye, including the approximation process for the EU environmental Acquis. The MoEUCC is composed of the 8 different general directorates. The general directorates, which are relevant to or may have an interest in the South Alternative, are listed below:

- **Ministry of Environment, Urbanization and Climate Change**
  - General Directorate of Environmental Management
  - General Directorate of EIA, Permit and Inspection
  - General Directorate of Spatial Planning
  - General Directorate for Protection of Natural Assets

Main environmental responsibilities of the MoEUCC are summarized below:

- Prepare the legislation on environment, public works, and housing development and monitor and audit the related implementations.
- Identify the principles and policies on environmental protection, rehabilitation of environment and prevention of environmental pollution, develop standards, criteria and programs in this context; outline the principles for implementing and monitoring these standards and criteria; undertake the works related to climate change.
- Assess the impacts of all facilities/activities that pollute the environment due to their activities resulting in solid, liquid or gaseous waste disposal/discharge into receiving environments; monitor, audit and issue the permits of such facilities/activities.
- Perform the measurements/analyses and monitoring studies concerning receiving environments.
- Establish the plans and policies regarding the global climate change and measures to be taken against its effects.

For the management of environmental issues, MoEUCC collaborates with other ministries, government agencies and relevant stakeholders. Ministries (through related General Directorates), which would be relevant to or may have an interest in the South Alternative are listed below:

- **Ministry of Transportation and Infrastructure (MoTI)**
  - General Directorate of Highways (KGM)

- **Ministry of Agriculture and Forestry**
  - General Directorate of Nature Protection and National Parks
  - General Directorate of Water Management
  - General Directorate of State Hydraulic Works
  - General Directorate of Forestry
  - General Directorate of Meteorological Services
  - General Directorate of Agricultural Reform

- **Ministry of Culture and Tourism**
  - General Directorate of Cultural Heritage and Museums

- **Ministry of Energy and Natural Resources**
  - General Directorate of Mining Affairs
  - General Directorate of Mineral Research and Exploration

- **Ministry of Finance**
  - General Directorate of National Estate

- **Ministry of Labor and Social Security**
  - General Directorate of Occupational Health and Safety
  - General Directorate of Labor

- **Ministry of Health**
  - General Directorate of Basic Health Services

2.1.2 Provincial, Regional and District Level Administrations

Provincial, regional and district level administrations are the field organizations of the Ministries. Under the MoTI, GD of KGM, İzmir 2nd Regional Directorate is the related local authority. The Aydın province also falls in the jurisdiction of the 2nd Regional Directorate of KGM. The jurisdiction area of KGM's 2nd Regional Directorate is presented in Figure 2.2.

The MoEUCC, Ministry of Agriculture and Forestry, Ministry of Culture and Tourism and Ministry of Health have provincial directorates in each province under the related Governorate. Provincial directorates under the Aydın Governorate are the local governmental authorities related with the South Alternative.

In addition, the Project is located within the jurisdiction of the 21st Regional Directorate of the Ministry of Agriculture and Forestry located in Aydın province. The motorway, in other words, passes through the jurisdiction area of the 21st State Hydraulic Works (DSI) under the same Ministry.

Regarding the cultural heritage, Aydın Regional Board for Conservation of Cultural Assets and Aydın Protection Council under the Ministry of Culture and Tourism will be the responsible authority along the route.

2.1.3 Local Administrations

Local Administration, which functions under the administrative tutelage of the central administration, is divided into three main administrative tiers. These are the special provincial administrations, municipalities, and village/neighborhood administrations (Toksoz, F., 2006). Since the Aydın Province is a metropolitan municipality, no special provincial administration is present. Aydın Metropolitan Municipality, related district municipality and the neighborhood headman is the local administrations relevant to the South Alternative.

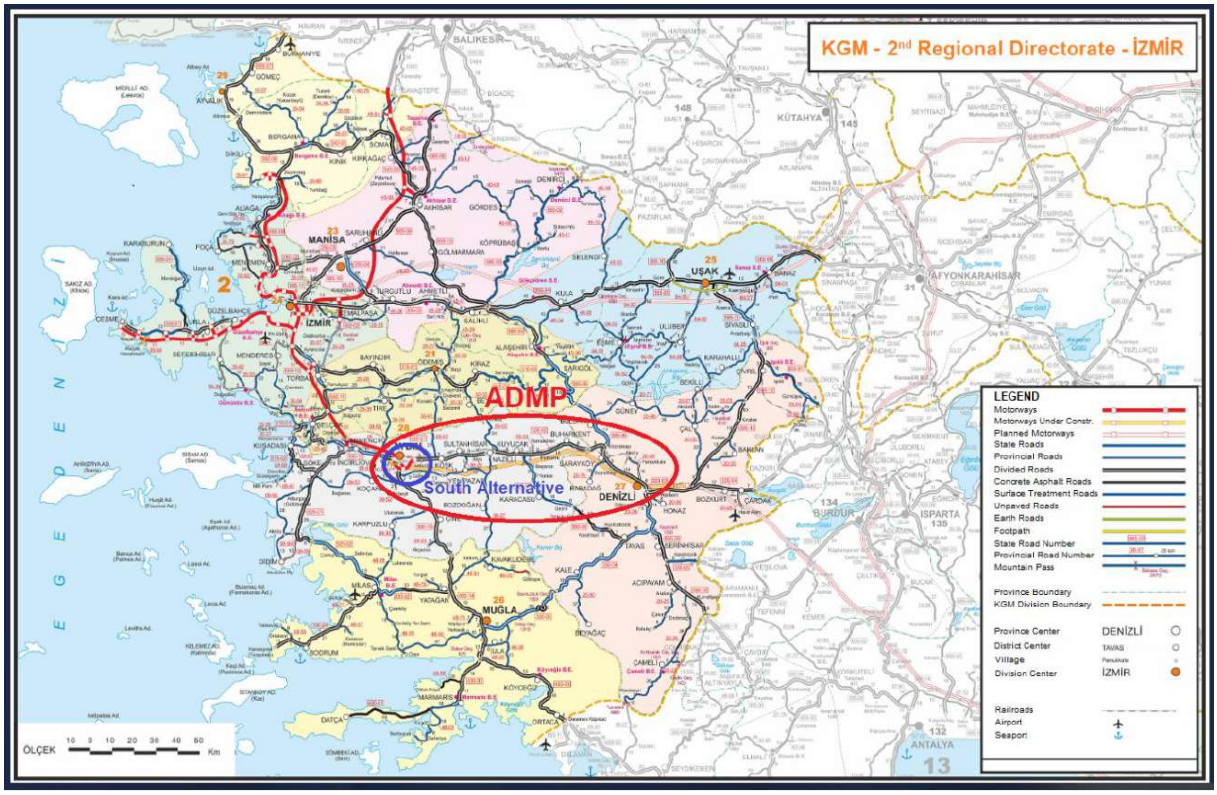


Figure 2.2 Jurisdiction Area of KGM's 2nd Regional Directorate

2.2 Applicable Turkish Environmental and Social Legislation

Turkish Environmental Law (Law No: 2872), which came into force in 1983, handles environmental issues on a very broad scope. Under the Environmental Law, environmental regulations have been developed in line with national and international initiative and standards, and some of them have been revised recently to be harmonized with the European Union (EU) Directives in the scope of pre-accession efforts of Türkiye.

Complementary to the Environmental Law and its regulations, the laws listed below also govern the protection and conservation of the environment, prevention and control of pollution, implementation of measures for the prevention of pollution, health and safety and labor issues:

- Electricity Market Law (Law No: 6446)
- Energy Efficiency Law (Law No: 5627)
- Expropriation Law (Law No: 2942)
- Forestry Law (Law No:6831)
- Groundwater Law (Law No: 167)
- Labor Law (Law No:4857)
- Law on the Conservation of Cultural and Natural Assets (Law No:2863)
- Law on Improvement of Olive Cultivation and Grafting of Wild Species (No:3573)
- Law on Soil Protection and Land Use (Law No:5403)
- Mining Law (Law No:3213)
- Municipality Law (Law No: 5393)
- National Parks Law (Law No: 2873)
- Pasture Law (Law No:4342)
- Public Health Law (Law No: 1593)
- Resettlement Law (Law No: 5543)
- Traffic Law (Law No:2918)

The primary environmental laws, regulations, by-laws and communiqués and other complementary regulations applicable to the infrastructure projects are listed below in Table 2.1. Project Sponsor will comply with the requirements of relevant national legislations and codes of practice, and fulfill all other legal requirements.

Table 2.1 National Environmental Legislation Applicable to the Project

Subject	Name of the Legislation
Land Use and Soils	
Agricultural lands	Law on Soil Protection and Land Use
	Implementation Regulation on Soil Protection and Land Use
	By-law on Protection and Use of Agricultural Lands and Land Consolidation
	Law on Improvement of Olive Cultivation and Grafting of Wild Species
	Regulation on Improvement of Olive Cultivation and Grafting of Wild Species
Forest lands	Forestry Law
	Implementation Regulation of 16th Article of the Forestry Law
Pasture lands	Pasture Law
	Pastures Regulation
Soils	Regulation on the Control of Soil Pollution and Lands Contaminated by Point Sources
Rehabilitation	Regulation Concerning the Rehabilitation of the Lands Disturbed by Mining Activities
Socio-economics	
Land Acquisition	Expropriation Law
	Regulation on the Exchange of Treasury Lands in the scope of Expropriation for Motorway Construction Purposes
Resettlement	Resettlement Law
	Resettlement Implementation Regulation
Water and Wastewater	
Water and Wastewater Management	Water Pollution Control Regulation
	Surface Water Quality Regulation
	Regulation on the Control of Pollution Caused by Dangerous Substances in and around the Water Bodies
	Regulation Concerning Water for Human Consumption
	Regulation Concerning Protection of Groundwater against Pollution and Deterioration
	Ordinance on Groundwater Resources
Air	
Air Quality	Regulation on the Control of the Air Pollution Sourced by the Industry
	Regulation on the Assessment and Management of Air Quality
	Regulation Concerning Follow up of Greenhouse Gas Emissions
Odor	Regulation on Control of Emissions Causing Odor
Noise	
Environmental Noise	Regulation on the Assessment and Management of Environmental Noise
	Regulation on Environmental Noise Emission Caused by Equipment Used Outdoors
Wastes	
Waste Management	Regulation on Waste Management
	Regulation on the Control of Packaging Wastes
	Hazardous Wastes Control Regulation
	Regulation on the Control of Medical Wastes
	Regulation on the Control of Waste Oils

Subject	Name of the Legislation
	Regulation on the Control of Waste Batteries and Accumulators
	Regulation on the Control of Waste Tires
	Regulation on the Control of Waste Vegetable Oils
	Regulation on the Control of Excavation Soil, Construction and Demolition Wastes
	Regulation on Mining Wastes
Landfills	Regulation on the Landfill of Wastes
	Circular on the Preparation of Implementation Project for Landfills
	Circular on Landfill of Mining Wastes and Technical Arrangement of Other Landfills
Environmental Permits and Licenses	
General	Environmental Impact Assessment (EIA) Regulation
	Regulation on Environmental Permit and Licenses
	Environmental Auditing Regulation
	Regulation for Starting Up and Opening a Workplace
	Communiqué on Certificate of Competency
Health and Safety	
Occupational Health and Safety	Labor Law
	Regulation on Occupational Health and Safety
	Regulation on Occupational Health and Safety at Mining Worksite
	Regulation on Methods and Essential for Work Health and Safety Training for Works
	Regulation on Health and Safety Signs
	Regulation Concerning the Use of Personal Protective Equipment at Workplaces
	Regulation on Health and Safety Measures to be taken at Works Involving Chemicals
	Regulation on Protecting Workers from Hazards of Explosive Environments
	First Aid Regulation
	Regulation Concerning the Protection of Workers from Risks Associated with Vibration
	Communiqué on Hazard Classes List related to Occupational Health and Safety
	Regulation on Control of Large-Scale Industrial Accidents
Dangerous Substances	Regulation on the Transportation of Dangerous Materials on Motorways
	Regulation Concerning the Classification, Packaging and Labeling of Dangerous Substances
Structural Safety	Regulation on Structures to be Built in Disaster Zones
	Regulation on Structures to be Built in Earthquake Zones
	Regulation on the Protection of Buildings from Fire
Cultural and Natural Heritage	
Protection	Law on the Conservation of Cultural and Natural Heritage
	Regulation on Procedures and Principles Concerning the Protection of Game and Wild Animals and their Habitats and Combat with their Pests
Wetlands	Regulation on the Protection of Wetlands
Others	
General	Regulation Concerning the Increase of Efficiency in the Usage of Energy Resources
	Regulation on the Implementation of the Law Concerning Private Security Services

2.2.1 EIA Process under Turkish EIA Regulation

Under Article 10, Environmental Law sets out the general scope of the Environmental Impact Assessment (EIA) procedure in Türkiye, indicating that institutions, agencies and establishments that lead to environmental problems as a result of their planned activities are obliged to prepare Environmental Impact Assessment Report or Project Information File. Based on this legal framework, the EIA Regulation was put into force for the first time after being published in the Official Gazette numbered 21489 and dated on February 7, 1993. Since then there had been several amendments in the first regulation and new EIA regulations were published in 2008 and 2013 repealing the former regulations in force. The latest EIA Regulation (2022 EIA Regulation) has been published in the Official Gazette dated 29.07.2022 and numbered 31907, which repealed the 2014 EIA Regulation.

Under its annexes, the EIA Regulation categorizes investments as projects subject to full EIA (Annex-1) and subject to preliminary review (Annex-2). This categorization is done based on the type of activity and/or plant capacity. If the planned investment is defined as an activity under Annex-1 of the EIA Regulation, a full EIA Report is required. For Annex-2 activities, first a Project Information File is prepared in accordance with a limited format specified in the Annex-4 of the EIA Regulation and the MoEUCC evaluates the need for a full EIA process for the project.

The categorization for motorway projects under the current Turkish EIA regulation is done as follows:

- Full EIA process is required for the following Annex-1 activities;
  - Highways and state motorways (Article 9-c)

- Limited EIA process is required to be conducted for the following Annex-2 activities;
  - Provincial roads and ring roads (excluding neighborhood and village roads) (Article 28-d)

According to the EIA Regulation in force (2022 EIA Regulation); projects, for which it is documented that if they have started production or been put in operation before the first publishing date of EIA Regulation that is 07/02/1993, are out of the scope of the EIA Regulation (Temporary Article 2). Additionally, projects (including the structures and facilities that are required for the implementation of those projects), which are taken to the public investment program before 23/06/1997 and has started production or operation before 29/05/2013 are also out of the scope of the EIA Regulation (Temporary Article 3).

The Aydın-Denizli Motorway Project was not planned before 1993 so that it has not an exemption from Turkish EIA legislation. In this regard, the EIA Report had been prepared in 2016, submitted to the Ministry of Environment and Urbanization and reviewed by the evaluation committee and EIA Positive decision had issued in 2017. (The positive decision certificate is given in Annex-2). The scope of the EIA Report that was subject to the positive decision basically covers the main route, its right of way, the access roads and not consists of the quarries, asphalt plants, crushers, aggregate facilities, construction camps, etc. In other words, the associated and affiliated facilities that are needed for the implementation of the project, was not covered in the scope of EIA reviews. That is the reason why there have been series of associated activities where either the preliminary EIA Reports prepared and submitted to the related Provincial Directorates of the MoEUCC (in Aydın and Denizli) or the clearance letters that are promoting that the specific activity is out of the scope of the EIA Regulation, have been awarded between 2017 and 2021. For the South Alternative, Project Sponsor has an official letter from the related Aydın Provincial Directorate of the MoEUCC via KGM that, South Alternative is “out of the scope of the EIA Regulation”, dated 27.04.2022. (The official letter is given in Annex-2).

Status of Environmental Permits and Licenses

Regarding to the South Alternative, main environmental permits and/or licenses that would be required for the project are listed below:

Land Preparation and Construction Phase

- **Land Use**
  - Forestry permit
  - Permit for the use of pasturelands
  - Permit for the use of agricultural lands for non-agricultural purposes
  - Land use agreements with state authorities for state-owned lands
  - Expropriation of privately-owned lands

- **Construction and Camp Sites**
  - Crossing permits/approvals for railroads, rivers, roads, canals, power supply lines, natural gas pipelines, etc.
  - Workplace notification for Camp Sites
  - Utility permits for the temporary connection to existing utilities (telecom, electricity, etc.)
  - Fuel storage permit
  - Permits for service roads
  - Provisional operation certificate/environmental permit for the operation of ready mixed concrete plants
  - Provisional operation certificate/environmental permit for the operation of asphalt plants
  - Provisional operation certificate/environmental permit for the operation of crushing and screening plants
  - Provisional operation certificate/environmental permit for the operation of mechanical plants

- **Water/Wastewater Management**
  - Provisional operation certificate/environmental permit for the operation of package wastewater treatment plants
  - Wastewater treatment plant identity
  - Groundwater Utilization Permit

- **Waste Management**
  - Permit for temporary waste storage areas
  - Storage permit for the access amount raised by the cut
  - Waste management plan approval
  - Agreements with licensed waste management/disposal companies

- **Quarry Operation**
  - Raw material production/quarry operation license
  - Permission to use long vehicles

- **Blasting and Explosives Management**
  - Blasting permit
  - Permit for storage of explosives

- **Others**
  - Private security permit
  - EIA Process

Operation Phase

- **Water/Wastewater Management**
  - Provisional operation certificate/environmental permit for the operation of package wastewater treatment plants at the service areas or connection quality control certificate and/or wastewater channel connection document

- **Others**
  - Certificate for starting up and operating of a workplace
  - Private security permit

The status of main environmental permits and/or licenses that would be required for the project, are listed in Table 2.2.

Table 2.2 Status of Main Environmental Permits and/or Licenses

No	Location	Name of the Plant/Facility	Km	Current Status *	EIA Regulation			Environmental Permits & License Regulation Status		
					Status	Progress **	Official Letter / Decision / Approval No and Date	Status	Progress ***	Official Letter / Decision / Approval No and Date
1	Aydın, Yeniköy	Yeniköy Mechanical Plant	15+600	Operation	EIA - Out of Scope	Completed	22.09.2022 - 4622477	Out of Scope	Completed – L-EPE	24.10.2022 - 4849148
2	Aydın, Efeler, Dereköy	Dereköy Crushing-Screening Plant	17+000	P / M / T	Ongoing			Will started once EIA obtained		
3	Aydın, Efeler, Dalama	Dalama Camp Site Concrete Batching Plant	20+000	Operation	EIA - Out of Scope	Completed	14.06.2021 - 1238637	Annex 2 List	Completed – EP-C	04.11.2022 - 309691428.1.1
4	Aydın, Efeler, Dalama	Dalama Camp Site Asphalt Plant	20+000	Operation	EIA - Annex 2 List	Completed - EIA-NR	21.03.2022 - E-202234	Annex 2 List	Completed – EP-C	04.11.2022 - 309691428.1.1
5	Aydın, Merkez, Dalama	Dalama 02 Quarry and Crushing-Screening Plant	20+000	Operation	EIA - Annex 2 List	Completed - EIA-NR	07.05.2021 - E-202162	Annex 2 List	Obtained – EP-C	21.03.2023 - 309729532.0.1
6	Aydın, Çine, Kasar	Dalama 03 Quarry	20+000	Operation	EIA - Annex 2 List	Completed - EIA-NR	02.08.2021 - E202198	Annex 2 List	Completed – EP-C	21.11.2022 - 309744250.0.1
7	Aydın, Efeler, Dalama	Dalama 07 Quarry	20+000	Operation	EIA - Annex 2 List	Completed - EIA-NR	06.06.2022 - E-202257	Annex 2 List	Obtained – TA-C	24.02.2023 - 1015481632.1.1
									Ongoing – EP Process	
8	Aydın, Çine, Kasar	Dalama Mechanical Plant	20+000	Operation	EIA - Out of Scope	Completed	23.02.2022 - 3025542	Out of Scope	Completed – L-EPE	25.03.2022 - E - 3285712
9	Aydın, Akçaköy	Akçaköy Quarry and Crushing-Screening Plant	21+000	Operation	EIA - Annex 2 List	Completed - EIA-NR	23.09.2022 - E-202296	Annex 2 List	Completed – L-EPE	22.12.2022 - 5344218
10	Aydın, Yenipazar, Hamzabali	Hamzabali Concrete Batching Plant	26+000	P / M / T	EIA - Out of Scope	Completed	25.05.2023 - 6507121	Will started once Mobilization / Test Completed		
11	Aydın, Yenipazar, Direcik	Direcik Concrete Batching Plant	38+000	Operation	EIA - Out of Scope	Completed	08.07.2021 - 1349454	Out of Scope	Completed – L-EPE	14.12.2021 - 2453704
									Ongoing – EP Process	
12	Aydın, Yenipazar, Hamidiye	Hamidiye Asphalt Plant	42+350	P / M / T	Ongoing			Will started once EIA obtained		
13	Aydın, Yenipazar, Hamidiye	Hamidiye Mechanical Plant	42+350	P / M / T	Ongoing			Will started once EIA obtained		
14	Aydın, Kuyucak, Karapınar	Kuyucak Camp Site Concrete Batching Plant	59+500	Operation	EIA - Annex 2 List	Completed - EIA-NR	08.01.2021 - E-20211	Annex 2 List	Obtained – TA-C	29.12.2021 – 309106450.1.1
									Ongoing – EP Process	
15	Aydın, Kuyucak, Karapınar	Kuyucak Camp Site Precast Beam Plant	59+500	Operation	EIA - Out of Scope	Completed	08.01.2021 - E-20211	Annex 2 List	Obtained – TA-C	29.12.2021 – 309106450.1.1
									Ongoing – EP Process	

* *P / M / T: Planning / Mobilization / Test*
** *EIA-NR: EIA Not Required*
*** *EP-C: Environmental Permit Certificate; L-EPE: Letter for Environmental Permit Exemption; TA-C: Temporary Activity Certificate*

2.2.2 Expropriation Process under Turkish Expropriation Law

As it is known, expropriation is the most widely used method for land acquisition. Article 46 of the Turkish Constitution explains that state and legal public entities, in cases of public benefit, are entitled to entirely or partially expropriate immovable properties in private possession, on condition that the real value of those immovable properties are paid in advance and in cash; and to establish easement (servitude) on these immovable properties in compliance with the procedures and principles set by expropriation law.

There are a large number of laws and regulations relevant to the implementation of land acquisition. Those can cited as follows; Expropriation Law (Law No: 2942), Resettlement Law (Law No: 5543), Code of Civil Law (Law No: 4721), Cadastre Law (Law No: 3402), Forestry Law (Law No: 6831), Environment Law (Law No: 2872), Municipalities Law (Law No: 5393), Pasture Law (Law No: 4342) and Village Law (Law No: 442) and several implementation regulations pertaining to the above-mentioned laws. Expropriation implementation activities based on Turkish laws and regulations can be summarized in line with the following stages:

- Project approval (public benefit decision)
- Preparation of expropriation plans
- Identification of property owners and address investigation
- Expropriation decision
- Establishment of a “Valuation Commission” and the Valuation Process
- Establishment of a “Negotiation Commission” and purchasing process

Before describing the process under the Turkish Expropriation Law, it should be underlined that according to the BOT Contract and in accordance with the relevant provisions of the Expropriation Law, expropriation works for the ADMP and since the South Alternative is a part of ADMP, will be conducted by the KGM as the related administrative authority/responsible agency. Project Sponsor does not have any responsibility or authority regarding the execution of expropriation works but they are liable to provide up to 500 million TL for the expropriation cost in the scope of expropriation expenditures. The costs exceeding this amount will be provided by the KGM. The costs related with the procurement of services for the valuation works and others will be separately covered by the Project Sponsor.

The process under Turkish Expropriation Law starts with the approval of relevant ministry/authority of the expropriation works on behalf the public interest. This decision is made public at the office of village/neighborhood head for 15 days and then it is regarded as “cutoff date”. After the approval of the Project, expropriation plans are prepared. The actual size and boundaries of the immovable assets and resources are determined by land surveys and a scaled (usually with a scale of 1/5.000) expropriation map is prepared. Expropriation maps shall demonstrate the boundaries, surface area and kind of immovable assets and resources to be expropriated. Mainly title deeds, taxes and state registers and/or external researches are used for identification of the owners.

Stage by stage (in accordance with the expropriation priority) the project responsible agency takes the “expropriation decision” for designated areas and informs/requests to the Land Titling and Cadastre Directorate to put an “expropriation note” on the register of the relevant property. The responsible agency establishes a Valuation Commission of at least three experts to determine the values of assets and resources. Valuation commission determines the unit and ceiling values of assets and resources to be expropriated. Then, responsible agency establishes a negotiation commission within its own entity to reconcile with property owners on the value. Each negotiation commission comprises of at least three members. The commission sends an official invitation letter to each property owner without declaring the value for the asset that was previously estimated by valuation commission.

Article 27 of the Expropriation Law, states that; for the expropriation of immovable properties in situations for which Minister of Councils takes decision regarding the need or urgency for national defense in the scope of the implementation of the Law on National Defense Obligations (Law No:

3634) or during emergencies foreseen by special laws, the immovable property subject to the expropriation may be seized by the related administration on condition that the procedures other than valuation shall be completed afterwards. In this process, following the request of the related administration, compensation amount for the immovable property shall be appraised by the court within 7 days through the experts assigned as per Article 10 and 15 of the Expropriation Law. Seizure shall only be made following the invitation to be done in accordance with Article 10 and the amount is deposited to the bank specified in the announcement.

In the scope of the Aydın-Denizli Motorway Project, for the parcels, for which agreements cannot be settled through the negotiations and expropriation, cannot be carried out through the purchasing process, urgent expropriation will be applied in accordance with Article 27 of the Expropriation Law. In this context, Urgent Expropriation Decision has been taken ***by the Presidency decision on September, 23rd, 2020 with the decision number, 2973*** for the urgent expropriation of the immovable assets (parcels shown on the related maps and lists) by the KGM in the scope of the Aydın-Denizli Motorway Project (See Annex-2).

2.2.3 Resettlement Process under Turkish Resettlement Law

In Türkiye, resettlement activities of the government are regulated by Resettlement Law (No: 5543). The Resettlement Law deals with the families applying to related governmental agencies in the project region and requesting government assisted resettlement. Law also covers the procedure of resettlement of immigrant families coming from other countries, as well as that of nomadic families.

Resettlement assistance of the government is provided to entitled families while expropriation compensation payments are paid to all individuals holding immovable properties in the project area. Three types of resettlement can be applied according to the choices and requests of affected families. Entitlement criteria related with resettlement whose lands will be expropriated are defined in Resettlement Implementation Regulation. According to the Regulation, owners requesting the resettlement must be residing at the project affected area, and they must earn annually less than 18 times monthly minimum official wages, and they should be seen as a family and must not be a civil servant.

Agricultural Resettlement: Agricultural resettlement is implemented through providing a family with the following; agricultural land at the amount of envisaged in special resettlement project, house, management building, and animal for income generation, agricultural devices and tools, workbench and credits one or more.

Non-agricultural Resettlement: This type of resettlement is implemented through providing a family with the following: building plot at the amount provisioned in special resettlement project, house, devices, tools, workbench and loans one or more.

Physical Settlement: This type of resettlement is implemented through providing construction credit support to a family within the amount of loan determined by the Ministry (MoEUCC) with the aim of re-building (moving) of villages because of unsuitability of a village center or consolidating of villages because of dispersed settlement or villages which are fragmented as a result of disasters; after selling land (house plot) from village development areas to people in need.

Article 12 of Resettlement Law refers to the resettlement of persons whose immovable properties are expropriated and specifies eligibility criteria for government assisted resettlement as follows:

(1) Due to the construction of a dam, an area adjacent to the dam, an area under protection, airport, highway, railway, plant and other facilities related to national economy and defense will be erected by public institutions and organizations; and due to the implementation of special laws and in order to protect historical and natural valuables;

a) The families who have to leave their locations/places as a result of partial or full expropriation of their immobile properties,

b) The families who do not own any immovable property, but who reside in the expropriation area at least for three years before the beginning of the calendar year, in which the resettlement planning studies were commenced, will be resettled to the locations/places indicated by the MoEUCC according to the provisions of this Law, provided that they request.

(2) However, the families who own immovable properties to be expropriated but left their places before the commencement date of resettlement planning studies shall not be resettled. Within the last three years as of this date, the families who sold their immobile properties without any compulsory situation and did not purchase immovable property with the equal or higher value shall not be resettled even if they did not leave their places. The compulsory situations mentioned above shall be determined by the regulations.

(3) Among the families residing in the expropriation area, those who are affected from the expropriation implemented by the public institutions and organizations, can be resettled by the Ministry to a location indicated within their village boundaries upon their written application if they do not want to be resettled by the government in any other place, provided that the suggestion of relevant Governorate and the approval of the Ministry of Interior are obtained.

(4) Among the families included in the scope of the this article, and requested to be resettled by the Government; the families who do not apply within the ninety day following the ending date of the announcement of resettlement, and the families who do not commit to deposit the amount determined by the MoEUCC from their expropriation compensation they received or will receive, or their full expropriation compensation and additional increase awarded by court in the case that the amount of expropriation compensation is lower than the amount (determined by the Ministry) into the account of the Central Account Unit of the Ministry, shall not be resettled.

Article 9 of Resettlement Law explains the resettlement assistance (which is similar to World Bank Standards) as follows:

(1) The immigrants, nomads, the persons whose places/grounds are expropriated and persons who are decided to be relocated by the reason of the national security shall be resettled in cities, towns and villages by means of providing the following through debiting/repayment according to the provisions of this Law, and pursuant to the plan and the project (specific) prepared by the MoEUCC;

a) At first, house and its' house-plot (for building),
b) For craftsmen, artisans and tradesmen: work place and its' building plot and operation credit to enable them providing for their livelihood,
c) For farmers, land, necessary agricultural inputs, agricultural structures or plot of structure, and in kind and in cash operation and equipment credits as envisaged in agricultural resettlement project (specific),
d) In case of the request of the right holder families (entitled to resettlement), resettlement credits can be given to the families collectively or individually, if the house, work place and agricultural land are found by themselves and their suggestions are approved by MoEUCC.

(2) Annual operation and equipment credits provisioned in agricultural resettlement projects (specific) shall not be paid to the families who did not request the mentioned credits within two years following the transfer of their agricultural lands.

(3) For immigrants accepted to enter the country according to this Law, as of the date they pass (enter) the border gates with their used goods which are exempt of customs; and for the people whose grounds(immovable properties) are expropriated and for those who are resettled due to national security and for the nomads, as of time when they are transferred to their resettlement areas; they shall be provided the support of medical help, accommodation, food, fuel and the support of clothing (for once only) for persons in need, and gratuitous assistances for temporary re-settlement for

those whose immovable properties are expropriated; these supports shall be provided according to the time, amount and the conditions specified in the regulations of the Law.

(4) Transportation (moving) of those (families) mentioned above to the resettlement areas (sites) shall be provided free of charge by the government according to the "Transportation (moving) Project" to be prepared (specifically) by the Ministry.

From the point of view of the international standards, another important point is the allocation of expenditure regarding land acquisition and resettlement under a single/same budget item. Article 33 of the Resettlement Law states that, the resettlement allowance will be allocated in the budget of the institution responsible for the expropriation.

It should be noted that in the selection of the route, physical displacement has been avoided to the extent the highway design criteria allowed. In the scope of the land acquisition process to be conducted for the potentially limited number of parcels on which buildings/structures located within the expropriation corridor according to the design, it is essential that the related authorities to aim the conduct acquisition process based on negotiated settlements to be established in accordance with the Expropriation Law thus the affected families do not apply to government and request government assisted resettlement.

2.2.4 Cultural Heritage Management under Law on the Conservation of Cultural and Natural Assets

According to the Law on the Conservation of Cultural and Natural Assets (Law No: 2863; amended by law numbered 4629) and the Principle Decision (No: 658), all cultural and natural properties requiring protection are considered as state property. As stated in the same law, the Ministry of Culture and Tourism and its local branches (Board for Conservation of Cultural Assets, and Museums, etc.) are the main national government institutions who have the authority of conducting the works of identification and registration of cultural assets and defining the conditions of conservation. In this respect, Aydın Regional Board for Conservation of Cultural Assets is the sole competent authority within the scope of the South Alternative.

The project area is under the responsibility of Aydın Regional Board for Conservation for Cultural Assets. The project is bound legally to follow the decision taken and shall be taken by the board for conservation. Information on the relevant Regional Board for Conservation of Cultural Assets is provided in Table 2.3.

Aydın Museum and Aydın Afrodisias Museum will be responsible for officially supervising actions such as official monitoring and/or further activities (trial pits, salvage excavation, re-routing and remote sensing surveys) in line with the decisions taken by Aydın Regional Board for Conservation of Cultural Assets. They will also prepare the conclusion reports about actions to be taken and submit to Board for Conservation for re-evaluation of the sites. Information on the museum directorates is presented in Table 2.4.

Table 2.3 Relevant Regional Board for Conservation of Cultural Assets

Regional Board for Conservation of Cultural Assets	District of Responsibility	Related Section of the Motorway	Address	Phone	Fax
Aydın Regional Board for Conservation for Cultural Assets	Central and related districts of Aydın Province	South Alternative	Veysipaşa Mahallesi, Hükümet Bulvarı, No:67, 09100, AYDIN	(256) 213 77 37	(256) 213 45 11

Table 2.4 Relevant Museum Directorates

Museums	Districts of Responsibility	Address	Phone	Fax
Aydın Museum Directorate	Efeler/Aydın	Ilıcabaşı Mahallesi, Müze Bulvarı, No:4 Efeler /AYDIN	(256) 225 22 59	(256) 225 22 59
Aydın Afrodisias Museum Directorate	Karacasu, Kuyucak, Buharkent / Aydın	Geyre Mahallesi, Kenan T. Erim Caddesi No: 4 Karacasu/AYDIN	(256) 448 80 86	(256) 448 80 86

Since South Alternative is a part of Aydın-Denizli Motorway Project, Aydın-Denizli Motorway Project Management is also responsible for conservation of immovable cultural assets in case of discovery, and implementation of plans minimizing the adverse impacts of the construction activities over these assets and keeping relevant government institutions informed. In this respect, the project management is obliged to prepare a plan which comprises of the construction activities and their impacts on the archaeological and immovable cultural assets located within the boundaries of the project construction and its impact area and to propose methods for eliminating or minimizing the negative impacts of construction activities over the concerned sites for the opinion of the directorate of Board for Conservation.

2.3 Relevant International Agreements and Protocols

Turkish national policy on protection of environment, cultural heritage and conservation of biological resources has been constituted on the base of relevant international agreements that Türkiye has signed or ratified. Relevant environmental international agreements and conventions that have been ratified by Türkiye are listed below.

- Convention Concerning the Protection of the World Cultural and Natural Heritage
- Convention for the Prevention of Marine Pollution from Land (Paris Convention)
- Bern Convention on Protection of Europe's Wild Life and Living Environment (1982),
- The Convention for the Protection of Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) (1981),
- Convention on Long Range Transboundary Air Pollution (CLRTAP) (1983),
- Vienna Convention for the Protection of the Ozone Layer (1988),
- Montreal Protocol on Substances Depleting the Ozone Layer (1990),
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) (1991),
- Convention on Biological Diversity (Rio Convention) (1992),
- The International Convention on the Established of an International Fund for Compensation for Oil Pollution Damage (FUND 1992),
- International Convention on Civil Liability for Oil Pollution Damage (1992),
- UN Framework Convention on Climate Change (UNFCCC) (2004),
- Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (RAMSAR) (1994),
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1994),
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1996),
- Kyoto Protocol (1997),
- United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa,
- European Landscape Convention (Florence Convention) (2001),
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention) (2004),
- Stockholm Convention on Persistent Organic Pollutant (POPs),
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (1972),

- Mediterranean Sea Protocol Concerning Specially Protected Areas and Biodiversity (1988), including related protocols,
- Convention for the Protection of the Black Sea Against Pollution (Bucharest) (1994) and its protocols including the Protocol for the Protection of Biological and Landscape Diversity in the Black Sea (2004)
- Convention On The Prevention Of Marine Pollution By From Ships (Marpol 73/78)
- Convention on the Regulation of Whale Hunting
- Conservation of Intangible Cultural Heritage Convention
- Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property
- European Cultural Convention (1954)
- European Convention on the Protection of the Archaeological Heritage (1969)
- Convention for the Protection of the Architectural Heritage of Europe (1985)

2.4 Applicable International Environment and Social Standards and Guidelines

International financial institutions follow certain policies and procedures regarding assessment and management of environmental and social impacts of the projects to be financed. The relevant environmental and social requirements of these institutions are mainly based on World Bank Group (WBG) Safeguard Policies. For the private sector financing, WBG/International Finance Corporation's (IFC) Environmental Health and Safety Guidelines and Performance Standards on Environmental and Social Sustainability have become the one of the most important international requirements. These standards have also been adopted by the major international private banks through the so called Equator Principles (EPs). These principles aim to ensure that projects to be financed by these banks are developed in a socially and environmentally sound manner.

The Supplementary ESIA Report prepared for the South Alternative is in accordance with the Equator Principles (IV) and IFC's Performance Standards on Environmental and Social Sustainability and general as well as sector-specific Environmental, Health and Safety Guidelines. Key points of each international principle, standard and guideline are provided in the following sections. It should be noted that when Turkish (host country) regulations differ from the levels and measures presented in the EHS Guidelines, the Project will aim to achieve whichever is more stringent.

2.4.1 Equator Principles IV

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects and is primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs apply globally to all industry sectors.

Most of the large private international banks (so called Equator Principles Financial Institutions-EPFIs) have officially adopted these principles (According to EP IV, published November 2019 and came into force in October 2020), summarized below, to ensure that the projects financed or advised by them are developed in a manner that is socially responsible and reflect sound environmental management practices.

Principle 1: Review and Categorisation

When a Project is proposed for financing, the EPFI will, as part of its internal environmental and social review and due diligence, categorize the Project (Category A, B or C) based on the magnitude of its potential environmental and social risks and impacts, including those related to Human Rights, climate change, and biodiversity. Such categorisation is based on the IFC's environmental and social categorisation process.

Principle 2: Environmental and Social Assessment

The EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project. The Assessment Documentation should propose measures identified to minimize, mitigate and offset/resolve the adverse impacts of risks on workers, affected communities and the environment.

The client is expected to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other Assessment, with these included in the Assessment Documentation. The client should refer to the UNGPs3 when assessing Human Rights risks and impacts, and the Climate Change Risk Assessment should be aligned with Climate Physical Risk and Climate Transition Risk categories of the TCFD.

Principle 3: Applicable Environmental and Social Standards

The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan

For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System. Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards.

Principle 5: Stakeholder Engagement

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.

Principle 6: Grievance Mechanism

For all Category A and as appropriate, Category B Projects, the EPFI will require the client, as part of the Environmental and Social Management System, to establish a grievance mechanism designed for use by Affected Communities and Workers to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project.

Principle 7: Independent Review

For all Category A and as appropriate, Category B Projects, an Independent Environmental and Social Consultant will carry out an Independent Review of the Assessment Documentation including the ESMPs, the Environmental and Social Management System, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance.

Principle 8: Covenants

An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance.

The client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. EPFIs will take reasonable measures to ensure that all existing environmental and social obligations continue to be included in the new financing documentation.

Principle 9: Independent Monitoring and Reporting

For all Category A and as appropriate, Category B Projects, in order to assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant; alternatively, the EPFI will require that the client retain qualified and experienced external experts to verify its monitoring information

Principle 10: Reporting and Transparency

For all Category A and as appropriate, Category B Projects, the client will ensure that, at a minimum, a summary of the ESIA is accessible and available online; and the client will publicly report GHG emission levels during the operational phase for Projects. In addition to these, the EPFI will encourage the client to share commercially non-sensitive Project-specific biodiversity data with the Global Biodiversity Information Facility (GBIF) and relevant national and global data repositories, using formats and conditions to enable such data to be accessed and re-used in future decisions and research applications.

2.4.2 IFC's Standards and Guidelines

2.4.2.1 Performance Standards on Environmental and Social Sustainability

IFC published its current Policy on Environmental and Social Sustainability in 2012. Within the framework of this Policy, it applies a comprehensive set of Performance Standards to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing in the member countries eligible for financing. The Performance Standards may also be applied by other financial institutions electing to apply them to projects in emerging markets.

The following eight Performance Standards establish the requirements that the client has to meet throughout the life of an investment supported by IFC or other relevant financial institution using these Standards:

PS 1: Assessment and Management of Environmental and Social Risks and Impacts
PS 2: Labor and Working Conditions
PS 3: Resource Efficiency and Pollution Prevention
PS 4: Community Health, Safety and Security
PS 5: Land Acquisition and Involuntary Resettlement
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
PS 7: Indigenous Peoples
PS 8: Cultural Heritage

In brief, the objectives of Performance Standard 1 are;

- To identify and evaluate environmental and social risks and impacts of the project,
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and where residual impacts remain, compensate/offset risks and impacts to workers, Affected Communities, and the environment,
- To promote improved environmental and social performance of clients through the effective use of management systems,
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately,
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

Performance Standards 2 through 8 describe potential environmental and social risks and impacts that require particular attention. Where environmental or social risks and impacts are identified, the client is required to manage them through its Environmental and Social Management System (ESMS) consistent with Performance Standard 1, which is applicable to all projects that may have environmental and social risks and impacts. Applicability of IFC's Performance Requirements/Standards is summarized in Table 2.5.

Table 2.5 Applicability of IFC's Performance Standards

IFC	Performance Standards (2012)	Applicability (Yes/No)
PS 1	Assessment and Management of Environmental and Social Risks and Impacts	**Yes**
PS 2	Labor and Working Conditions	**Yes**
PS 3	Resource Efficiency and Pollution Prevention	**Yes**
PS 4	Community Health, Safety and Security	**Yes**
PS 5	Land Acquisition and Involuntary Resettlement	**Yes**
PS 6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	**Yes**
PS 7	Indigenous Peoples	**No**
PS 8	Cultural Heritage	**Yes**

2.4.2.2 General Environmental, Health and Safety (EHS) Guidelines

In addition to the Performance Standards, IFC publishes health and safety guidelines that provide examples of general and subject-specific Good International Industry Practices (GIIP). In this respect, IFC published General EHS Guidelines in April 2007. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. The document provides guidance for effective management of environmental, occupational health and safety, and community health and safety aspects of the projects including their construction and decommissioning phases. Besides the General EHS Guidelines, IFC has published sector-specific guidelines for a variety of industries including the Toll Roads and Construction Materials Extraction, as described below. Relevant aspects of the Environmental, Health, and Safety (EHS) Guidelines would be applicable to the South Alternative and will be considered in the scope of the Supplementary ESIA Report.

2.4.2.3 Environmental, Health and Safety (EHS) Guidelines for Toll Roads

The EHS Guidelines for Toll Roads, published in April 2007, include information relevant to construction, operation and maintenance of large, sealed road projects including associated bridges and overpasses.

2.4.2.4 Environmental, Health and Safety (EHS) Guidelines for Construction Materials Extraction

The EHS Guidelines for Construction Materials Extraction, published in April 2007, includes information relevant to construction materials extraction activities such as aggregates, limestone, slates, sand, gravel, clay, gypsum, feldspar, silica sands, and quartzite, as well as to the extraction of dimension stone. It addresses stand-alone projects and extraction activities supporting construction, civil works, and cement projects.

2.4.3 Project Categorization

According to World Bank policies, projects to be invested in are classified as Category A, B or C based on environmental and social criteria. Based on World Bank Operational Policy 4.01 (Environmental Assessment), definition of these project categories may be briefly given as follows:

Category A: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectoral Environmental Assessment).

Category B: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas (including wetlands, forests, grasslands, and other natural habitats) are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of Environmental Assessment for a Category B is narrower than that of Category A. The findings and results of Category B Environmental Assessment are described in project documentation such as Project Appraisal Document or Project Information Document.

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further Environmental Assessment action is required for a Category C project.

IFC, in its Guidance Note 1 on the Assessment and Management of Environmental and Social Risks and Impacts, states that “For certain projects, and particularly for greenfield investments and projects (including, but not limited to, major expansion or transformation-conversion activities) involving specifically identified physical elements, aspects and facilities that are likely to generate potentially significant adverse environmental and social risks and impacts, the client should conduct a comprehensive full-scale ESIA”. Accordingly, ***South Alternative would be categorized as “Category A”*** based on World Bank and IFC’s criteria and thus a comprehensive full-scale ESIA Report would be required for the Project.

To provide further evaluation in the scope of national and international categorization criteria in consideration of existing indicative lists of Category A project, the screening criteria defined in the European Union’s (EU) EIA Directive and Turkish EIA Regulation is also considered as described below.

According to the EU’s EIA Directive, all projects listed in Annex I of the Directive, are considered as having significant effects on the environment and require an EIA (*http://ec.europa.eu*). “Construction of motorways and express roads” and “Construction of a new road of four or more lanes, or realignment and/or widening of an existing road of two lanes or less so as to provide four or more lanes” are listed under Article 7 of the EIA Directive’s Annex I list. Thus, the ***South Alternative would be categorized as an Annex I activity according to the EU’s EIA Directive***.

In consideration of the all the categorization approach and criteria of the IFC, EU's EIA Directive and Turkish EIA Regulation, the South Alternative, which is likely to include activities and components that are to be effectively managed to avoid or minimize significant environmental and social impacts, ***would be identified as a "Category A" project by potential lenders*** and thus an ESIA Report would be required for the project.

CHAPTER 3

PROJECT DESCRIPTION

3. CHAPTER – PROJECT DESCRIPTION

Aydın-Denizli Motorway Project ("ADMP"), which is a continuation of the previously completed İzmir-Aydın Motorway, is designed to connect Aydın and Denizli provinces of the Aegean Region of Türkiye. At the construction phase of the ADMP, General Directorate of Highways ("KGM"), as the owner of the project, has submitted an order for a design change of the main carriageway between Km 15+856 and 34+630 in Section 1 ("South Alternative"). Thus, project description will be done in the scope of said section of the project, and the project information given in this Chapter, and the assessments to be done in the following chapters, has been prepared based on the current design as of the preparation period of this report. It should be noted that in case of any design change during and after the Supplementary ESIA study has been completed, the project would be managed in the scope of Environmental and Social Management System ("ESMS") by means of Change Management Procedure.

Table 3.1 provides the actual design of the section that formed the basis of assessments.

Table 3.1 The Actual Design of the Section that Formed the Basis of Assessments

Section	Name	Location		Length (Km)		
		Start	End	Main Road	Access Road	TOTAL
Section 1	South Alternative	Km 15+856	Km 34+630	18.774	7.242	26.016

In accordance with the terms of the BOT Contract signed between the KGM and the Project Sponsor, the ADMP includes, financing, planning, design, construction, operation, full range of maintenance and repair works including landscape activities during the operation period.

According to the BOT Contract, contract duration covers both the construction and operation phases. Construction period is 3 years after the effective date of the contract and the operation period is 17 years, within the total of 20 years of contract duration. If the construction period exceeds 3 years, the delay time will be deducted from the operation period. If the construction of the motorway is completed before the end of foreseen construction period, the remaining time will be added to operation period.

The Project Sponsor will transfer the motorway to the KGM at the end of the contract duration, free from any debt or commitment and in a well-maintained, operating condition, without any charge. Thus, the rights of the Project Sponsor to operate maintain, and repair the motorway will expire at the end of the contract duration.

As the South Alternative is a part of and within the scope of the ADMP, the conditions and/or the terms of the main contract will also be valid for this section. If any change is done about the conditions and/or the terms of contract related to the South Alternative, the actual status will be notified to the relevant parties by the Project Sponsor.

3.1 Project Design Criteria

Motorways are access-controlled highways that have two or more traffic lanes in each direction and provide uninterrupted flow, on which opposing traffic is separated by a median and collection of tolls are performed at designated points. As the South Alternative is a part of and within the scope of the ADMP, motorway has been designed in accordance with the KGM's technical specifications for motorways. The design criteria specified by the KGM for the Aydın-Denizli Motorway and so South Alternative, is listed in Table 3.2.

Table 3.2 Motorway Design Criteria

Project Component	Unit	Motorway (Main Carriageway)	Access Roads
Project speed	km/hour	120	100
Width of the traffic lane	m	3.75	3.50
Number of traffic lanes	-	2x3	2x2
Shoulder width (emergency lane)	m	3	3
Side width for guardrails (at fill)	m	1	1
Central reserve width	m	5	3
Shoulder width for central reserve	m	1	1
Normal standard side slope (minimum superelevation)	%	2.5	2.5
Maximum superelevation	%	6	6
Minimum radius for horizontal curve	m	1,000	600
Radius for horizontal curve (minimum superelevation=2.5%)	m	3,400	2,050
Radius for horizontal curve with no superelevation requirement	m	5,000	4,500
Minimum vertical clearance for bridges	m	5	5

Source: Final Design Reports (June, 2005 & March, 2007)

A typical cross-section for the main carriageway is provided in Figure 3.1. As can be seen from this cross-section, the motorway will be a dual carriageway having 3 lanes in each direction (2 x 3). Each of the 6 lanes will have a width of 3.75 meters (3.75 m x 6). The central reserve will be 5 meters (2.5 m x 2) plus 2 meters of lined shoulder (1 m in each side of the reserve). At the outer side of the traffic lanes in each direction, there will be 3 meters of lined shoulders that will serve as emergency strips. Thus, the total width of the platform (consisting of traffic lanes, central reserve and the lined shoulder for both directions) will be 35.5 meters (17.75 m x 2). There will be also ditches as required in both sides of the main carriageway. Additional drawings for motorway's main carriageway and access roads are provided in Annex-1.

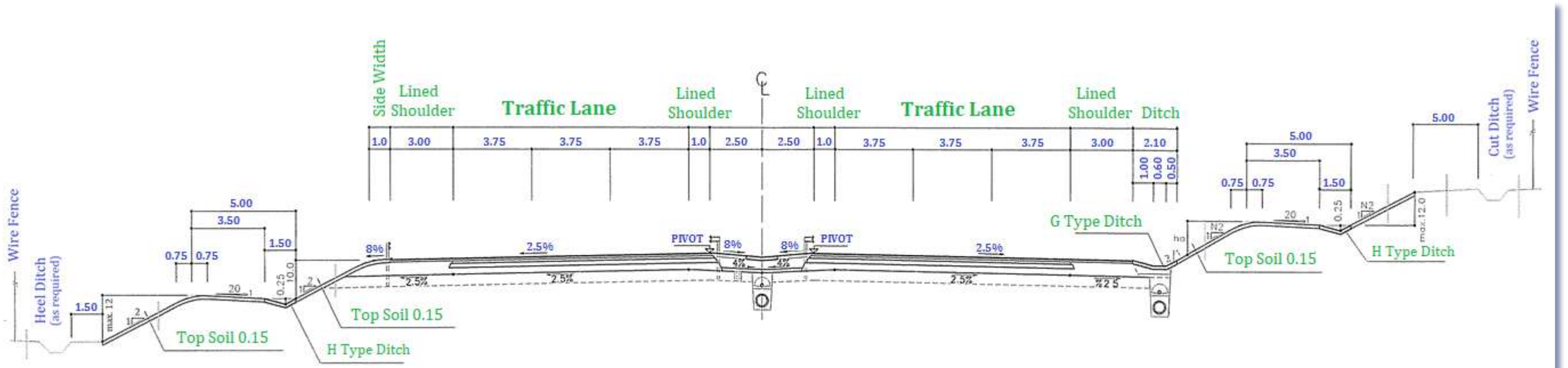
Access roads will have a different design when compared to main carriageway. Access roads will be composed of 2 lanes in each direction (2 x 2). Each of the 4 lanes will have a width of 3.5 meters (3.5 m x 4). The central reserve in access roads will be 3 meters (1.5 m x 2) plus 2 meters of lined shoulder (1 m in each side of the reserve). At the outer side of the traffic lanes in each direction, there will be 3 meters of lined shoulders that will serve as emergency strips. Thus, the total width of the access roads' platform (consisting of traffic lanes, central reserve and the lined shoulder for both directions) will be 25 meters (12.5 m x 2). Typical cross-section for Motorway's access roads is presented in Figure 3.2.

Design speed at the interchange arms will vary between 50 and 80 km/hour depending on the radius of the horizontal curve. Minimum relative slope will be 0.4% while maximum slope will vary between 0.50% and 1%. Additional design criteria are listed below:

- For all types of topographical models, side slope for standard coating shall be 2.5% and superelevation will not exceed 6%.
- Vertical clearance shall be minimum 5 meters for all roads passing over or under the Motorway.
- Embankment (fill) slopes (s) shall be determined based on the height (h) of the embankment as follows:
  - For h<1,5 m ; s=4:1;
  - For 1,5 m<h<3 m ; s=3:1;
  - For h>3 m ; s=2:1;

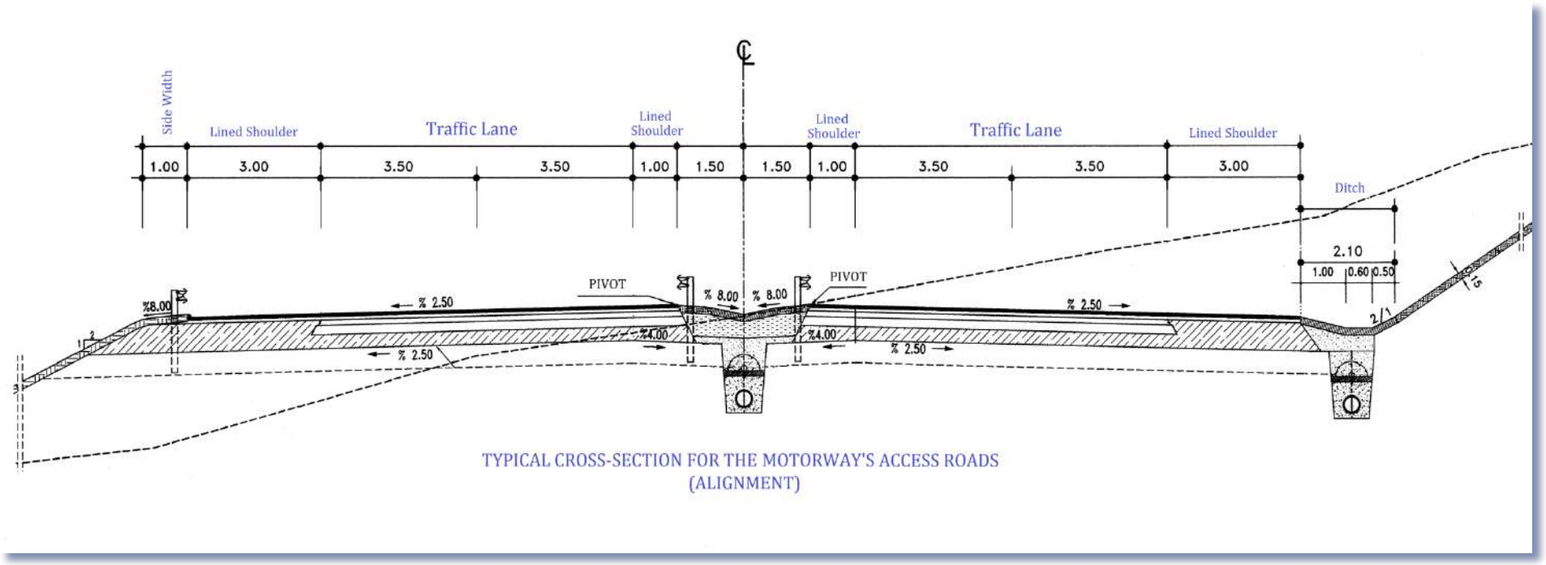
- Cutting slopes shall be determined based on the results of geotechnical studies.
- Minimum bench width shall be 5 meters on the embankments and cuttings.

- Horizontal (i.e. shoulder lines, traffic lines, parking lines, etc.) and vertical signing (i.e. traffic signs, plates, etc.) of the motorway will be in accordance with KGM's technical specifications (i.e. dimensions, color, material, reflectivity features, numbering, information figures, location of signs, etc.).



TYPICAL CROSS-SECTION FOR THE MOTORWAY'S MAIN CARRIAGEWAY (ALIGNMENT)

Figure 3.1 Typical Cross-section for the Motorway's Main Carriageway



TYPICAL CROSS-SECTION FOR THE MOTORWAY'S ACCESS ROADS (ALIGNMENT)

Figure 3.2 Typical Cross-section for the Motorway's Access Roads

3.2 Description of Activities and Project Components

The main activities to be carried out will include the land acquisition, land preparation and construction stages. In this context, before the start of construction works, the lands should be acquired in line with the applicable Turkish laws and regulations. Since, KGM is the responsible authority for the implementation of expropriation works in accordance with the national Expropriation Law, for the forestry lands, treasury lands and other state-owned lands, necessary permits, land use permits and/or easement rights should be obtained by KGM from the related authorities in the scope of applicable legislation as per the land allocation works.

The works on a new route consist of three main steps. The first step, substructure works, start with earthworks that involve activities such as top soil stripping, poor soil excavations, and cut-fill operations. Following the earthworks, construction of engineering structures including bridges, underpasses, overpasses, retaining walls, culverts, concrete pipes, viaducts are performed. As the next step, pavement works, including the formation of subbase, base, asphalt layer and concrete or parquet paving for special situations, are conducted (http://www.kgm.gov.tr). Following the completion of substructure and pavement works, finishing operations that involve the placement of horizontal and vertical traffic signs and installation of guardrails and fences are conducted. Once the park and service areas, maintenance/operation centers and toll collection systems are prepared, the Motorway become ready for the tests and commissioning. This standard procedure will be followed in the construction of the South Alternative.

Where the project has to cross existing infrastructure (e.g. sewage, electricity, water supply, telecommunication, natural gas, etc. lines), these will need to be relocated in the scope of the construction works so that no permanent interruption would occur on the services provided to local users. Similarly, some of the existing roads may need to be temporarily closed therefore the users of the affected roads would be diverted to the service roads to ensure local transportation services are not interrupted.

During the operation phase, road maintenance and repair works will be conducted by the Project Sponsor until the end of Contract Duration. Maintenance works will involve routine maintenance, winter maintenance and periodic maintenance works. Periodic maintenance works that will involve large scale repair of the superstructures are anticipated to be required in every 10 years. Maintenance and repair works will be performed in accordance with the Operation, Maintenance and Repair Standards and technical specifications. The rights of the Project Sponsor to operate maintain and repair the Motorway will expire at the end of the Contract Duration, when the motorway shall be transferred to the KGM free from any debt or commitment and in a well-maintained, operating, in-service condition, without any charge. Number of vehicles subject to passage fee will be identified by means of electronic passage systems to be installed in line with the specifications. Technical and legal supervision and control of the construction and operation works/periods will be executed by the personnel or independent consulting firms to be assigned by the KGM. Special structures will be inspected and released/signed off during site surveillance.

3.2.1 Construction Camp Sites and Quarries

During the construction works, temporary facilities/sites will be needed. These facilities and sites include construction camp sites, quarries, plants and service roads. Following the completion of construction activities, temporary facilities will be decommissioned. Table 3.3 provides a list of the camp sites, quarries and plants to be used in the scope of the project. A map showing the locations of construction compounds is provided in Figure 3.3.

Table 3.3 Locations of the Camp Sites, Quarries and Plants

Location		Description of the Site / Quarry / Plant	Area / Capacity Information
Km 15+600	Aydın, Yeniköy	Yeniköy Mechanical Plant	400 tonnes/hour
Km 17+000	Aydın, Efeler, Dereköy	Dereköy Crushing and Screening Plant	395,000 tonnes/year
Km 20+000	Aydın, Efeler, Dalama	Dalama Construction Camp Site	7.80 ha
		Concrete Batching Plant	90 m^3/hour
		Asphalt Plant	340 tonnes/hour
Km 20+000	Aydın, Merkez, Dalama	Dalama 2 Quarry	24.68 ha
			1,560,000 tonnes/year
		Crushing and Screening Plant	395,000 tonnes/year
	Aydın, Çine, Kasar	Dalama 3 Quarry	20.79 ha
			1,593,800 tonnes/year
	Aydın, Efeler, Dalama	Dalama 7 Quarry	24.88 ha
			1,560,000 tonnes/year
Km 20+000	Aydın, Çine, Kasar	Dalama Mechanical Plant	400 tonnes/hour
Km 21+000	Aydın, Akçaköy	Akçaköy Quarry	4.20 ha
		Crushing and Screening Plant	332,800 tonnes/year
Km 26+000	Aydın, Yenipazar, Hamzabali	Hamzabali Concrete Batching Plant	90 m^3/hour
Km 30+475	Aydın, Yenipazar	Satellite Construction Camp Site *	
Km 38+500	Aydın, Yenipazar, Direcik	Direcik Concrete Batching Plant	90 m^3/hour
Km 42+350	Aydın, Yenipazar, Hamidiye	Hamidiye Asphalt Plant	340 tonnes/hour
		Hamidiye Mechanical Plant	400 tonnes/hour
Km 59+500	Aydın, Kuyucak, Karapınar	Kuyucak Construction Camp Site	34.59 ha
		Concrete Batching Plant	62 m^3/hour
		Precast Beam Plant	90 m^3/hour

** Mobilization (As the area is allocated as Service Area for the operation phase of the project, camp site is planned to be demobilized as per the completion of the construction works of the south Alternative).*

Camp Sites include facilities such as cafeteria, medical room, showers and toilets, wastewater treatment plants/septic tanks, water supply facilities (i.e. water wells, water tanks) etc. Layout plans of the Construction Camp Sites are provided in Annex-1.

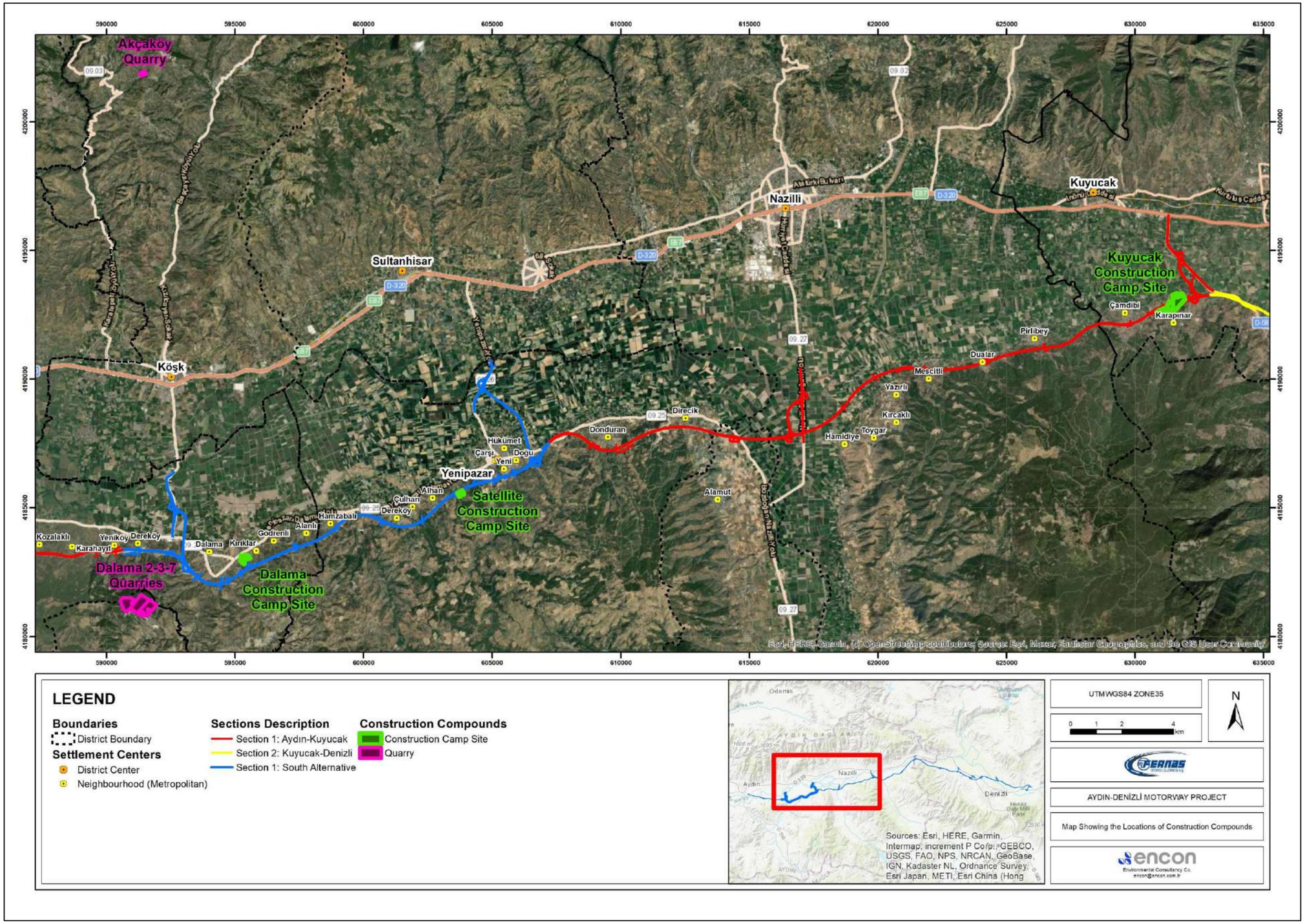


Figure 3.3 Map Showing the Locations of Construction Compounds

Construction Camp Sites

Dalama Construction Camp Site

Dalama Construction Camp Site is located at around Km 20+000 near Kırıklar neighborhood of Efeler district of Aydın province. Mobilization of the site had been completed at the inception phase of the Aydın-Denizli Motorway project. The site will also be used during the construction phase of the South Alternative. The site, which is one of the former pasture lands of Kırıklar neighborhood, was allocated for use after the current land use status was changed and will be rehabilitated after the construction phase of the project.

A concrete plant, with a capacity of 90 m3/hour, an asphalt plant with a capacity of 340 tonnes/hour has been established at this site. Photographs showing the Dalama Construction Camp Site are presented in Figure 3.4.

Location of the Dalama Construction Camp Site

Technical/Administration Offices, Dalama CCS

Concrete Batching Plant, Dalama CCS

Domestic Package WWTP Unit

Dining Hall, Dalama CCS

Aggregate Pile, Dalama CCS

Figure 3.4 Photographs Showing Dalama Construction Camp Site

Satellite Construction Camp Site

In the scope of construction phase of the South Alternative, a satellite construction camp site at Km 30+475 is planned to be used. Since the area is allocated as Service Area for the operation phase of the project, camp site is planned to be demobilized as per the completion of the construction works of the section. The photographs of the satellite construction camp site are given in Figure 3.5 below.

Location of the Satellite CCS

Accommodations, Satellite CCS

Dining Hall, Satellite CCS

Cafeteria, Satellite CCS

Figure 3.5 Photographs of the Satellite Construction Camp Site

Kuyucak Construction Camp Site

Kuyucak Construction Camp Site is located at Km 59+500, near Karapınar neighborhood of Kuyucak district of Aydın province. Mobilization of the site had been completed at the inception phase of the Aydın-Denizli Motorway project. The site will also be used during the construction phase of the South Alternative. As the area was a former pasture land, it was allocated for use after the current land use status was changed.

The Camp Site is the Main Management Center of the project and the supervisor unit of KGM is also established in this site.

A concrete plant with a capacity of 62 m^3/hour, and a precast beam plant with a capacity of 90 m^3/hour had been established at this site. The precast beams of the viaducts and bridges are being provided from the site along the Aydın-Denizli Motorway Project. Photographs showing Construction Camp Site are being presented in Figure 3.6.

Location of the Kuyucak Construction Camp Site

Gazebo, Kuyucak CCS

Precast Beam Plant Line, Kuyucak CCS

Precast Beams, Kuyucak CCS

Material Testing Laboratory, Kuyucak CCS

Precast Components, Kuyucak CCS

Figure 3.6 Photographs Showing Kuyucak Construction Camp Site

Quarries

Akçaköy Quarry

Akçaköy Quarry is located at around Km 21+000 near Akçaköy neighborhood of Köşk district of Aydın province. The closest settlement is Akçaköy neighborhood with a distance of 1.1 km to the northwest. According to the documents provided by the Project Sponsor, the quarry is 16.65 ha with a capacity of 332,800 tonnes/year. And also there will be a crushing and screening plant with a capacity of 332,800 tonnes/year. Location of the Akçaköy Quarry is presented in Figure 3.7.

Figure 3.7 Location of the Akçaköy Quarry

Dalama 2 Quarry

Dalama 2 Quarry is located at around Km 20+000 near Dalama neighborhood of Efeler district of Aydın province. The closest settlement is Dereköy neighborhood with a distance of 1.98 km to the north. According to the documents provided by the Project Sponsor, the quarry is 24.68 ha with a capacity of 1,560,000 tonnes/year. And also there will be a crushing and screening plant with a capacity of 395,000 tonnes/year.

Dalama 3 Quarry

Dalama 3 Quarry is 20.79 ha with a capacity of 1,593,800 tonnes/year.

Dalama 7 Quarry

Dalama 7 Quarry is 24.88 ha with a capacity of 1,560,800 tonnes/year.

Location of the Dalama 2 – 3 - 7 quarries and photographs of the quarry area are presented in Figure 3.8 and Figure 3.9, respectively.

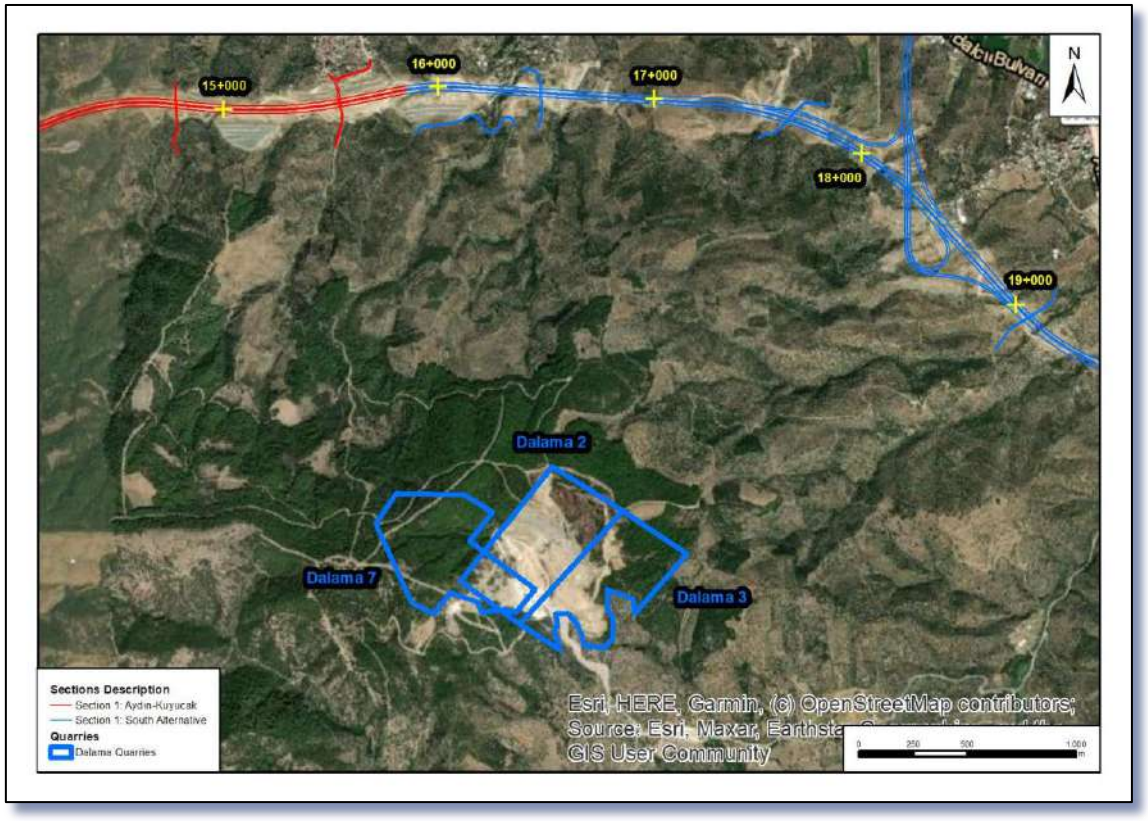
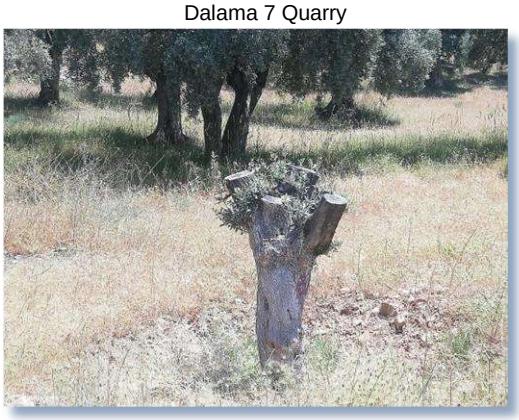


Figure 3.8 Locations of the Dalama 2 – 3 – 7 Quarries

Dalama 2 Quarry

Dalama 7 Quarry

Crushing and Screening Plant



Relocated Olive Trees nearby Quarry Area

Figure 3.9 Photographs of the Dalama 2 – 3 – 7 Quarries

3.2.2 Storage Sites

In the scope of road construction works, excavated materials are planned be used in the fill operations wherever the properties and the quality of the materials are suitable. When there is a surplus of excavated materials, excess material will be needed to be stored at designated storage areas. In this regard, list of storage sites identified to be used for the South Alternative is presented in Table 3.4.

Table 3.4 List of Storage Sites Planned to be Used

Location	Location			Description of the Site	Area (ha)	Storage Capacity (m^3)
	Province	District	Nearest Neighborhood			
Km: 20+000	Aydın	Efeler	Kırıklar	Kırıklar Storage Site	37	1,500,000
Km: 37+500	Aydın	Yenipazar	Direcik	Direcik Storage Site	21	3,000,000
TOTAL					**58**	**4,500,000**

3.2.3 Engineering Structures

Main engineering structures in the South Alternative includes the viaducts, bridges, overpasses and underpasses, culverts, etc. In accordance with KGM's specifications, safety, durability, aesthetics and environmental coherence, construction and maintenance costs, constructability and construction duration have been the main considerations in the design and engineering of the structures. In the design of these structures, the Standard Specifications for Highway Bridges published by the American Association of State Highway and Transportation Officials (AASHTO) has been used. In the seismic calculations, the Standard Specifications used for the seismic design of the highway bridges has been taken as basis. Where required, project-specific revisions have been/would be done with the approval of KGM to adequately adapt these specifications to the Project. Table 3.5 provides a summary of the total number of engineering structures for South Alternative section of the project.

Table 3.5 List of Engineering Structures, South Alternative

Component	Number of Engineering Structures
Viaduct	8
Interchange	4
Overpass	8
Underpass	11
Ecological Bridge	1
Bridge	9
Culvert	85

Viaducts are substructures constructed on girders/beams. They are effectively used to cross challenging topographical and/or geotechnical conditions while providing protection for the corresponding habitats (e.g. forests, wetlands, river valleys, etc.). Viaducts are suited to narrow, steep-sided valleys and they have environmental advantages as they can minimize land take and fragmentation within a valley by allowing watercourses and any existing nature conservation interest to continue under the structure; maintain connectivity for species movement; and retain views up and down the valley.[1]

[1] European Cooperation in the Field of Scientific and Technical Research; Iuell, B., Bekker, G.J., Cuperus, R., Dufek, J., Fry, G., Hicks, C., Hlavá˘c, V., Keller, V., B., Rosell, C., Sangwine, T., Tørsløv, N., Wandall, B. le Maire, (Eds.) 2003

Culverts are hydraulic engineering or service structures of small-scale that are used to ensure passage/drainage of perennial surface water bodies or creeks formed as a result of precipitation through the road body as well as passage of pedestrians, cyclists/motorcyclists and animals.

Viaducts, ecological bridge and bridges to be constructed in the scope of South Alternative are listed in Table 3.6, Table 3.7, and Table 3.8 respectively.

Table 3.6 Viaducts, South Alternative

Viaduct		Length (m)	Location on the Route		Explanation
			Start	End	
Viaduct 13	**Left**	360.20	Km 19+571	Km 19+931	
	Right	364.66	Km 19+562	Km 19+926	
Viaduct 14	**Left**	254.50	Km 22+300	Km 22+554	
	Right	340.50	Km 22+257	Km 22+597	
Viaduct 15		211.50	Km 24+835	Km 25+047	
Viaduct 16	**Left**	507.20	Km 26+159	Km 26+666	
	Right	515.40	Km 26+157	Km 26+673	
Viaduct 17	**Left**	342.10	Km 28+012	Km 28+352	
	Right	336.90	Km 28+075	Km 28+354	
Viaduct 18		297.50	Km 29+350	Km 29+647	
Viaduct 19		469.50	Km 32+213	Km 32+682	
Viaduct		297.50	Km 33+360;		K4 Yenipazar-1 Interchange; Access Road
			Access Road Km 0+659	Access Road Km 0+956	

Table 3.7 Ecological Bridge, South Alternative

Ecological Bridge		Location
Ecological Bridge	L=56.30 m	Km 28+968

Photographs showing the location of Ecological Bridge are presented in Figure 3.10 below.

Location of Ecological Bridge

Nearby the Location of Ecological Bridge

Figure 3.10 Photographs Showing the Location of Ecological Bridge

Table 3.8 Bridges, South Alternative

Bridge		Location	Explanation
Interchange Bridge	L=36.00 m	Km 18+267	K2 Yörük Ali Efe-1 Interchange
	L=50.00 m	(Km 18+267; Access Road Km 2+635)	K3 Yörük Ali Efe-2 Interchange
Bridge	L=34.00 m	(K3-State Road; Km 0+314)	Canal Crossing
	L=38.00 m	(K3-State Road; Km 1+342)	Drying Canal Crossing
	L=38.00 m	(K3-Arm 4; Km 0+203)	Drying Canal Crossing
	L=105.70 m	(K3-State Road; Km 2+126)	Büyük Menderes Creek
Interchange Bridge	L=78.00 m	Km 33+660	K4 Yenipazar-1 Interchange
	L=46.00 m	(Km 33+660; Access Road Km 4+017)	K5 Yenipazar-2 Interchange
Bridge	L=39.00 m	(Km 33+660; Access Road Km 3+220)	Drying Canal Crossing

Interchanges to be constructed are listed in Table 3.9.

Table 3.9 Interchanges, South Alternative

Interchange	Location
K2 Yörük Ali Efe-1	Km 18+267
K3 Yörük Ali Efe-2	(Km 18+267; Access Road Km 2+635)
K4 Yenipazar-1	Km 33+660
K5 Yenipazar-2	(Km 33+660; Access Road Km 4+017)

Overpasses and underpasses to be constructed in Section 1 of the Motorway to provide connection between settlements, agricultural field roads, forest roads or zoning roads are listed in Table 3.10 and Table 3.11, respectively.

Table 3.10 Overpasses, South Alternative

Overpass		Location	Connection Provided Between / To
Overpass	B=11.00 m	Km 16+475	Dereköy - Field Road
	B=11.00 m	Km 19+080	Dalama - Field Road
	B=13.00 m	Km 20+065	Dalama - Kuloğulları
	B=11.00 m	Km 23+278	Alanlı - Çavdar, Kuloğulları
	B=11.00 m	Km 26+980	Dereköy - Field Road
	B=11.00 m	Km 28+696	Çulhan - Forest Road
	B=13.00 m	Km 32+140	Yenipazar - Karacaören
	B=11.00 m	Km 32+820	Yenipazar - Sarısu

Table 3.11 Underpasses, South Alternative

Underpass		Location	Connection Provided Between / To
Underpass	7.00 x 6.00	Km 17+624	Dalama - Field Road
	12.00 x 6.00	(Km 18+267; Access Road Km 1+228)	State Road
	7.00 x 6.00	Km 20+340	Dalama - Field Road
	7.00 x 6.00	Km 20+985	Dalama - Field Road
	7.00 x 6.00	(Km 33+660; Access Road Km 1+018)	Current Field Road
	7.00 x 6.00	(Km 33+660; Access Road Km 1+360)	Current Field Road
	12.00 x 6.00	(Km 33+660; Access Road Km 1+583)	Dalama - Yenipazar Provincial Road
	7.00 x 6.00	(Km 33+660; Access Road Km 1+900)	Current Field Road
	7.00 x 6.00	(Km 33+660; Access Road Km 2+290)	Current Field Road
	7.00 x 6.00	(Km 33+660; Access Road Km 3+560)	Current Field Road
	15.00 x 8.00	Km 34+278	Canal

Culverts of different dimensions to be constructed in Section 1 of the Motorway are listed in Table 3.12.

Table 3.12 Culverts, South Alternative

Culverts	Dimension (m x m)	Location
Culvert	2.00 x 2.00	Km 18+622, Km 19+986, Km 20+634, Km 21+758, Km 23+350, Km 24+685, Km 33+140, Km 34+241, (K2-Arm 1; Km 0+229), (K2-Arm 2; Km 0+170), (K2-Arm 3; Km 0+359), (Km 18+267; Access Road Km 0+147), (Km 18+267; Access Road Km 0+480), (Km 18+267; Access Road Km 2+240), (Km 18+267; Access Road Km 2+519), (Km 18+267; Access Road Km 2+580), (Km 18+267; Access Road Km 2+725), (K3-Arm 2; Km 0+259), (K3-Arm 2; Km 0+320), (K3-Arm 2; Km 0+386), (K3-Arm 3; Km 0+190), (K3-Arm 3; Km 0+238), (K3-State Road; Km 0+865), (K4-Arm 2; Km 0+249), (K4-Arm 4; 0+246) (Km 33+660; Access Road Km 0+442), (Km 33+660; Access Road Km 1+342), (Km 33+660; Access Road Km 1+494), (Km 33+660; Access Road Km 1+735), (Km 33+660; Access Road Km 2+116), (Km 33+660; Access Road Km 2+382), (Km 33+660; Access Road Km 2+698), (Km 33+660; Access Road Km 2+815), (Km 33+660; Access Road Km 3+785), (K5-Arm 1; Km 0+074), (K5-Arm 1; Km 0+195), (K5-Arm 2; Km 0+249), (K5-Arm 3; Km 0+239), (Yenipazar Provincial Road; Km 0+678) (YY45; Km 0+068), (YY50; Km 0+476),
	3.00 x 2.00	Km 18+113, Km 24+078, Km 27+090, Km 30+091,
	3.00 x 3.00	Km 16+790, Km 17+782, Km 18+497, Km 18+908, Km 21+263, Km 23+061, Km 25+355, Km 25+454, Km 25+788, Km 29+042, Km 30+237, Km 30+579, Km 30+990, Km 31+193, Km 31+659, Km 32+905, Km 33+981, Km 34+453, (Km 18+267; Access Road Km 0+595), (Km 18+267; Access Road Km 2+192), (K3-Arm 3; Km 0+095)
	4.00 x 4.00	Km 20+872, Km 21+845, Km 28+579,

Culverts	Dimension (m x m)	Location
	5.00 x 5.00	Km 16+246, Km 16+637, Km 17+511, Km 19+430, Km 30+462, Km 33+458, (K3-State Road; Km 1+630), (K4-Arm 2; Km 0+467), (YY55; Km 0+418),
	6.00 x 5.00	Km 19+147, Km 27+772,
	7.00 x 5.00	(Km 18+267; Access Road Km 1+316),
	7.00 x 6.00	(Km 18+267; Access Road Km 1+580),
	9.00 x 5.00	Km 20+268, Km 23+719,
	12.00 x 5.00	(Km 18+267; Access Road Km 2+140),

3.2.4 Toll Collection Areas

As the Motorway is to be operated with an access-controlled system, all the entrance and exit points will be equipped with toll collection stations where automatic passage (OGS), fast passage (HGS) infrastructures are available.

Toll plazas, toll passage lanes, operation building(s), transformer building(s) and parking areas will be available at the toll collection areas. Toll plazas and passage lanes will be designed to have sufficient capacity for the existing and future traffic projections. Thus, number of toll booths will change from location to location. At toll stations with free passage system (FPS), no toll booth will be present but plate recognition system will be installed. Communication infrastructure will be provided to allow data transfer to traffic management systems. An example layout drawing for toll stations is provided in Figure 3.11.

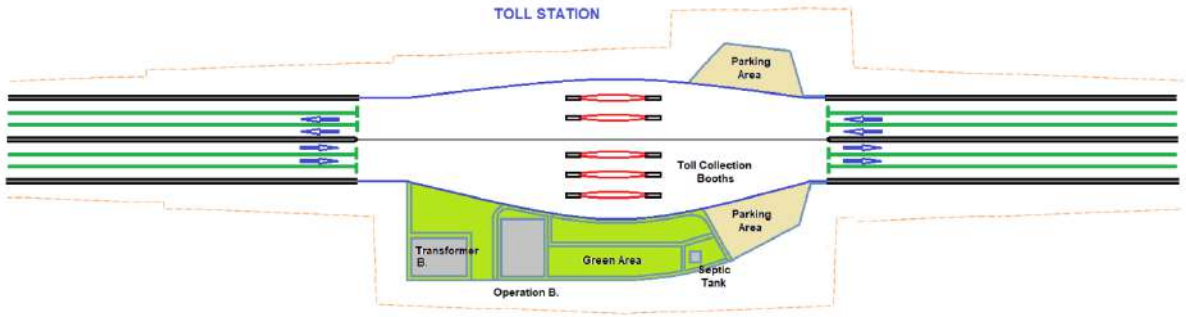


Figure 3.11 Example Layout of Toll Station

Toll collection areas to be constructed of the South Alternative are listed in Table 3.13.

Table 3.13 List of Toll Collection Areas, South Alternative

Area	Location
Toll Collection Area (7 Toll Booths)	(Km 18+267; Access Road Km 1+760)
Toll Collection Area (7 Toll Booths)	(Km 33+660; Access Road Km 2+900)

Example photographs showing the construction of Toll Collection Areas are presented in Figure 3.12 below.

Toll Collection Area

Toll Collection Area

Figure 3.12 Example Photographs Showing the Construction of Toll Collection Areas

3.2.5 Service Areas

Service areas are facilities built at international standards in every 20-50 km to meet the needs of the users of the motorways in a continuous (24 hours 7 days) and efficient way and allow the drivers have a break for resting purposes. Four different types (A, B, C, and D) of services areas can be built on motorways. In the South Alternative, Type C service areas will be built.

In the scope of the South Alternative, service areas will be built on each side of the motorway, opposing to each other. Connection between two sites will be provided by suitable road structures (e.g. culvert, overpass, etc.). Parking areas for passenger vehicles and heavy vehicles will be separated. Service areas to be constructed of the South Alternative are listed in Table 3.14.

Table 3.14 List of Service Areas

Area	Location
Heavy Vehicle Parking Area (Left)	Km 21+400
Service Area (C Type) (Right) *	Km 30+475
Service Area (C Type) (Left)	Km 31+450

** The area is allocated as Service Area for the operation phase of the project, but a temporary satellite camp site is planned to be mobilized on the area during construction phase and will be demobilized as per the completion of the construction works of the South Alternative.*

An example layout for service areas is presented in Figure 3.13.

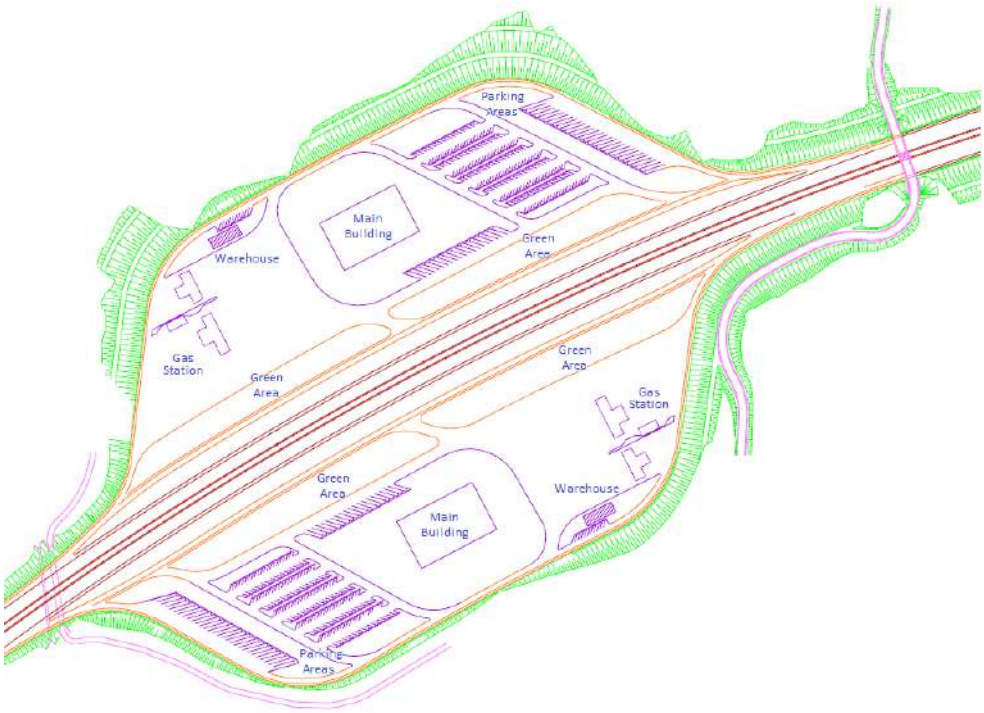


Figure 3.13 Example Layout of Service Area

3.2.6 Maintenance and Operation Centers

To ensure that the level of services is adequately provided and maintenance and repair works are regularly performed, maintenance centers are built minimum in every 50-60 km in motorway projects. Additionally, in every 120-150 km, main maintenance centers are located. In the maintenance centers, offices, workshops, salt tanks, warehouse, garage, gas station, management dwellings, dormitories and parking areas are provided. But no Maintenance and Operation center would be placed along the South Alternative section of the Aydın-Denizli Motorway.

3.2.7 Pavement Structure

Layers of the road pavement and their thickness for the motorway, access roads and other roads according to motorway specifications is listed in Table 3.15 and demonstrated on the sketch given in Figure 3.14. Mainly crushed and screened quarry materials will be used for the preparation of the pavement layers.

Table 3.15 Pavement Layers and their Thickness

Layer	Thickness of Layers (cm)		
	Motorway	Access Roads	Ancillary Roads Service and Parking Area
Abrasion/Wearing Coarse*	4	5	5
Binder	8	6	7
Bituminous Base	15	10	10
Plant-Mix Base	20	20	20
Plant-Mix Subbase	20	20	20
TOTAL	**67**	**61**	**62**
Selected Material (CBR>=10)	*Between 20 and 50 cm depending on the soil properties*		

**Abrasion Layer shall be of modified bituminous stone mastic asphalt*

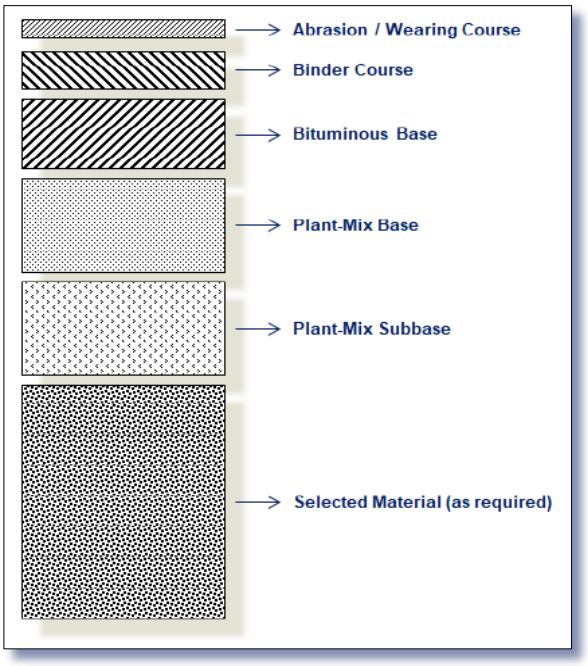


Figure 3.14 Pavement Layers for the Motorway

3.3 Expropriation Corridor

In motorway projects, expropriation corridor is minimum 100 meters according to KGM standards. Where required, expropriation corridor is widened to cover the excavation and embankment areas and construction areas for the larger structures such as interchange areas, acceleration lanes, park and service areas, drainage ditches, etc.

In the South Alternative, expropriation corridor will be minimum 100 meters in accordance with the KGM's specifications, while it can be widened up to 350 meters depending on the topographical conditions and type and location of large project components. The area to be allocated to the motorway will be enclosed by suitable structures/materials (e.g. wire fence etc.).

3.4 Description of the Route

Existing land use characteristics along the South Alternative route changes. According to CORINE Land Cover database, the South Alternative passes predominantly through olive trees, forest areas and agricultural lands (for a corridor of 400 m (200 meters in each side of the motorway axis) which would cover the maximum width of the expropriation corridor that is given as 350 m). Detail information of the route is being given in Chapter 5- "Land Use and Property".

The settlements located in the vicinity of the motorway components in South Alternative are listed in Table 3.16.

Table 3.16 Settlements located in the vicinity of the motorway components in South Alternative

Districts	Neighborhoods	Nearest Approximate Motorway Km	Approximate Distance of the Settlement Center to Nearest Motorway Components (m)	Direction with respect to Main Carriageway	Population (TÜİK 2022)
	Yeniköy	Km 15+500	125	Northwest	1,242
	Dereköy	Km 16+500	20	North	245
	Dalama	Km 19+000	40	North	1,561
	Kırıklar	Km 22+000	85	North-Northwest	388
	Gödrenli	Km 23+000	312	North-Northwest	336
	Alanlı	Km 24+000	50	North	436
Yenipazar	Hamzabali	Km 25+000	13	North-Northwest	782
	Dereköy	Km 27+500	20	North	404
	Çulhan	Km 28+500	230	North-Northwest	180
	Alhan	Km 29+500	0	North-Northwest	109
	Yeni	Km 32+000	0	North	1,337
	Çarşı	Km 32+000	260	North	1,587
	Doğu	Km 33+000	0	North	1,085
	Hükümet	Km 33+000	0	North	2,033
	Donduran	Km 37+000	850	East-northeast	1,019

3.5 Workforce

Project workforce will include personnel to be employed by contractor (direct workers) and sub-contractors (contracted workers). These personnel will be categorized as site personnel and office/administrative personnel. Site personnel refers to the workers who are directly involved in the construction activities at field; while office/administrative personnel refers to the office managers, administrative staff, drivers, etc. who are not directly engaged with the construction works conducted at site. Maximum number of direct and contracted workers/personnel anticipated to be employed in each section of the project is given in Table 3.17 for the peak period of construction works.

Table 3.17 Maximum Number of Personnel anticipated to be employed at Peak Construction Works

Number Of Personnel	FOIAS	SUB-CONTRACTORS	TOTAL
	800	200	**1,000**

Site personnel are mainly composed of engineers, technicians, foremen, topographers, operators, drivers, laboratory workers and unskilled workers. On the other hand, composition of office / administrative personnel generally includes Project Manager, Site Manager, office engineers, financial staff and others.

In the operation phase, relevant personnel will work at the toll plazas. At each toll plaza, 4-5 personnel will provide services in shifts for the arrangement of cash payments. In addition, 4-5 personnel will work at each control center that will be established at the toll collection areas.

In addition to the personnel to be employed at the toll collection areas, project will create employment opportunities for local people at the service areas that will include restaurants, tea and coffee houses, shops, gas stations, kiosks, etc.

3.6 Construction Machinery

The number and distribution of construction machinery to be used for the South Alternative are presented in Table 3.18. The impact of noise and vibration from equipment during the construction and operation phases of the project is presented in Chapter 11. In order to be on the safe side in the Noise Modeling and Assessment Report prepared in this context (See Annex 8), the number of construction equipment to be used on Aydın-Denizli Motorway has been taken into account. The construction equipment used for the Noise Model is presented in Table 3.19.

Table 3.18 List of Construction Machinery

Type of Machinery	FOIAS	SUB-CONTRACTORS	TOTAL
Excavator	50	-	50
Grader	10	-	10
Crusher	2	-	2
Dozer	10	-	10
Loader	10	-	10
Roller	15	-	15
Dump Truck	150	-	150
Rock Driller	1	-	1
TOTAL	**248**	**-**	**248**

Table 3.19 List of Construction Machinery for Noise and Vibration Model Report

Type of Machinery	FOIAS	SUB-CONTRACTORS	TOTAL
Excavator	74	-	74
Grader	11	-	11
Crusher	2	-	2
Dozer	25	-	25
Loader	19	-	19
Roller	40	-	40
Dump Truck	231	-	231
Rock Driller	2	-	2
TOTAL	**404**	**-**	**404**

3.7 Material to be Used

Aggregate, concrete, steel, aluminum, cement, bitumen, cables, etc. will be used in construction works. Concrete will be required for the construction of bridges, retaining walls, culverts, and other engineering structures. Aggregate to be used for concrete production will be supplied from licensed quarries. Following extraction, aggregate will be crushed, screened and washed where necessary. Concrete types/classes to be used in the project will include the following:

- Precast prestressed beam concrete
- Post-tensioned prestressed beam concrete
- Reinforced concrete
- Plain concrete

During the operation phase, use of salt (NaCl), calcium chloride ($CaCl_2$) and magnesium chloride ($MgCl_2$) will be required in the scope of road deicing activities. These materials would be used directly or blended in proper ratios. Amount of chemicals to be used per m^2 of road surface will depend

on the road conditions (i.e. open roads prior to the start of snowfall event, snow covered roads, slippery ice bound roads) and weather temperatures (between 0^0C and -12^0C).

Suitable chemicals and materials (e.g. concrete, cement, epoxy, repair mortar, rust removing chemicals, hydrochloric acid, etc.) will also be used for the repair and maintenance of engineering structures.

3.8 Traffic Projection

Since the South Alternative is located on Section 1 (Aydın-Kuyucak) of the Aydın-Denizli Motorway Project, the minimum traffic (as passenger car equivalents-PCE) guaranteed under the related terms of the BOT contract for Section 1 of the motorway is provided below:

- Section 1 (Aydın-Kuyucak): 35,000 PCE/day

Furthermore, the traffic projection (between 4th quarter 2023 and end of 2nd quarter 2041) for the route has been completed in August, 2021. Annual Average Daily Traffic (AADT) data and Passenger Car Unit (PCU) for the route are summarized in Table 3.20 and Table 3.21, respectively.

Table 3.20 Traffic Projection* for Section 1 of Aydın-Denizli Motorway Project (AADT – Annual Average Daily Traffic)

Year	Class Category; (LV: Light Vehicle), (HV: Heavy Vehicle)					Total
	Car + Moto (LV)	Light Commercial Vehicle (HV)	Bus (HV)	Truck (HV)	Truck & Trailer (HV)	
Section 1 (Aydın-Kuyucak)						
2023	404	53	13	40	48	558
2024	5,718	736	180	555	669	7,858
2025	6,748	857	204	646	778	9,233
2026	7,832	984	229	742	894	10,681
2027	8,170	1,018	231	767	924	11,110
2028	8,511	1,052	234	793	956	11,545
2029	8,854	1,088	236	820	988	11,987
2030	9,200	1,125	238	848	1,022	12,434
2031	9,559	1,163	241	877	1,056	12,896
2032	9,933	1,202	243	906	1,092	13,375
2033	10,321	1,242	245	936	1,128	13,872
2034	10,724	1,282	248	967	1,164	14,385
2035	11,143	1,324	250	998	1,202	14,917
2036	11,578	1,366	253	1,030	1,241	15,467
2037	12,030	1,410	255	1,063	1,280	16,037
2038	12,500	1,454	258	1,096	1,320	16,627
2039	12,988	1,499	260	1,130	1,361	17,238
2040	13,496	1,545	263	1,165	1,403	17,870
2041	14,023	1,592	265	1,200	1,445	18,525

**between 4th quarter 2023 and end of 2nd quarter 2041*

Table 3.21 Traffic Projection* for Section 1 of Aydın-Denizli Motorway Project (PCU – Passenger Car Unit)

Year	Class Category; (LV: Light Vehicle) (HV: Heavy Vehicle)					Total
	Car + Moto (LV)	Light Commercial Vehicle (HV)	Bus (HV)	Truck (HV)	Truck & Trailer (HV)	
Section 1 (Aydın-Kuyucak)						
2023	404	66	17	60	96	642
2024	5,718	920	225	833	1,337	9,033
2025	6,748	1,071	255	969	1,556	10,598
2026	7,832	1,230	286	1,113	1,787	12,249
2027	8,170	1,272	289	1,151	1,848	12,730
2028	8,511	1,315	292	1,190	1,911	13,219
2029	8,854	1,360	295	1,231	1,976	13,716
2030	9,200	1,407	298	1,273	2,044	14,220
2031	9,559	1,454	301	1,316	2,113	14,742
2032	9,933	1,503	304	1,359	2,183	15,281
2033	10,321	1,552	307	1,404	2,255	15,839
2034	10,724	1,603	310	1,450	2,329	16,416
2035	11,143	1,655	313	1,497	2,404	17,012
2036	11,578	1,708	316	1,545	2,481	17,628
2037	12,030	1,762	319	1,594	2,560	18,265
2038	12,500	1,817	322	1,644	2,640	18,923
2039	12,988	1,873	325	1,695	2,722	19,604
2040	13,496	1,931	328	1,747	2,805	20,307
2041	14,023	1,989	331	1,800	2,890	21,034

**between 4th quarter 2023 and end of 2nd quarter 2041*

3.9 Implementation Program

Implementation Program of the Project is presented in Table 3.22. Project expropriation and land use permitting works have already started and progressing at different paces and different locations.

Table 3.22 Project Implementation Program

AYDIN DENİZLİ MOTORWAY PROJECT IMPLEMENTATION SCHEDULE (including DESIGN CHANGE - SOUTH ALTERNATIVE)

DESCRIPTION	Starting	Ending
1. Milestones	03.11.2020	28.11.2022
1.1. SPV	03.11.2020	
1.2. Site Delivery	22.01.2021	
1.3. Start of the Work	22.01.2021	
1.4. Contract Signing	30.12.2021	
1.5. Effective Date of the Contract	30.12.2021	
1.6. Approval of the Implementation Projects		28.11.2022
2. ESIA Studies		
2.1. Environmental and Social Baseline Studies (inc. Field Work)		
2.2. Stakeholder Engagement Activities (Road Trip-Informative Meetings)		
2.3. ESIA Reporting		
2.4. Inception Report		
2.4. First Draft of Supplementary ESIA		
2.5. Final Supplementary ESIA		
3. Mobilization / Demobilization	22.01.2021	28.12.2023
3.1. Mobilization	22.01.2021	25.04.2021
3.2. Demobilization	29.11.2023	28.12.2023
4. Expropriation Woks	14.01.2021	31.12.2022
4.1. Submission of Expropriation Plan	14.01.2021	15.10.2021
4.2. Realization of Expropriation Works	03.05.2021	31.12.2022
5. Project Works	14.01.2021	13.11.2022
5.1. Submission of Preliminary Projects	14.01.2021	30.08.2021
5.2. Submission of Implementation Projects	02.08.2021	13.11.2022
6. Construction Works	14.01.2021	30.12.2023
6.1. Earthworks	14.01.2021	15.08.2023
6.1.1. Section 1 (Aydin - Kuyucak)	14.01.2021	15.08.2023
6.1.1.1. Topsoil Stripping and Soft Soil Excavation	14.01.2021	27.01.2023
6.1.1.2. Route Excavation	16.01.2021	26.06.2023
6.1.1.3. Route Fill	16.01.2021	26.07.2023
6.1.1.4. Grading & Approval Tests	01.06.2022	15.08.2023
6.1.2. Section 2 (Kuyucak - Denizli)	08.02.2021	01.06.2023
6.1.2.1. Topsoil Stripping and Soft Soil Excavation	08.02.2021	29.05.2022
6.1.2.2. Route Excavation	10.02.2021	07.05.2023
6.1.2.3. Route Fill	10.02.2021	17.05.2023
6.1.2.4. Grading & Approval Tests	01.08.2021	01.06.2023
6.2. Engineering Structures	17.02.2021	27.11.2023
6.2.1. Bridges, Overpass & Underpass Bridges	17.02.2021	16.07.2023
6.2.1.1. Section 1 (Aydin - Kuyucak)	16.07.2021	16.07.2023
6.2.1.2. Section 2 (Kuyucak - Denizli)	17.02.2021	07.05.2023
6.2.2. Viaducts	15.03.2021	27.11.2023
6.2.2.1. Section 1 (Aydin - Kuyucak)	28.06.2021	27.11.2023
6.2.2.2. Section 2 (Kuyucak - Denizli)	15.03.2021	14.09.2023
6.3. Culverts	22.01.2021	17.04.2023
6.3.1. Section 1 (Aydin - Kuyucak)	13.04.2021	17.04.2023
6.3.2. Section 2 (Kuyucak - Denizli)	22.01.2021	28.12.2022
6.4. Toll Collection Systems	13.02.2023	28.12.2023
6.5. Pavement Works	16.08.2021	03.12.2023
6.5.1. Section 1 (Aydin - Kuyucak)	20.06.2022	03.12.2023
6.5.1.1. Subbase	20.06.2022	22.08.2023
6.5.1.2. Plant Mix Base	11.07.2022	06.09.2023
6.5.1.3. Bituminous Base	31.08.2022	11.10.2023
6.5.1.4. Binder Implementation	25.09.2022	10.11.2023
6.5.1.5. Stone Mastic Asphalt Implementation	17.12.2022	03.12.2023
6.5.2. Section 2 (Kuyucak - Denizli)	16.08.2021	31.07.2023
6.5.2.1. Subbase	16.08.2021	06.06.2023
6.5.2.2. Plant Mix Base	06.09.2021	16.06.2023
6.5.2.3. Bituminous Base	01.11.2021	26.06.2023
6.5.2.4. Binder Implementation	15.11.2021	11.07.2023
6.5.2.5. Stone Mastic Asphalt Implementation	25.09.2022	31.07.2023
6.6. Secondary Works	01.03.2021	30.12.2023
6.6.1. Guardrails and Fences	06.05.2023	28.12.2023
6.6.1.1. Guardrails	06.05.2023	28.12.2023
6.6.1.2. Fences	06.05.2023	28.12.2023
6.6.2. Relocation Works	01.03.2021	28.12.2022
6.6.3. Lighting	07.02.2023	25.12.2023
6.6.4. Maintenance and Operation Center	15.02.2023	30.12.2023
6.6.5. Intelligent Transportation Systems	15.02.2023	30.12.2023
6.7. Others	01.03.2021	30.12.2023
6.7.1. Horizontal and Vertical Traffic Signs	08.05.2023	30.12.2023
6.7.2. Landscape Works	08.05.2023	30.12.2023
6.7.3. Geotechnical Works	01.03.2021	28.12.2023
6.7.4. Service Areas	07.02.2023	15.12.2023
7. Tests and Commissioning	29.11.2023	28.12.2023
7.1. Approval of the Project	29.11.2023	28.12.2023

3.10 Project Costs and Incomes

As the Aydın-Denizli Motorway Project and so South Alternative will be implemented in the framework of a BOT model, financing, planning/design, building/construction, operation and full range of maintenance and repair works will be under the responsibility of the Project Sponsor during the Contract Duration. Finance structure of the Aydın-Denizli Motorway as a BOT Project is represented in Figure 3.15.

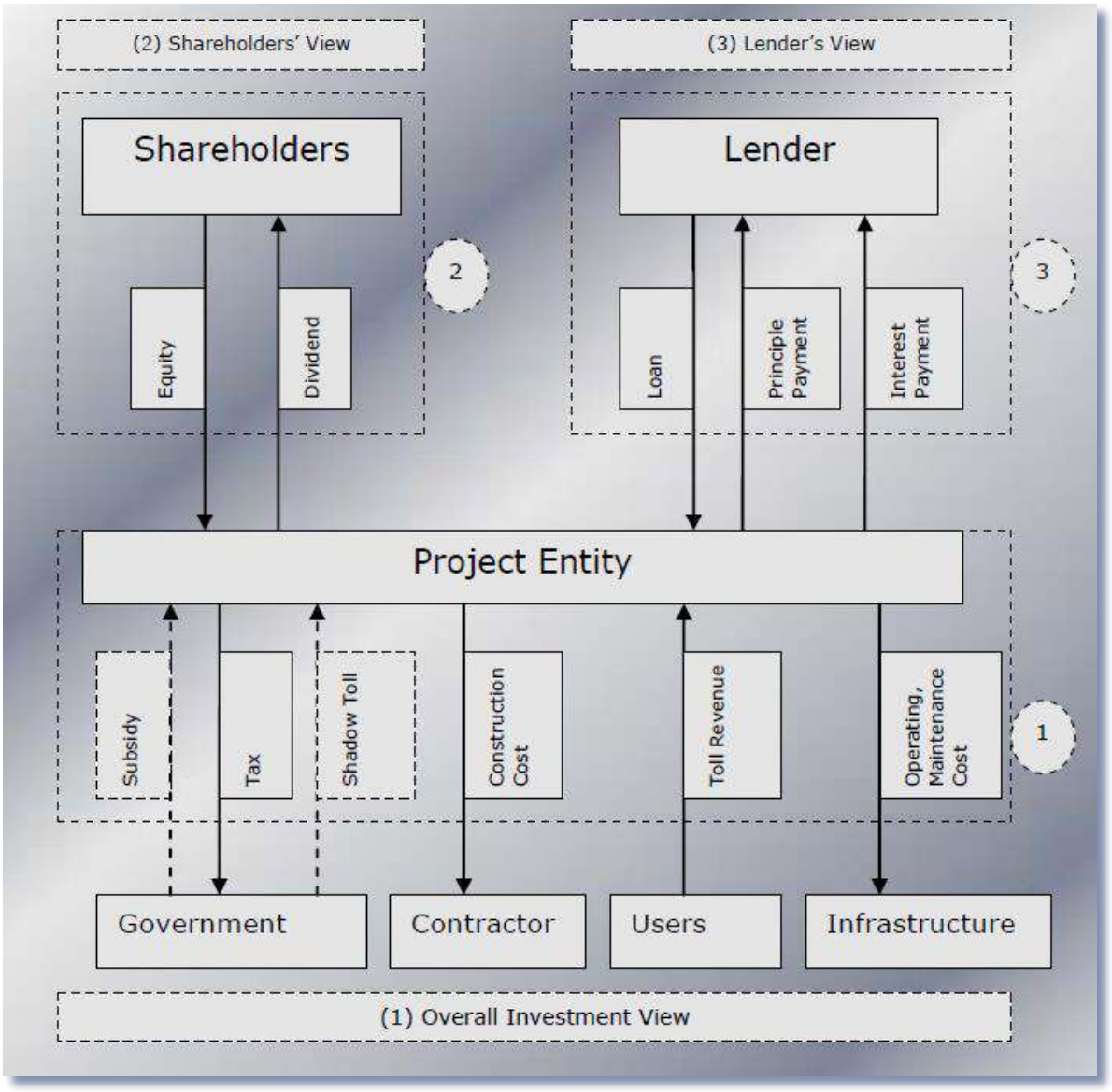


Figure 3.15 Representation of the Finance Structure of BOT Projects (*Source: KGM, August 2010*)

The main cost items for the pre-operation and operation phases of the project would include the following (*KGM, June 2011*):

- Expropriation costs;
- Construction costs for the motorway components and access roads;
- Maintenance and repairment costs during the operation phase (routine maintenance, winter maintenance, periodic maintenance in every 10 years);
- Other operation costs;
- Taxes;
- Reimbursement of credit principal and interest.

Construction costs will mainly include the costs for the expropriation, surveys, design, consulting services, earthworks, construction of engineering structures, bridges, overpasses, underpasses, etc.

Following the completion of the construction works and commissioning of the motorway, toll revenues will be collected from the road users by the Project Sponsor until the end of the Contract Duration, which has been specified as 17 years. In case the toll revenues collected are below the revenue projected to be collected for the minimum traffic guaranteed under the BOT Contract (see Section 3.8), the difference will be paid to the Project Sponsor. Additional earnings will be obtained as a result of the operation of the service areas.

CHAPTER 4

ESIA METHODOLOGY

4. CHAPTER – ESIA METHODOLOGY

In its simplest form, impact assessment is defined as the process of identifying the future consequences of a current or proposed action by the International Association for Impact Assessment (IAIA). Good Environmental and Social Impact Assessment (ESIA) practice requires the task of identifying and assessing environmental effects to commence at the early inception of the project[1].

The supplementary environmental and social impact assessment (ESIA) study to be conducted for the South Alternative will conform to both the requirements of the Turkish EIA Regulation as well as international standards including Equator Principles (EPs) IV and IFC's Performance Standards on Environmental and Social Sustainability (including general and sector-specific EHS guidelines). IFC, in its Guidance Note 1 on the Assessment and Management of Environmental and Social Risks and Impacts, which was published in January 1, 2012 and updated in June 14, 2021, specifies the key process elements of an ESIA study as follows:

1) Initial screening of the project and scoping of the assessment process;
2) Examination of alternatives;
3) Stakeholder identification (focusing on those directly affected) and gathering of environmental and social baseline data;
4) Impact identification, prediction and analysis;
5) Generation of mitigation or management measures and actions;
6) Significance of impacts and evaluation of residual impacts;
7) Documentation of the assessment process (i.e. ESIA Report).

Considering the procedural steps of the Turkish EIA Regulation and based on IFC's approach that summarizes the international good practice for impact assessment, the systematic process to be conducted for the assessment of South Alternative's environmental and social impacts and development of mitigation measures and plans for the management of significant impacts is illustrated in Figure 4.1.

[1] UK Highways Agency 205/08: Design Manual for Roads and Bridges; http://www.standardsforhighways.co.uk/ha/standards/dmrb/

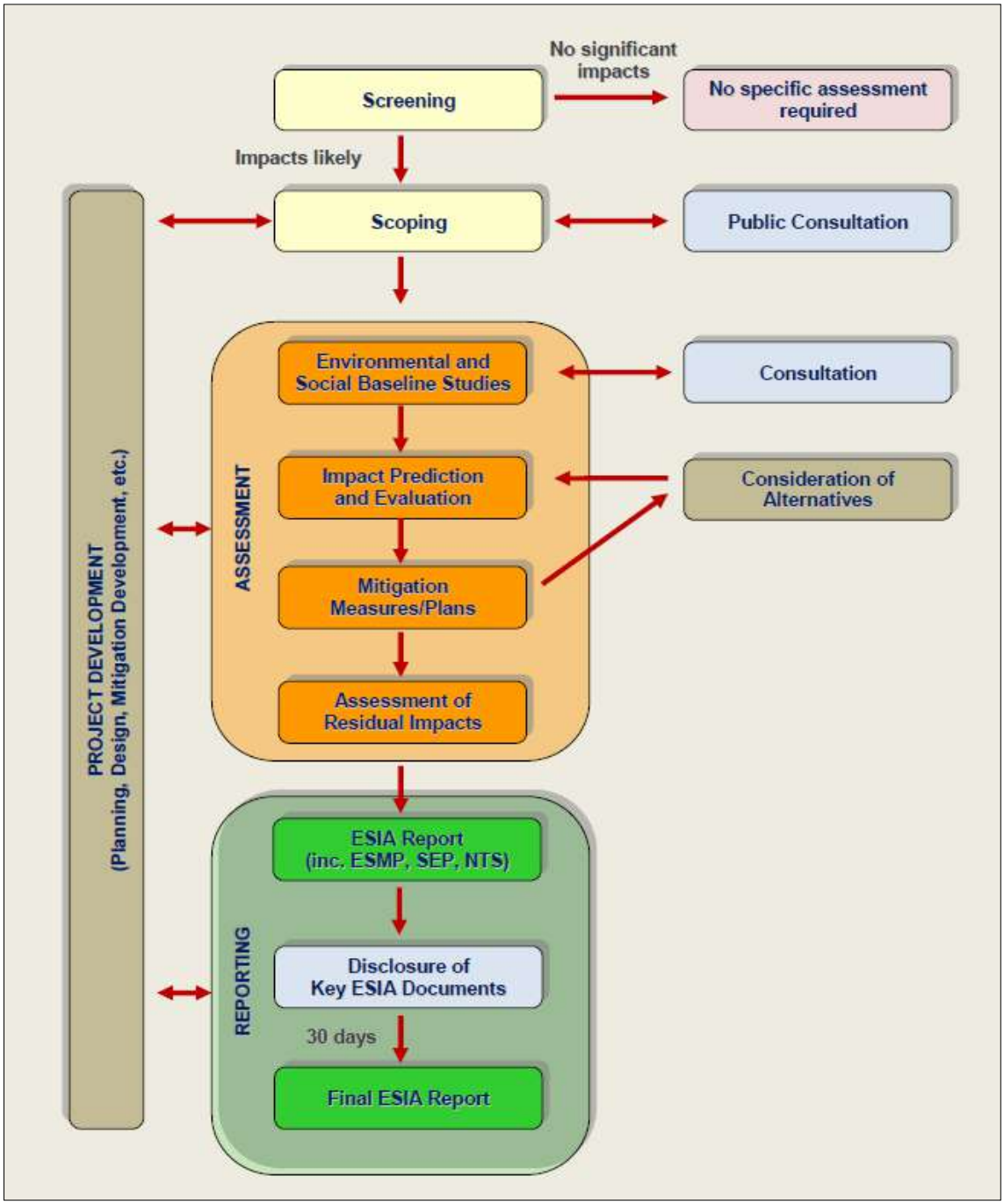


Figure 4.1 ESIA Process (adapted from IFC's Guide to Biodiversity for the Private Sector)

In the ESIA Process, screening is used to make a rapid, high-level analysis to determine whether a full ESIA is necessary. As a part of the screening process conducted for the South Alternative, the project has been classified as a ***Category A Project***, for which the borrower is responsible for preparing an EIA Report/full-scale ESIA.

Following the screening of the Project, scoping works have been conducted to determine which impacts are likely to be significance and should become the main focus of the ESIA.

A comprehensive baseline information assembly program has been designed for the Project to establish a reference point against which any future changes associated with a project can be assessed and offer information for subsequent monitoring. The baseline program has relied on both desk-based studies to analyze readily available information from governmental organizations, academic publications, internet resources, etc. and field surveys to gather site environmental and social information.

Impact prediction and evaluation is the key of the ESIA and involves analyzing the impacts identified in the scoping and baseline work to determine their nature (adverse or beneficial, direct or indirect), temporal (permanent or temporary) and spatial (local, regional, national, etc.), reversibility (reversible or irreversible), magnitude and likelihood. Such detailed impact analysis has required professional judgment and input from relevant experts.

Once the potential impacts are more fully understood, it is necessary to judge the significance of each impact, to determine whether it is acceptable, requires mitigation or is unacceptable. Cumulative impacts, which may result from multiple actions on valued receptors, have been separately assessed as a part of the study to the extent the level of readily available information allowed. As an iterative process, emerging findings of the assessments have been conveyed to design teams to develop mitigation plans for the Project, where feasible.

It should be noted that determining the significance of impacts is a complex and subjective process. A number of factors affect significance including the importance of resources at local, regional, national or international levels; whether the area is subject to formal or informal protection; the ecological values of potentially affected animal and plant species and habitats, and the value of the ecosystems as sources of food or livelihood for local communities[2].

Scoping of Environmental and Social Impacts

Scoping phase of an ESIA process serves for

i. Determination of impacts that are likely to be significant and should become the main focus of the upcoming impact assessment studies;
ii. Identification of data availability and any gaps; and
iii. Determination of the appropriate spatial and temporal scopes for the assessment and suggestion of suitable survey and research methodologies[3].

As with similar large infrastructure projects, the primary impacts of the South Alternative that are to be assessed and suitably managed are anticipated to occur during the construction phase as a result of vegetation clearing, earth moving activities and civil works, extraction of construction materials (from quarries), involvement of large numbers of personnel and heavy machines/equipment, etc. The associated impacts would include changes in the land use and soils, habitat alteration and fragmentation, waste and wastewater generation within the construction corridor and Camp Sites, quarries, etc., emissions into air, noise generation, etc. In addition, acquisition of lands prior to the start of the construction and the large-scale employment to be caused by the project is likely to bring a variety of occupational health and safety issues and socio-economic impacts (i.e. physical or economic displacement) that require evaluation and management. For the Aydın-Denizli Motorway Project and so South Alternative, maximum duration of the construction phase has been specified in the related Build-Operate-Transfer (BOT) Contract as three years. Thus, the construction phase impacts of the project will be generally temporary, except the impacts on biodiversity and socio-economic environment.

[2] A Guide to Biodiversity for the Private Sector: The Social and Environmental Impact Assessment Process, IFC, 2016

[3] Ibid.

During the operation phase, environmental and social impacts of the project will be as a result of vehicle traffic on the motorway route, road maintenance activities and surface water runoff through the impermeable road surfaces, etc. Employment opportunities will be provided, but at relatively lower levels when compared to construction phase. The associated impacts of the motorway operation are likely to include air emissions and noise generation along the motorway route, use of hazardous materials, and waste and wastewater generation at service areas.

Besides the adverse environmental and social impacts, the Aydın-Denizli Motorway Project and so that South Alternative is likely to bring several benefits including contribution to alleviation of existing traffic problems especially in the cities of Aydın and Denizli (up to İzmir Province), reduced travel times and increased transportation comfort, new employment opportunities during the construction phase and operations to be conducted at the service areas, maintenance works, etc.

As a consequence, the environmental and social components that are likely to be in interaction with construction and operation phase activities of the South Alternative are listed below. Thus, the supplementary ESIA study focuses on the assessment and mitigation of the potential impacts on these environmental and social components. In addition, cumulative impacts on each environmental and social component are also assessed in the scope of the supplementary ESIA study. This Supplementary ESIA Report was prepared based on the most current design as of the preparation period of this report.

- Land Use and Property
- Topography, Soils and Geology
- Use of Resources and Waste Management
- Water Resources
- Ecology and Biodiversity
- Air Quality
- Noise and Vibration
- Protected Areas, Landscape and Visual Environment
- Cultural Heritage
- Socio-economic Environment (including local and national conditions, transportation network and traffic loads)
- Community Health and Safety
- Labor and Working Conditions

An interaction matrix is presented in Table 4.1 in order to outline the activities and/or impact factors that have potential to cause interaction of the project with each related environmental and social component. This list identifies the activities that have a potential to cause environmental and social impacts and thus will be evaluated in the scope of the supplementary ESIA studies. Based on this evaluation, mitigation measures will be developed for the activities that would be likely to cause significant environmental and social impacts.

Table 4.1 Interaction Potential Matrix for Scoping

Project Activities / Interaction Factors	Environmental and Social Components												
	Land Use and Property	Topography, Soils and Geology	Water Resources	Ecology and Biodiversity	Air Quality	Environmental Noise and Vibration	Local Social and Economic Conditions	Cultural Heritage (Known and undiscovered)	Protected Areas, Landscape and Visual Environment	Community Health and Safety	Labor and Working Conditions	Transportation Network and Traffic Loads	National Economy
Land Preparation and Construction Phase													
Land acquisition													
Veg. clearing, top soil stripping, cut/fill, construction													
Storage of excess excavated materials													
Construction materials extraction													
Materials transportation													
Operation of plants (mechanical, asphalt, conc.)													
Hazardous materials use and waste generation													
Water use and domestic wastewater gen.													
Rehabilitation works													
Employment of workforce													
Procurement of materials and services													
Operation Phase													
Operation of Motorway													
Road maintenance works													
Surface run-off													
Employment													
Operation of service areas, operation centers, etc.													

Source: Adapted from EIA Sectoral Guidance for Motorways/Toll Roads published by the former Ministry of Environment and Forestry in June, 2009.

Color Code: ***Interaction Potential*** ***Benefit Potential***

In the scope of the impact assessment, impacts will be categorized as construction phase impacts and operation phase impacts. Additionally, residual impacts remaining after the mitigation measures will also be identified in the assessment. It should be noted that, where relevant, construction phase impacts will also cover the land/site preparation activities to be conducted in the pre-construction phase. In this scope, activities such as vegetation removal, top soil stripping, soil improvement, land levelling, etc. will be considered as pre-construction activities, while the cut and fill operations, road construction, construction of road structures such as viaducts, overpasses, underpasses, culverts, buildings, service areas, completion of superstructures and finishing operations will be considered under the construction phase impacts. Since the motorway construction will progress kilometer by kilometer and the pre-construction and construction activities will be conducted gradually in different sections, a strict distinction of the pre-construction and construction phases and the associated activities would not be practical thus impacts associated with both phases will be considered under the heading of "construction phase impacts". The period after the completion of construction activities will be the operation phase of the project. Due to the nature of the project, no decommissioning has been assumed for the motorway.

Study Area and Area of Influence (AoI)

Good ESIA practice suggests that the study area for ESIA is to be defined on a case-by-case basis reflecting the project and the surrounding environment over which significant effects can reasonably be thought to have the potential to occur both from that project in combination with other projects. The study area is recommended to be set for each individual topic[4].

The Area of Influence (AoI) for the South Alternative will be determined individually for each different environmental and social component. In line with IFC PS 1, the AoI is to encompass the following as appropriate:

- The area likely to be affected by:

  i. The Project (e.g. Project sites, immediate airshed and watershed, or transport corridors) and the Project Sponsor's activities and facilities that are directly owned, operated or managed (including by subcontractors) and that are a component of the project (e.g. access roads, borrow and disposal areas, construction camps);
  ii. Impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or
  iii. Indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.

- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

In this respect, the motorway including all of its components (i.e. interchanges, viaducts, service areas, etc.) as well as the components including viaducts, Construction Camp Sites, service roads, quarries, material borrow sites and storage sites have been considered in the Supplementary ESIA to the extent the level of information allowed. For each environmental and social component (e.g. water, air, ecology, etc.) individual study areas have been determined depending on the nature and characteristics of the specific impacts. For the Supplementary ESIA, the overall study area has been determined by considering the largest sub study area; therefore the overall study area covers all sub study areas identified for the different environmental and social components.

[4] UK Highways Agency 205/08, Design Manual for Roads and Bridges

Study areas and AoI's for each environmental and social component are listed in Table 4.2. As mentioned previously, the AoI has been determined in consideration of the direct impact area of the project activities. In this respect, the motorway width (35.5 m) and the minimum width of the expropriation corridor (100 m) had been considered. It should be noted that the expropriation corridor will extend up to maximum 350 m at the locations of interchanges, large embankment and cut sites, service areas, etc. In addition, some of the quarries and disposal areas are located out of the expropriation corridor. Thus, in consideration of such components, study area had to be expanded exceptionally as needed. Also within the scope of cumulative impact assessment studies, an area of 5 km north and 5 km south from the project area was determined. Disregarding such exceptional cases, the general Study Area for the South Alternative is shown in Figure 4.2. The overall study area covering all sub study areas has been determined as 4,000 m corridor (2,000 m from each side of the Motorway axis) on the basis of the air quality and socio-economic environment components.

Table 4.2 Proposed Study Areas and Possible Area of Influence for the Motorway

Environmental and Social Component	Study Area **	Possible Area of Influence (AoI) **
Land Use and Property	400 m	100 m
Topography, Soils and Geology	400 m	100 m
Ecology and Biodiversity	400 m	100 m
Air Quality	4,000 m	2,000 m
Noise and Vibration	2,000 m	1,000 m
Landscape and Visual Environment	400 m	400 m
Protected Areas	400 m	100 m
Cultural Heritage	400 m	100 m
Socio-economic Environment *	4,000 m	2,000 m
Health and Safety	2,000 m	1,000 m
Cumulative Impact Assessment ***	10,000 m	10,000 m

** It should be noted socio-economic environment, due to its nature, propound a distinction in the ESIA approach; thus the study area specified in the table for socio-economic environment should be considered as the minimum study area. Settlements, whose lands extend beyond the proposed study area, have also been included in the scoping assessments, whenever if they are likely to be affected.*

*** Represents the total width. For example; a 400 m study area is composed of 2 x 200 m corridors (200 m located in the left side and 200 m located in the right side of the Motorway's axis, making a total of 400 m in total).*

**** Within the scope of cumulative impact assessment studies, an area of 5 km north and 5 km south from the Project area was determined.*

The works done within the scope of Aydın-Denizli Motorway Project are summarized in the Table 4.3 below.

Table 4.3 Summary of the studies done within the scope of Supplementary ESIA for South Alternative

Study Subject		**Date of the study**	**Number of Measurement Points**
Environmental Studies			
Air quality	Particulate Matter (PM_{10})	August, 2023	5
	PM_{10} Heavy Metal	August, 2023	5
	NO_X, SO_X, VOC, BTEX	August, 2023	2
	Particulate Matter ($PM_{2.5}$)	August, 2023	5
	Settled Dust	August, 2023	5
Noise and Vibration	Noise	August, 2023	5
Soil	Heavy metals	August, 2023	2
	VOC, TPH, BTEX		
Water	Surface Water	August, 2023	5
	Ground Water		5
Biodiversity	Terrestrial Flora and Fauna	13-14.07.2023	-
Social Studies			
Socio-economic Field Study (Key Informant Interviews(KI), Focus Group Studies(FG))		25-26.07.2023	1 (KI), 4 (FG)
Road Trip (Consultation meetings)		22-23.08.2023	2

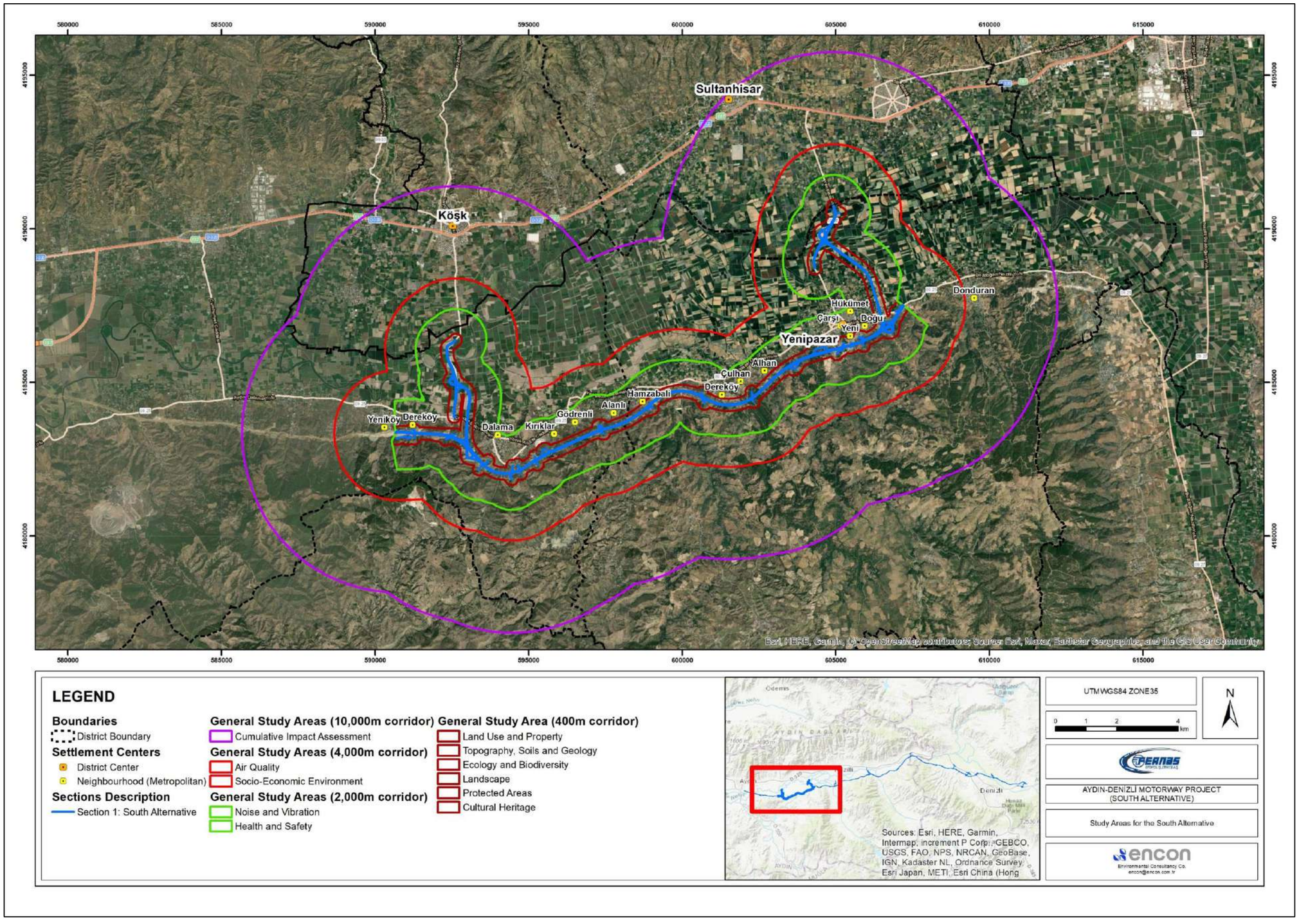


Figure 4.2 Study Areas for the South Alternative

Assessing Significance of Impacts

Significance of impacts is the key output of the environmental and social impact assessment process as the mitigation strategies/approaches of Projects are developed depending on the level of significance.

The significance of impacts is a function of the value and/or sensitivity of the receptor and/or resource and the magnitude of the impact that cause change in the conditions of the receptor and/or resource. Thus, assigning environmental and/or social value/sensitivity of the resources and receptors and estimation of the magnitude of impact are the initial steps to be complete to assess the significance of impacts.

Once the value/sensitivity of the receptor/resource as well as the magnitude of impact is determined, assessment of significance is generally done on the basis of impact categorization matrices. For the evaluation of the significance of the impacts for construction and operation phases of the South Alternative, the categorization matrix (3 x 3) given in Table 4.4 will be used. This matrix allows the evaluation of the magnitude of impacts in combination with the sensitivity/value of receptors/resources. Once the overall significance of impacts are categorized on the basis of this matrix, mitigation measures will be developed for the significant (i.e. high and/or medium) impacts, and the residual impacts will be evaluated after the implementation of the mitigation measures.

Table 4.4 Impact Significance Categorization Matrix *

		Sensitivity / Value of Receptor / Resource		
		High (3)	**Medium (2)**	**Low (1)**
Magnitude of Impact	**Major (A)**	High (A3)	High (A2) **	Medium (A1)
	Moderate (B)	High (B3)	Medium (B2)	Low (B1)
	Minor (C)	Medium (C3)	Low (C2)	Low (C1)

** Adapted from World Bank, December, 2012.*

*** It should be noted that the significance level represented by (A2) was ranked as "medium" in the source document; but it has been modified to "high" in this assessment in order to be on the safe side and make a stricter assessment.*

Impact Significance	**High**	Imperative to reduce impact significance but relevant mitigation required before proceeding; represent key factors in the decision-making process. These impacts are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
	Medium	Significance is to be reduced to a lower category as long as it is feasible by taking relevant mitigation measures; if not possible can be proceeded by acceptance of associated risks. These impacts effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
	Low	Acceptable to proceed without additional measures assuarance of compliance with standards and safety criteria is assured. These impacts may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.

** Adapted from L. Canter, 1993 and Highways Agency 205/08: Design Manual for Roads and Bridges*

The structure of the impact categorization matrix to be used in the scope of the assessments entails categorization of value/sensitivity and magnitude in three levels. In the scope of the Supplementary ESIA conducted for South Alternative, the environmental and / or social "sensitivity/value" of a receptor / resource will be defined as "high", "medium" or "low", individually for each type of receptor / resource depending on their value / importance for the community (i.e. cultural or economic) or wild life, existing quality, protection status that will be identified based on the findings of the baseline studies (desk-based and field) and consultation to be done with local stakeholders. When there are government-established thresholds or national/international scientific literature defined for a receptor/resource this will be taken into consideration; otherwise sensitivity/value designation will be done by using professional judgement of the ESIA experts. Typical descriptors that would be considered to describe specific sensitivity/value criteria for each individual environmental and/or social component under the relevant chapters of this Supplementary ESIA Report are provided in Table 4.5.

Table 4.5 Typical Descriptors to be considered in Assigning Individual Value/Sensitivity Criteria

Value / Sensitivity Level	Typical Criteria Descriptors
High	High importance and rarity, international or national scale, and very limited potential for substitution.
Medium	Medium importance and rarity, regional scale, limited potential for substitution.
Low	Low importance and rarity, local scale.

** Adapted from Highways Agency 205/08: Design Manual for Roads and Bridges.*

The "magnitude" of the impacts is a measure for the degree of change. Magnitude represents impacts' physical/geographical extent/range (in terms of area, length, etc.), duration (long-term, medium-term or short term), reversibility of the impact (short-term reversible, long-term reversible or irreversible), frequency (one-off, intermittent or continuous) and likelihood (unlikely, probable or certain) etc. In consideration of these individual factors, overall magnitude of the impacts will be determined for each impact. The categorization of the overall magnitude (as minor, moderate, major) would change for each resource (i.e. environmental media) under consideration and this categorization will be done in the relevant chapters of this Supplementary ESIA Report. Magnitude factors and the typical descriptors that would be considered to estimate overall magnitude for impacts under the relevant chapters of this Supplementary ESIA Report are provided in Table 4.6.

Applying the matrix, the greater the environmental sensitivity/value of the receptor/resource, and the greater the overall magnitude of impact, the more significant the impact. For example, the consequences of a highly valued environmental resource or highly sensitive receptor suffering a major detrimental impact of high magnitude would be a very significant adverse impact[5].

[5] Highways Agency 205/08: Design Manual for Roads and Bridges

Table 4.6 Impacts Magnitude Criteria

Magnitude Factors						Typical Criteria Descriptors for Overall Magnitude *		
Type	**Geographic Extent**	**Duration**	**Reversibility**	**Frequency**	**Magnitude**	**Overall Magnitude Level**	**Adverse/Negative**	**Beneficial/Positive**
Beneficial / Positive	**Restricted** (within the expropriation corridor; <200 m at each side of the Motorway axis)	**Short** (less than 1 year)	**Short term reversible** (within 3 years)	**One-off / Occasional**	**Low** (e.g. amount of land use to be affected is less than 5% of the total amount of land use within the impact area)	**Major**	**Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements**	**Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality**
Neutral	**Local** (200 to 1.000 m at each side of the Motorway axis)	**Medium** (1 - 3 years)	**Long term reversible** (3 - 15 years)	**Intermittent**	**Medium** (e.g. amount of land use to be affected is less than 10% of the total amount of land use within the impact area)	**Moderate**	**Loss of resource, but not adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements**	**Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality**
Adverse / Negative	**Wide** (>1.000 m at each side of the Motorway axis)	**Long** (more than 3 years)	**Irreversible**	**Recurrent / Continuous**	**High** (e.g. amount of land use to be affected is more than 10% of the total amount of land use within the impact area)	**Minor**	**Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements**	**Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring**

** Adapted from Highways Agency 205/08: Design Manual for Roads and Bridges*

Mitigation and Residual Impacts

Once the impacts are predicted and evaluated including judgment of significance, mitigation measures and plans are developed, by taking the results of the consultations to be done, to eliminate or reduce/minimize adverse impacts and maximize the benefits. The mitigation hierarchy given in Figure 4.3 is followed, whenever technically and financially possible. In this hierarchy, avoidance is considered the most acceptable form of mitigation. It may require changes to be made on the Project's design or location that would be done wherever technically and financially feasible. Minimization and mitigation through environmental and social measures/treatments/design is aimed where avoidance is not a possible option. Compensation/offset for residual risks and impacts is considered to be the last option in this hierarchy where avoidance or minimization and/or mitigation measures are not available. This option does not eliminate the identified adverse risks and impacts, but they seek to offset it with an (at least) comparable positive one.

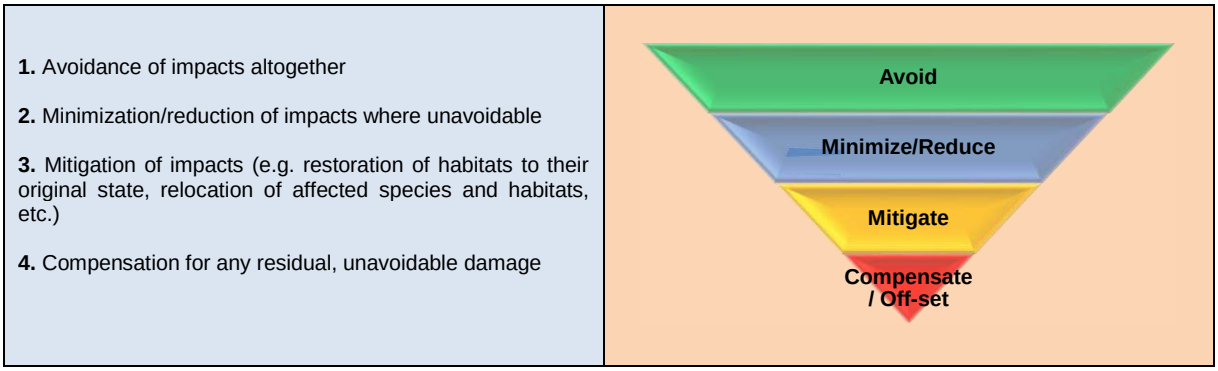


Figure 4.3 Mitigation Hierarchy to be adopted

Within this Supplementary ESIA, impact categorisation and significance have been evaluated with reference to definitive standards, accepted/published criteria and legislation, where available. Where it has not been possible to quantify impacts, qualitative assessments have been carried out, based on expert knowledge, GIIP and professional judgement. Quantitative methods predict measurable changes as a result of the South Alternative and rely on accurately measuring baseline conditions to make accurate predictions/estimations regarding the potential impacts. Qualitative assessment methods rely on expert judgement and experience.

While it is important to identify the initial significant impacts associated with the project, the key focus of the impact assessment has been to define the significance of residual impacts and effects following application and/or consideration of mitigation measures. A residual impact is one which continues to be present following the application of avoidance and/or mitigation measures. In this regard, a summary table is provided in the final section of each Chapter to indicate the potential significance of impacts first in the absence and then in the presence of mitigation to assist in demonstrating the anticipated effectiveness of proposed mitigation measures and assign the significance of residual impacts.

Once the significance of Project-level impacts of South Alternative is determined under relevant Chapters of this Supplementary ESIA Report, cumulative impacts have been separately assessed in Chapter 17 ("Cumulative Impact Assessment"). Methodology for the cumulative impact assessment is also provided in said chapter.

CHAPTER 5

LAND USE AND PROPERTY

5. CHAPTER – LAND USE AND PROPERTY

Aydın-Denizli Motorway Project, which is a continuation of the previously completed İzmir-Aydın Motorway, is designed to connect Aydın and Denizli provinces of the Aegean Region of Türkiye. At the construction phase of the ADMP, General Directorate of Highways ("KGM"), as the owner of the project, has submitted an order for a design change of the main carriageway between Km 15+856 and Km 34+630 in Section 1 ("South Alternative"). Thus, project description will be done in the scope of said section of the project, and the existing land use characteristics and ownership properties given in this Chapter, has been prepared based on the current design as of the preparation period of this report.

This Chapter identifies the existing land use characteristics and ownership properties along the South Alternative route and assesses the potential impacts of the South Alternative on these aspects. Measures proposed for the mitigation of the potential impacts and the residual impacts are also described in this chapter. Potential socio-economic impacts on local communities and/or owners/users of the affected lands (e.g. physical displacement, economic displacement, etc.) associated with the changes in the existing land use characteristics are covered in Chapter 14 ("Socio-economic Environment").

5.1 Assessment Methodology and Data Sources

The study area for the land use analyses has been determined based on the width of the expropriation corridor, which will have a width of minimum 100 meters in accordance with motorway standards and may expand up to 350 meters depending on topographical conditions and associated cut and fill plans. Accordingly, the GIS analyses have been conducted for a corridor having a width of 400 meters (in addition to the motorway width, around 200 meters in each side), which would cover the maximum expropriation corridor. The results of the land use analyses are presented in Table 5.3 and Table 5.4.

The land use characteristics for the South Alternative has been analyzed by using "Coordination of Information on the Environment (CORINE) Land Cover" (2018) database with the aid of GIS tools and Former Turkish General Directorate for Rural Services (GDRS) database for Aydın was established in 2001.

The study area itself does not directly represent the amount of land to be affected by the land preparation and construction activities, as it has been identified based on the maximum width of the expropriation corridor, which is 350 meters, and in actual case the expropriation corridor will be as low as 100 meters along an important portion of the motorway route. Accordingly, to make more accurate judgments on the amount of land to be affected, as the next step, expropriation plans prepared for the South Alternative and land use (i.e., forestry) permits obtained/to be obtained for the lands to be used will also be analyzed to characterize the land use patterns and ownership information. To characterize the forestry features within the study corridor, relevant Forest Management Plans and Forest Stand Maps will be analyzed by the aid of GIS. For the construction facilities that are located on registered lands, database of the General Directorate of Land Registry and Cadastre and land use permits will also be used. The result of the analyses to be conducted will be presented in tabular formats and land use maps will also be produced for visual representation.

The data sources to be used in this scope are listed below:

- Coordination of Information on the Environment (CORINE) Land Cover (2018)
- Land Use Database of the former Turkish General Directorate for Rural Services (GDRS)
- Database of the General Directorate of Land Registry and Cadastre
- Forest Management Plans and relevant Forest Stand Maps (official data from the General Directorate of Forestry)
- 1/100,000 scale Environmental Master Plan of Aydın-Muğla-Denizli
- Expropriation Plans prepared for the South Alternative
- Land use permits/easement rights obtained by KGM in the scope of the project.

Significance Criteria

The significance criteria for the impacts on land use and property will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impact on the land use components, while sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 5.1. Detailed explanation of the sensitivity components for each ecosystem component is provided in the following "Baseline Conditions" section.

Table 5.1 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	Moderate (2)	Low (1)
Forest lands	Forests having ecological functions according to Forestry Management Plans	Forests having social and cultural funcitons according to Forestry Management Plans	Forests having economic function according to Forestry Management Plans
Agricultural areas	Lands having land use capability of Class I-II according to GDRS Database (agricultural lands suitable for agricultural soil cultivation)	Lands having land use capability of Class III-IV according to GDRS Database (agricultural lands not suitable for soil cultivation)	Lands having land use capability of Class V-VIII according to GDRS Database (Non-arable lands)
Pasturelands	Lands having land use capability of Class I-V according to GDRS Database	Lands having land use capability of Class VI according to GDRS Database	Lands having land use capability of Class VII-VIII according to GDRS Database

5.2 Baseline Conditions

Existing land use characteristics along the South Alternative route does not change. The South Alternative passes predominantly through agricultural lands.

Further evaluation of the baseline land use characteristics according to different information sources is provided below.

5.2.1 Land Use Characteristics within the Study Area

5.2.1.1 Land Use Characteristics according to CORINE Database

The CORINE program was initiated in the European Union in 1985 (http://www.eea.europa.eu/). The land cover project is a part of the CORINE program and is intended to provide consistent localized geographical information on the land cover of the member states of the European Community.

The studies in the scope of CORINE program in Türkiye were started by the former State Statistical Institute (currently acting as Turkish Statistical Institute-Turkstat) in 2001. Later on, former Ministry of Environment and Forestry (currently acting as Ministry of Environment, Urbanization and Climate Change) was involved in the process and as a result of the efforts of the Ministry, CORINE 2000 and CORINE 2006 projects were approved by the European Environment Agency in 2008 and 2009, respectively. In the current situation, Türkiye has submitted the databases produced under the program to the European Environment Agency and the relevant maps have been integrated with the European land cover maps (http://corine.tarimorman.gov.tr/corineportal). The overall land cover classification of CORINE database, which provides a conceptual framework for understanding the different types of land cover, is listed in Table 5.2.

Table 5.2 Criteria for Sensitivity/Value of Resource/Receptor

Level 1	Level 2	Level 3	Definition
1. Artificial surfaces	1.1. Urban Fabric	1.1.1. Continuous Urban Fabric	Most of the land is covered by buildings, roads and artificially surfaced area covering almost all the ground. Non-linear areas of vegetation and bare soil are exceptional.
		1.1.2. Discontinuous urban fabric	Most of the land is covered by structures. Buildings, roads and artificially surfaced areas associated with vegetated areas and bare soil, which occupy discontinuous but significant surfaces.
	1.2 Industrial, commercial and transport	1.2.1. Industrial or commercial units	Artificially surfaced areas (with concrete, asphalt, tarmacadam, or stabilized, e.g. beaten earth) devoid of vegetation, occupy most of the area in question, which also contains buildings and/or vegetated areas.
		1.2.2. Road and rail networks and associated land	Motorways, railways, including associated installations (stations, platforms, embankments). Minimum width to include: I00 m.
		1.2.3. Port areas	Infrastructure of port areas, including quays, dockyards and marinas.
		1.2.4. Airports	Airport installations: runways, buildings and associated land.
	1.3. Mine, dump and construction sites	1.3.1. Mineral extraction sites	Areas with open-pit extraction of industrial minerals (sandpits, quarries) or other minerals (opencast mines). Includes flooded gravel pits, except for river-bed extraction.
		1.3.2. Dump Sites	Landfill or mine dump sites, industrial or public.
		1.3.3. Construction Sites	Spaces under construction development, soil or bedrock excavations, earthworks.
	1.4. Artificial, non-agricultural vegetated areas	1.4.1. Green Urban Areas	Areas with vegetation within urban fabric. Includes parks and cemeteries with vegetation.
		1.4.2. Sport and Leisure Facilities	Camping grounds, sports grounds, leisure parks, golf courses, racecourses, etc. Includes formal parks not surrounded by urban zones.
2. Agricultural areas	2.1. Arable Land	2.1.1. Non-irrigated arable land	Cultivated areas regularly ploughed and generally under a rotation system.
		2.1.2. Permanently irrigated land	Crops irrigated permanently and periodically, using a permanent infrastructure (irrigation channels, drainage network). Most of these crops could not be cultivated without an artificial water supply. Does not include sporadically irrigated land.
		2.1.3. Rice fields	Land developed for rice cultivation. Flat surfaces with irrigation channels. Surfaces regularly flooded.
	2.2. Permanent crops	2.2.1. Vineyards	Areas planted with vines.
		2.2.2. Fruit trees and berry plantations	Parcels planted with fruit trees or shrubs: single or mixed fruit species, fruit trees associated with permanently grassed surfaces. Includes chestnut and walnut groves.
		2.2.3. Olive groves	Areas planted with olive trees, including mixed occurrence of olive trees and vines on the same parcel.
	2.3. Pastures	2.3.1. Pastures	Dense, predominantly graminoid grass cover, of floral composition, not under a rotation system. Mainly used for grazing, but the fodder may be harvested mechanically. Includes areas with hedges (bocage).
	2.4. Heterogeneous agricultural areas	2.4.1. Annual crops associated with permanent crops	Non-permanent crops (arable lands or pasture) associated with permanent crops on the same parcel.
		2.4.2. Complex cultivation	Juxtaposition of small parcels of diverse annual crops, pasture and/or permanent crops.
		2.4.3. Land principally occupied by agriculture, with significant areas of natural vegetation	Areas principally occupied by agriculture, interspersed with significant natural areas.
		2.4.4. Agro-forestry areas	Annual crops or grazing land under the wooded cover of forestry species.
3. Forests and semi-natural areas	3.1 Forests	3.1.1 Broad-leaved forest	Vegetation formation composed principally of trees, including shrub and bush understories, where broad- leaved species predominate.
		3.1.2 Coniferous forest	Vegetation formation composed principally of trees, including shrub and bush understories, where coniferous species predominate.
		3.1.3 Mixed forest	Vegetation formation composed principally of trees, including shrub and bush understories, where broad- leaved and coniferous species co-dominate.

Level 1	Level 2	Level 3	Definition
	3.2. Shrub and/or herbaceous vegetation associations	3.2.1. Natural grassland	Low productivity grassland. Often situated in areas of rough uneven ground. Frequently includes rocky areas, briars, and heathland.
		3.2.2. Moors and heathland	Vegetation with low and closed cover, dominated by bushes, shrubs and herbaceous plants (heath, briars, broom, gorse, laburnum, etc.).
		3.2.3. Sclerophyllous vegetation	Bushy sclerophyllous vegetation. Includes *maquis and garrige.* *Maquis:* a dense vegetation association composed of numerous shrubs associated with siliceous soils in the Mediterranean environment. *Garrigue:* discontinuous bushy associations of Mediterranean calcareous plateaus. Generally composed of kermes oak, arbutus, lavender, thyme, cistus, etc. May include a few isolated trees.
		3.2.4. Transitional woodland/shrub	Bushy or herbaceous vegetation with scattered trees. Can represent either woodland degradation or forest regeneration/colonization.
	3.3. Open spaces with little or no vegetation	3.3.1. Beaches, dunes, and sand plains	Beaches, dunes and expanses of sand or pebbles in coastal or continental, including beds of stream channels with torrential regime.
		3.3.2. Bare rock	Scree, cliffs, rocks and outcrops.
		3.3.3. Sparsely vegetated areas	Includes steppes, tundra and badlands. Scattered high-attitude vegetation.
		3.3.4. Burnt areas	Areas affected by recent fires, still mainly black.
		3.3.5. Glaciers and perpetual snow	Land covered by glaciers or permanent snowfields.
4. Wetlands	4.1. Inland wetlands	4.1.1. Inland marshes	Low-lying land usually flooded in winter, and more or less saturated by water all year round.
		4.1.2. Peatbogs	Peatland consisting mainly of decomposed moss and vegetable matter. May or may not be exploited.
	4.2. Coastal wetlands	4.2.1. Salt marshes	Vegetated low-lying areas, above the high-tide line, susceptible to flooding by sea water. Often in the process of filling in, gradually being colonized by halophilic plants.
		4.2.2. Salines	Salt-pans, active or in process of . Sections of salt marsh exploited for the production of salt by evaporation. They are clearly distinguishable from the rest of the marsh by their segmentation and embankment systems.
		4.2.3 Intertidal flats	Generally unvegetated expanses of mud, sand or rock lying between high and low water-marks. On contour on maps.
5. Water bodies	5.1. Inland waters	5.1.1. Water courses	Natural or artificial water-courses serving as water drainage channels. Includes canals. Minimum width to include: 100 m
		5.1.2. Water bodies	Natural or artificial stretches of water.
	5.2. Marine waters	5.2.1. Coastal lagoons	Unvegetated stretches of salt or brackish waters separated from the sea by a tongue of land or other similar topography. These water bodies can be connected with the sea at limited points, either permanently or for parts of the year only.
		5.2.2. Estuaries	The mouth of a river within which the tide ebbs and flows.
		5.2.3. Sea and ocean	Zone seaward of the lowest tide limit.

NB: When the various national CORINE land cover projects are carried out, the above definitions may be tightened up and supplemented in order to make them more operational.

Land use characteristics within the study corridor have been analyzed according to CORINE 2018 database. The results of the analyses are presented in Table 5.3 for the South Alternative route.

Map demonstrating the land-use character of the route are presented in Figure 5.1.

Table 5.3 Land Use Characteristics along the South Alternative Route

Level 1	Level 2	Level 3	Code 2018	South Alternative			Level 1 Total Area (ha)		Level 2 Total Area (ha)		Level 3 Total Area (ha)	
				Area (m^2)	Area (ha)	Percent (%)	Area (ha)	Percent (%)	Area (ha)	Percent (%)	Area (ha)	Percent (%)
1. Artificial surfaces	1.1. Urban Fabric	1.1.2. Discontinuous urban fabric	112	360,449.05	36.04	2.60	36.04	2.60	36.04	2.60	36.04	2.60
2. Agricultural areas	2.1. Arable Land	2.1.2. Permanently irrigated land	212	3,186,256.17	318.63	23.01	458.98	33.15	318.63	23.01	318.63	23.01
	2.4. Heterogeneous agricultural areas	2.4.2. Complex cultivation	242	1,403,538.89	140.35	10.14			140.35	10.14	140.35	10.14
3. Forests and seminatural areas	3.1. Forests	3.1.2. Coniferous forest	312	562,598.94	56.26	4.06	879.33	63.50	56.26	4.06	56.26	4.06
	3.2. Shrub and/or herbaceous vegetation associations	3.2.1. Natural grassland	321	93.85	0.01	0.00			823.07	59.44	0.01	0.00
		3.2.3. Sclerophyllous vegetation	323	8,230,593.43	823.06	59.44					823.06	59.44
5. Water bodies	5.1. Inland waters	5.1.1. Water courses	511	58,633.96	5.86	0.42	10.34	0.75	10.34	0.75	5.86	0.42
		5.1.2. Water bodies	512	44,797.96	4.48	0.32					4.48	0.32
Total				**13,846,962.24**	**1,384.70**	**100.00**	**1,384.70**	**100.00**	**1,384.70**	**100.00**	**1,384.70**	**100.00**

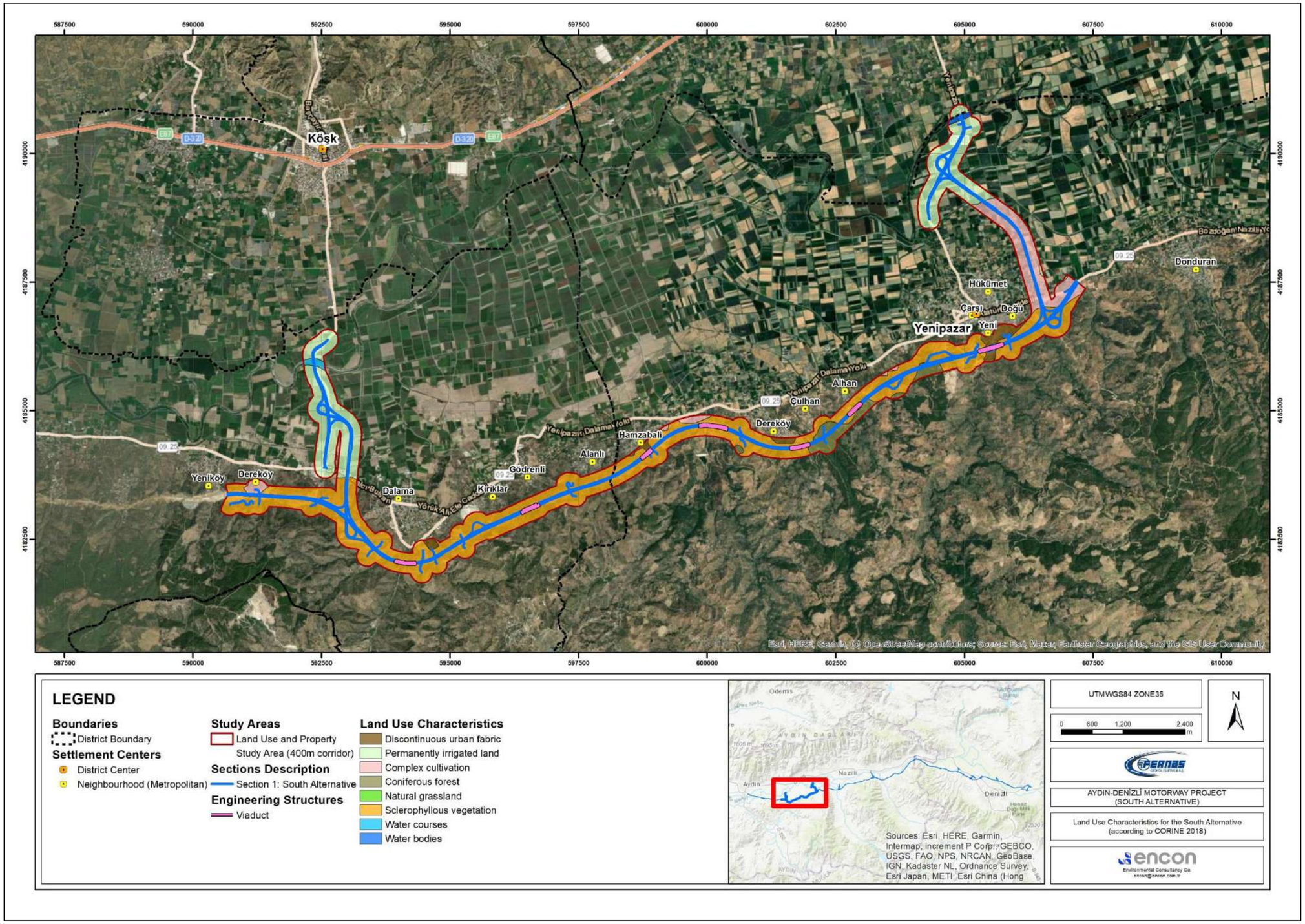


Figure 5.1 Land Use Characteristics for the South Alternative

As can be seen from the information provided in Table 5.3, a major part of the South Alternative route (for a corridor of 400 m which would cover the maximum width of the expropriation corridor that is given as 350 m) is formed of lands classified as forests and semi natural areas according to CORINE 2018 Land Cover database. Lands classified as forest and semi natural areas more than 63% of the studied corridor, of which only 4% consists of forests classified as Coniferous Forest types. Lands classified as agricultural areas cover 33% of the studied corridor. Artificial surfaces consisting of discontinuous urban fabric cover almost 3% of the studied corridor. The remaining negligible part (0.75%) of the corridor corresponds to water bodies. The entire corridor (of 400 m width) covers an area of around 1,385 ha. It should be however noted that not all lands within the expropriation corridor will be physically affected from the project activities.

5.2.1.2 Land Use Characteristics according to Land Use Database of the former Turkish General Directorate for Rural Services

Former Turkish General Directorate for Rural Services (GDRS) developed national land use and soil characteristics databases for all provinces based on the surveys performed by the General Directorate for Soil and Water (TOPRAKSU, one of the founding institutions of the Turkish General Directorate for Rural Services) in 1966-1971 and updated in 1982-1984 (former Ministry of Environment and Forestry, 2004). A Land use and soil database for Aydın was established in 2001.

The results of the land use analyses (land use type and land use capability) done for the study corridor (1,385 ha; for a width of 400 meter along the total length of the route) based on the Turkish General Directorate for Rural Services database are provided in Table 5.4 and the relevant land use type and capability maps are presented from Figure 5.2 and Figure 5.3.

Table 5.4 Land Use Characteristics within the Study Corridor (according to Turkish General Directorate for Rural Services, 2001)

Land Use Types	Land Use Capability	South Alternative		
		Area (m^2)	Area (ha)	Percent (%)
Irrigated farmland	I	3,319,351.61	331.94	23.97
	II	281,833.75	28.18	2.04
	III	1,034,493.33	103.45	7.47
Sub.total (Irrigated farmland)		**4,635,678.69**	**463.57**	**33.48**
Pasture	VII	91,233,59	9.12	0.66
Sub.total (Pastures)		**91,233.59**	**9.12**	**0.66**
Shrubbery	VII	1,714,585.97	171.46	12.38
Sub.total (Shrubbery)		**1,714,585.97**	**171.46**	**12.38**
Olive Grove	I	259,503.33	25.95	1.87
	II	34,589.74	3.46	0.25
	III	855,944.91	85.59	6.18
	VII	5,671,819.01	567.18	40.96
Sub.total (Olive Groves)		**6,821,857.00**	**682.19**	**49.27**
Settlements		510.025.67	51.00	3.68
River		73.581.31	7.36	0.53
Total		**13,846,962.24**	**1,384.70**	**100.00**

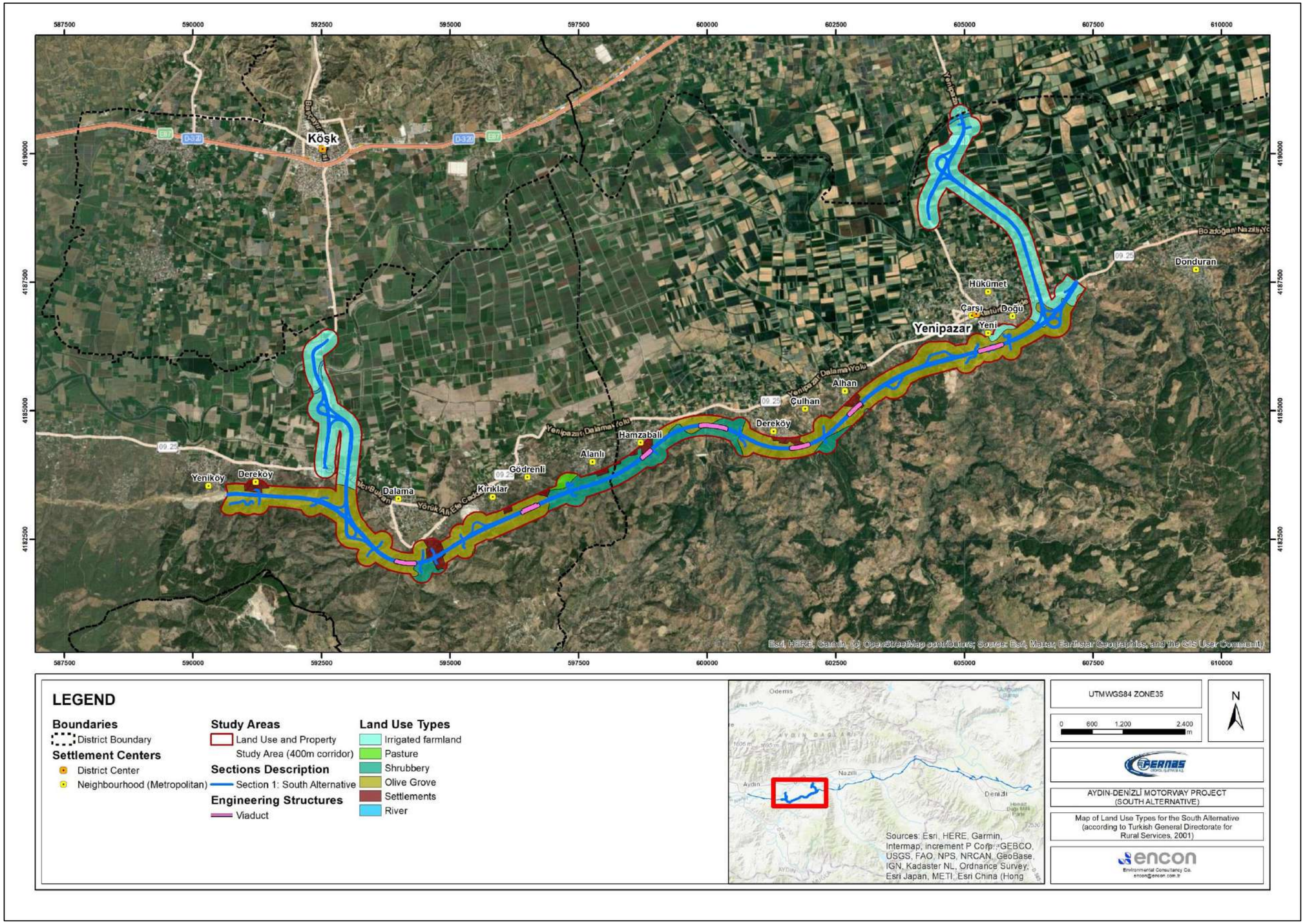


Figure 5.2 Map of Land Use Types for the South Alternative (according to Turkish General Directorate for Rural Services, 2001)

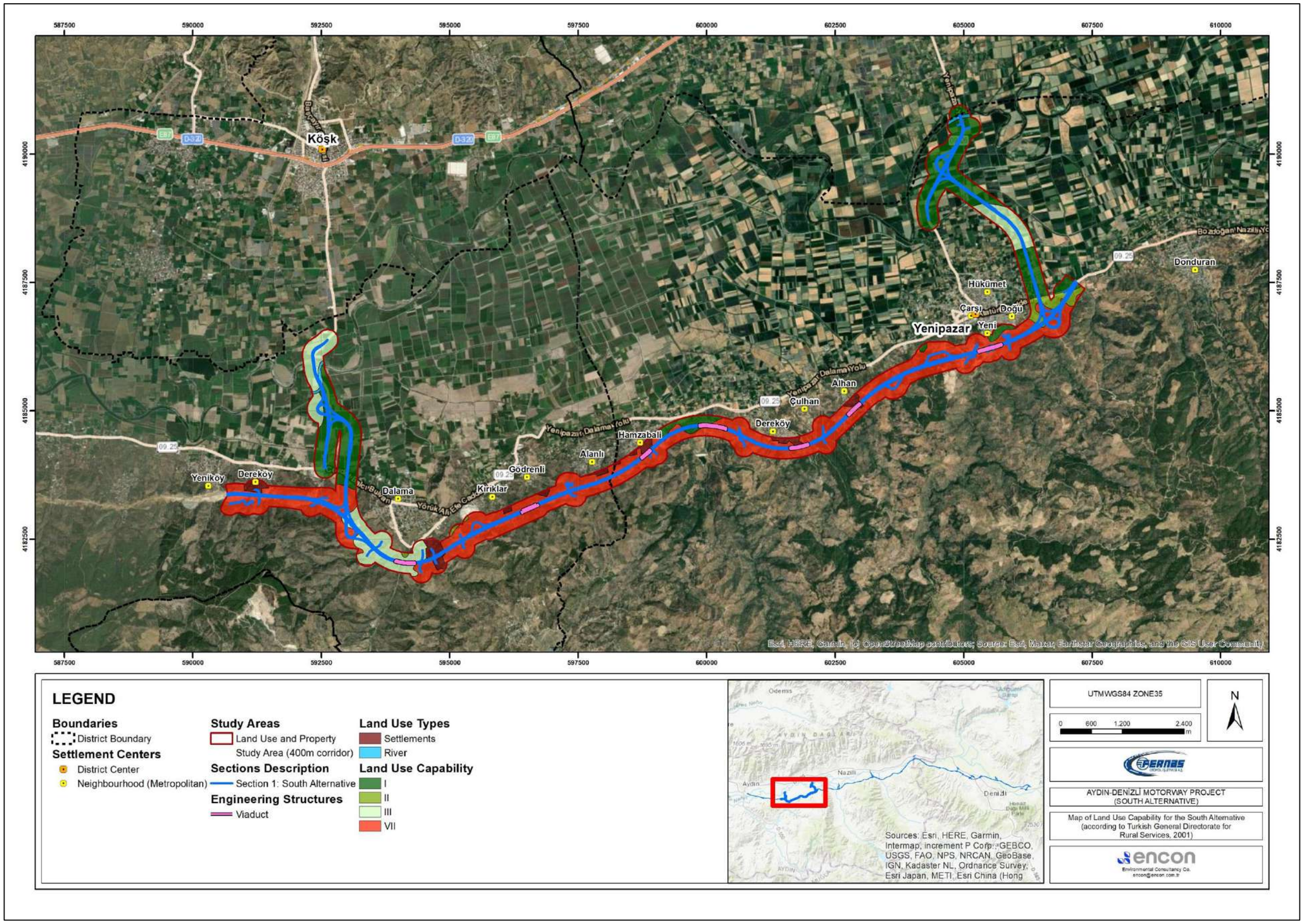


Figure 5.3 Map of Land Use Capability for the South Alternative (according to Turkish General Directorate for Rural Services, 2001)

A comparison of the areas occupied by different land use types under CORINE (2018) and GDRS (2001) databases is provided in Table 5.5 to allow an evaluation of the changes within 20 years. It should be noted that the classification system of the two database differs and the following comparison is given to provide a general overview of the development.

Table 5.5 Comparison of the Areas for Different Land Use Types According to CORINE (2018) and GDRS (2001) Databases

Land Use Type	Data Source			
	CORINE (2018)		GDRS (2001)	
	Area (ha)	Percent (%)	Area (ha)	Percent (%)
Agriculture/Farmlands	458.98	33.15	1,145.76	82.75
Forestry	56.26	4.06	-	-
Shrubbery	823.07	59.44	171.46	12.38
Pastures, Meadows, etc.	-	-	9.12	0.66
Others (Settlements/Urban Fabric, Mineral Extraction Sites, Transport Networks, etc.)	46.39	3,35	58.36	4.21
Total	**1,384.70**	**100.00**	**1,384.70**	**100.00**

Turkish General Directorate for Rural Services database defines the land use capabilities in 8 different classes as summarized in Table 5.6. These classes represent the agricultural potential of the soils. In this classification system, soils are categorized between Class I, which represent the arable lands on which agricultural activities can be conducted in the most efficient, economic and simplest way without causing erosion, and Class VIII, which represent the lands that are not arable, cannot even be used as grassland or forest areas but support only wildlife development or can be used as resting area or national park by human. Characteristics of each class are summarized in Table 5.6 (Former Ministry of Agricultural and Rural Services, July 2008).

The Land Use Capabilities of the soils corresponding to the study corridor were given in Table 5.4. The key findings of the land use capability analyses are summarized below (settlement areas, ponds and rivers that cover 4.21% of the study corridor and not categorized under any of the land use capability classes are not taken into consideration in the following figures):

- Agricultural lands suitable for soil cultivation (Classes I, II, III and IV) cover more than half of the entire study corridor (41.79%; 578.57 ha).
- Agricultural lands not suitable for soil cultivation (Class VI and VII) cover 54% (747.76 ha) of the study corridor.
- Class VIII (non-arable lands) soils are not present within the corridor.

Table 5.6 Agricultural Potentials Represented by Different Land Use Capability Classes and Their Characteristics

Class	Agricultural Potential	Definition of Land Use Capability
Class I	Agricultural lands suitable for agricultural soil cultivation	Class I lands are; flat or near flat, deep, fertile and easily cultivated so that the conventional agricultural methods can be applied; potential for water and soil erosion are minimal; have good drainage; are not prone to flood damage exposure; suitable for hoe plants and other intensively grown crops; Class I irrigated lands with low precipitation rates have slope values less than 1% slope, loamy structure, good water holding capacity and medium level permeability.
Class II		Class II lands are decent lands that can only be processed after taking some special precautions. Their difference from Class I lands are one or more of the limiting factors such as slight slope, moderate exposure to erosion, moderately thick soil, exposure to occasional moderate floods and a moderate level of moisture that can easily be isolated.
Class III		Class III lands are moderately good lands for hoe plants which can generate solid income provided they are utilized with a good cropping system and proper agricultural methods. Moderate slope, increased erosion sensitivity, excessive moisture, exposed soil, presence of stones, having a lot of sand and/or gravel, low water holding capacity and low yield are properties of this type of land.
Class IV		Class IV lands can be constantly utilized as meadows. Field crops can also be occasionally grown. High levels of slope, bad soil characteristics, erosion and climate are the factors limiting agricultural activities on these lands. Soils with low slopes and poor drainage are also classified as Class IV lands. These soils are not subject to erosion, but they are unsuitable for growing many agricultural products as they have a low yield and a tendency to suddenly dry up in the spring. In semi-arid regions, cropping systems incorporating legumes are generally not possible due to climate.
Class V	Agricultural lands not suitable for soil cultivation	Class V lands are reserved for long-life plantations such as meadows and forests as they generally are unsuitable for cultivated plants. A few factors such as stony structure and sogginess hinder cultivation here. The land is flat or near-flat. It is not subject to an excessive amount of wind and water erosion. Grazing and tree logging activities can be carried out on condition that a good soil cover is constantly maintained.
Class VI		Class VI lands require moderate precautions even when they are used as forest or meadow since they have quite a bit of slope and are subject to severe erosion. Exposed, soggy or very dry conditions make this type of land unsuitable for cultivation.
Class VII		Class VII lands have high slope, are stony and have been subject to violent erosion. Exposed soils, dry and/or some unfavorable conditions and swamps can be classified as Class VII soil. These can be used as forest or meadow without showing due care. If the vegetation on these soils diminishes, erosion can get quite violent.
Class VIII	Non-arable lands	Class VIII lands exhibit features that prevent them from being used as forest, meadow or cultivated land. This type of land is habitat to wild life and can also be used for recreational purposes or as catchment basins for streams. These include lands containing marshes, swamps, deserts as well as areas of high mountainous regions, rocky lands or lands with very deep craters.

Former Ministry of Agriculture and Rural Services, in its Technical Procedure on Soil and Land Classification Standards dated 2008, specifies the suitability of different land classes for cultivation, grazing and forestry activities as summarized in Table 5.7. As can be seen from the table and mentioned previously, Class VIII lands are not suitable for cultivation, grazing or forestry activities but can provide habitat use to wildlife components only. Similarly, Class VII lands are suitable only for forestry and grazing activities to a limited extent. Level of suitability for agricultural and grazing uses differs by classes.

Table 5.7 Usage Suitability Matrix for Different Land Use Classes

Land Use Capability Class	Wild life	Forestry	Grazing			Cultivation			
			Limited	Moderate	Intensive	Limited	Moderate	Intensive	Very Intensive
I									
II									
III									
IV									
V									
VI									
VII									
VIII									

**Colored boxes show the suitable uses for each type of activity.*
Source: Former Ministry of Agricultural and Rural Services, July 2008.

5.2.1.3 Forestlands

In 1993, Helsinki Process began with the aim of developing guidelines for the sustainable management of forests in Europe. The Process has sought to identify measurable criteria and indicators for the evaluation of how European countries have progressed in their efforts to follow the principles of sustainable forest management and conservation of the biological diversity of European forests. The guidelines developed in the scope of the process concluded that forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual human needs of present and future generations. In alignment with the outcomes of the Helsinki process, Turkish Regulation on the Forestry Management categorizes the forestry functions under three groups as ecological, social/cultural and economic and attributes specific management goals for each sub-function as listed in Table 5.8.

Forests with economic functions are operated/managed with the aim of production of forest products (wood and non-wood) having economic value and meet the economic demand for these products in a continuous and regular way. These forests are particularly allocated to economic functions, while they can co-perform other functions (e.g. ecological) as well. This function includes areas (i.e. wood productions forests) that are suitable for forest maintenance and regeneration works both in terms of growing conditions and also social considerations.

Some of the forests are established on sensitive ecological balances and shelter high ecological value so that these forests primarily serve for ecological functions as the irreversible impacts of forest production activities cannot be tolerated on such environments. Consequently, even if these types of forests have an economic value in terms of forest product production, conservation of them for their ecological value or environmental functions becomes the first priority.

Forests having social and/or cultural functions primarily serve for the protection of public health by preventing noise and/or air emissions and aesthetic and scientific research purposes and provide recreational areas for natural activities, sports, ecotourism purposes, etc. Forest zones in the vicinity of motorways or railways, having a width of minimum 50-100 m, are considered to be effective in mitigating the adverse impacts of noise generation and forming an aesthetic view.

Table 5.8 Functions of Forests and Associated Management Goals

Functions	General Forestry Functions	Management Goals
Economic	Forest products production	Industrial plantation
		Quality and featured wood production
		Industrial wood production in maximum capacity
		Firewood production
		Others (specific afforestation, etc.)
		Production of non-wood forestry products
		Honey production areas
		Herbal products
		Animal products
		Water and mineral products
Ecological	Nature protection	Nature protection
		Gene conservation forest
		National Park
		Protection forest
		Nature Park
		Nature protection area
		Wildlife protection and development sites

Functions	General Forestry Functions	Management Goals
		Alpine zone
		Natural old growth forest
		Ecological transition zone
		Sensitive ecosystems
		Coastal forests
		Forest ecosystem improvement areas
		Very unfavorable growth grounds
		Areas with very high protection value
		High mountain forest ecosystems
		Seed stands
		Seed orchards
		Areas to be protected from social stress
		Wild life protection and management sites of General Directorate of Forestry
		Biological diversity conservation and development areas
	Erosion protection/ Soil conservation	Avalanche prevention
		Landslide prevention
		Stone and rock fall prevention
		Soil conservation
		Flood prevention
	Climate protection	Forests primarily allocated to climate protection
Social/ Cultural	Hydrological	Drinking water protection
		Utility water protection
		Conservation of water resources
	Public Health	Noise prevention
		Air pollution prevention
		City forests
		Protection of health facilities
	Aesthetics	Road protection for aesthetic purposes (green road)
		Aesthetic appearance
	Ecotourism and recreation	Nature trekking areas
		Rock climbing sites
		Bird watching sites
		Recreational areas (picnic areas, fest areas, etc.)
		Sports area
		Hunting area
		Tourism intended forests
	National security	Military installations and drill sites
		National border and strategic areas
	Scientific	Research intended areas
		Arboretum research forest
		Educational purposes
		Faculty research
		Forestry research forest

South Alternative falls within the jurisdiction of two different Forestry Management Directorates (Aydın ve Nazilli) under Muğla Regional Directorate of Forestry as summarized in Table 5.9. Map of Boundaries of Forestry Management Sub-directorates is represented in Figure 5.4.

Table 5.9 Relevant Forestry Directorates for the Project

Regional Directorate	Forestry Management Directorate	Management Sub-directorate
Muğla Regional Directorate of Forestry	Aydın Forestry Management Directorate	Köşk Forestry Management Sub-directorate
	Nazilli Forestry Management Directorate	Yenipazar Forestry Management Sub-directorate

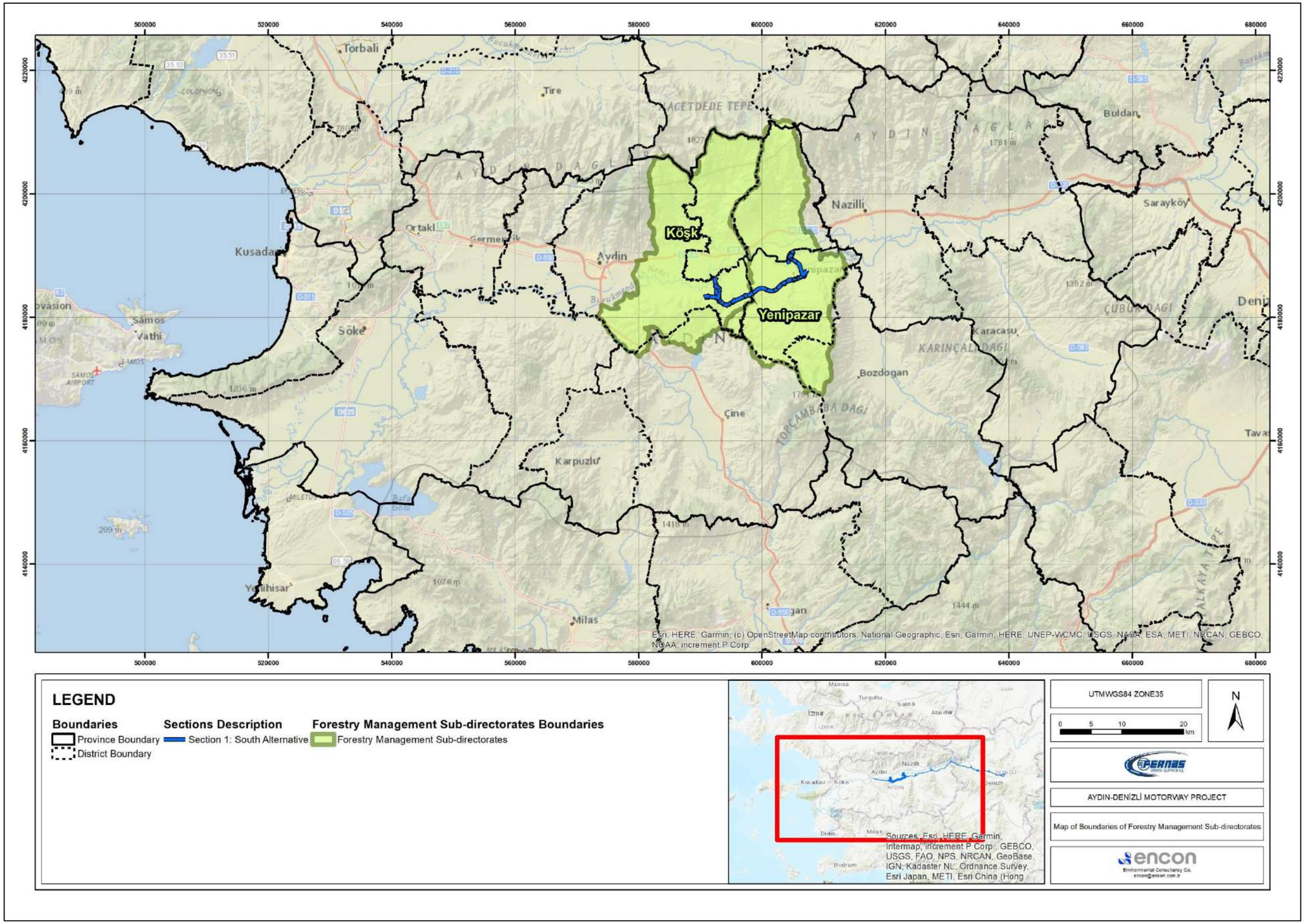


Figure 5.4 Map of Boundaries of Forestry Management Sub-directorates

Forest Management Plans covers both the actual forests where forest cover (e.g. trees) are present at different density levels and open areas where forest cover is absent (unwooded forest soils) or where uses other than forestry such as settlement, agricultural, quarry, etc. are present. Forest Management Plans categorize the actual forests as high forests and coppice forests. Each category is further classified as productive forests where canopy cover rates ranges between 11-100% and degraded forests, where canopy cover rate is lower than 10%. Classification of canopy levels as 1, 2 and 3 according to the density of cover is done as summarized in Table 5.10.

Table 5.10 Canopy Cover Classification According to Forest Management Plans

Canopy Cover Classification	**Canopy Cover Levels**	
	Symbol	**Rate (%)**
Absent to sparse	-	0-10
Sparse	1	11-40
Moderately closed	2	41-70
Closed to fully closed	3	71-100

Areas of actual forests (covered by forest vegetation) and open areas corresponding to the study area according to their functions and canopy levels have been analyzed by using the Forest Management Plans and the relevant database. The results of the analyses are presented in Table 5.11. Maps showing forest functions and types are presented in Figure 5.5.

As known, the study area for the assessment of project impacts on the land use is 1,385 ha for the 400 meters study corridor. Within the study corridor, there is no forest specified as “coppice forest”, and thus all of the actual forests are categorized as high forests having different canopy covers. The key findings of the analyses done based on the relevant Forest Management Plans of the study area are summarized below:

- According to the Forest Management Plans, 8.41% (116.49 ha) of the entire study corridor is covered by actual forests. Almost 68% (79.21 ha) of the actual forests are productive, where the canopy cover level changes between 10-100%, while the remainder 32% (37.27 ha) correspond to degraded forests where the canopy cover level is less than 10%.
- Regarding the actual forest functions, 90% (105.17 ha) of the all-actual forests serve for economic functions, while the remaining 10% (11.32 ha) serves for ecological functions.

Table 5.11 Canopy Cover Classification According to Forest Management Plans

Forest Functions			Area of Actual Forests (ha)								Open Areas (ha)	
			High Forests				Coppice Forests					
			Canopy Cover Classification				Canopy Cover Classification					
			Productive			Degraded	Productive			Degraded		
			Level 3 (71-100%)	Level 2 (41-70%)	Level 1 (11-40%)	(0-10%)	Level 3 (71-100%)	Level 2 (41-70%)	Level 1 (11-40%)	(0-10%)		
SOUTH ALTERNATIVE											**Settlements**	**Agricultural Land**
Economic	Forest products production	Industrial plantation	1.94									
		Industrial wood production in maximum capacity	20.33	3.87		26.67						
		Production of non-wood forestry products	3.54	11.31	37.51							
Ecological	Nature protection	Very unfavorable growth grounds	0.71			10.61						
Sub-total (Canopy Levels)			26.52	15.18	37.51	37.27	0.00	0.00	0.00	0.00		
Total (Actual Forest/Open Area Type)			116.49				0.00				52.90	1,215.30
Total (Actual Forests/Open Areas)			116.49									1,268.21
Grand Total (South Alternative)												1,384.70

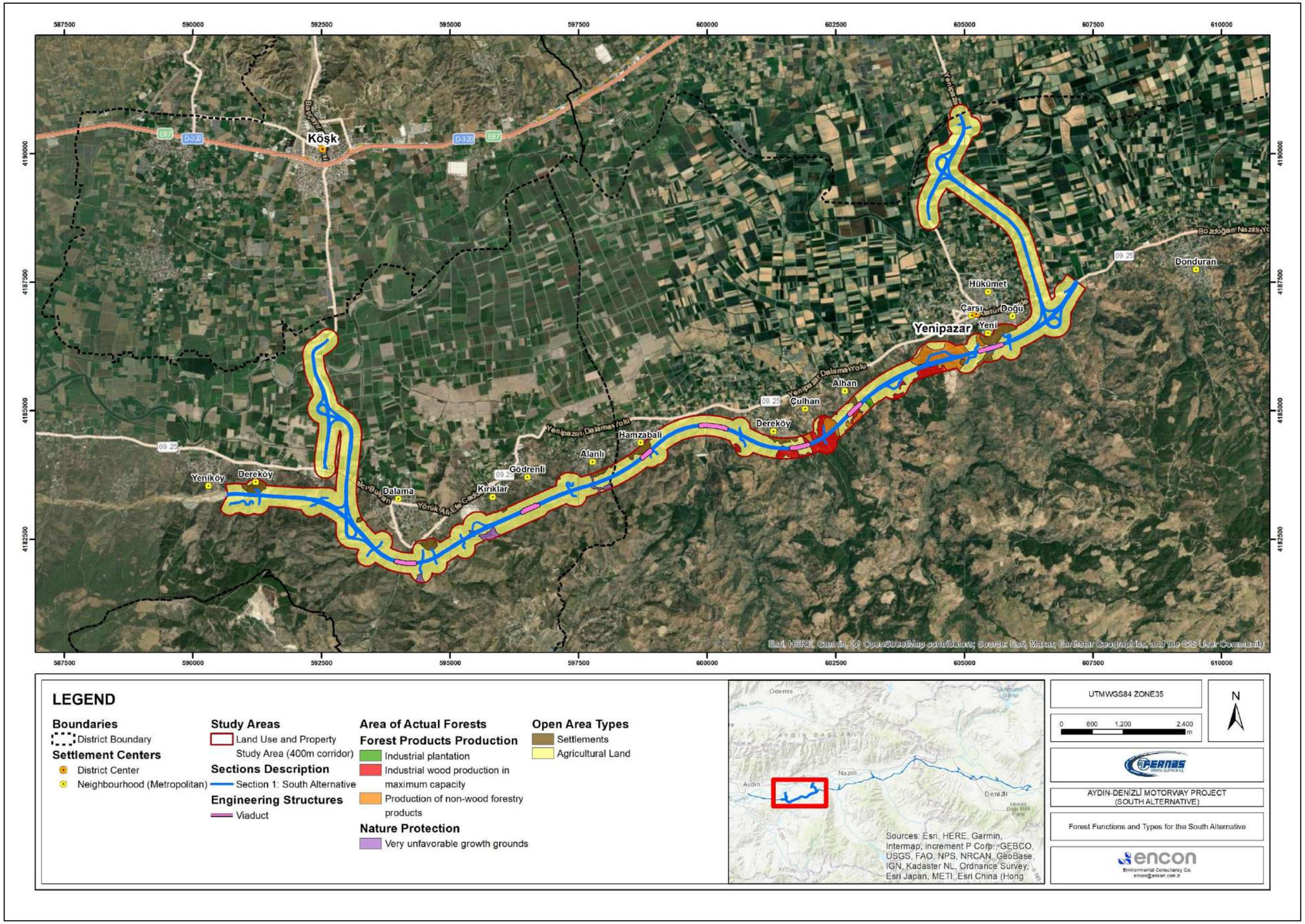


Figure 5.5 Forest Functions and Types for the South Alternative

In addition to information presented above, forests corresponding to the study area according to their stand types have been analyzed by using the Forest Management Plans and the relevant database. The results of the analysis are presented in Table 5.12. Map showing stand types of forests are presented in Figure 5.6.

As it can be observed from the table, 3.78% (52.36 ha) of forest areas in the South Alternative constitute of stone pine types. The second dominant stand type is Calabrian pine. It should be noted that open areas (especially agricultural lands) are dominant in the South Alternative.

Table 5.12 Land Use Properties and Forestlands according to Stand Types within the Study Area

Forest Stand Types	**South Alternative**		
	Area (m^2)	**Area (ha)**	**Percent (%)**
Stone Pine	523,620.12	52.36	3.78
Calabrian Pine	261,421.52	26.14	1.89
Scrub	7,093.20	0.71	0.05
Degraded Scrub	106,065.16	10.61	0.77
Degraded Forest Area	149,199.10	14.92	1.08
Open Area for Afforestation	117,484.02	11.75	0.85
Settlements	529,040.05	52.90	3.82
Agricultural Land	12,153,039.08	1,215.30	87.77
Total	**13,846,962.24**	**1,384.70**	**100.00**

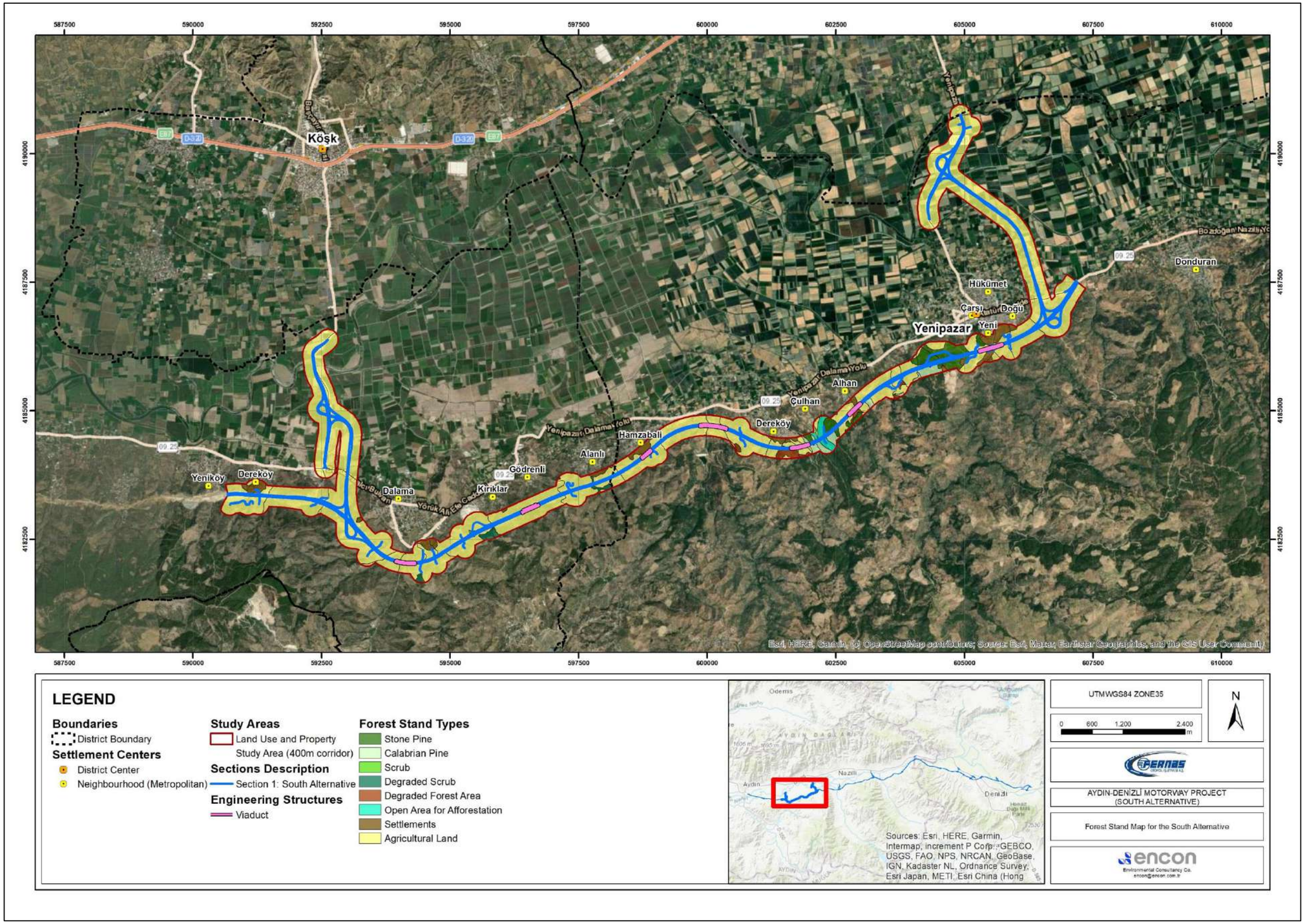


Figure 5.6 Forest Stand Map for the South Alternative

5.2.1.4 Agricultural Lands

According to CORINE (2018) database, agricultural areas (including the arable lands and heterogeneous agricultural areas) cover 33.15% (458.98 ha) of the entire study corridor (1,384.70 ha).

Assuming that the land use capabilities given for the South Alternative according to GDRS database previously in Table 5.4 are applicable to the current situation, Table 5.13 provides an overview of the land use capabilities of the agricultural areas within the study corridor. As can be seen, in the South Alternative, a major part (54%) of the agricultural lands consists of soils having Class VII land use capability. Class VII lands have high slope, are stony and have been subject to violent erosion. Exposed soils, dry and/or some unfavorable conditions and swamps can be classified as Class VII soil. These can be used as forest or meadow without showing due care. If the vegetation on these soils diminishes, erosion can get quite violent.

Table 5.13 Land Use Capabilities of the Agricultural Areas within the Study Corridor (according to Turkish General Directorate for Rural Services, 2001)

Land Use Capability Class	South Alternative		
	Area (m^2)	Area (ha)	Percent (%)
I	3.578.854,95	357,89	25,85
II	316.423,48	31,64	2,29
III	1.890.438,25	189,04	13,65
VII	7.477.638,58	747,76	54,00
Settlements	510.025,67	51,00	3,68
River	73.581,31	7,36	0,53
Total	**13.846.962,24**	**1.384,70**	**100,00**

Land use capability of soils for the study area on settlement-basis is presented in Table 5.14.

Table 5.14 Land Use Capability of Agricultural Lands in Each Settlement (GDRS, 2001)

Province	District	Neighborhood	Main Land Use Capability Class
Aydın	Efeler	Yeniköy	VII
		Dereköy	VII
		Dalama	III
		Kırıklar	VII
		Gödrenli	VII
		Alanlı	VII
	Yenipazar	Hamzabali	VII
		Dereköy	VII
		Çulhan	VII
		Alhan	VII
		Yeni	VII
		Çarşı	VII
		Doğu	VII
		Hükümet	I
		Donduran	II

5.2.1.5 Pasture Lands

According to CORINE (2018) database, pasturelands are not present within the study corridor. According to GDRS (2001) database (see Table 5.4), pasturelands are 0.66% for the South Alternative. As seen in Table 5.4, total area of pastureland is 9.12 ha.

Additionally, in the scope of the socio-economic field surveys conducted (see Chapter 14 "Socio-economic Environment"), availability of pasturelands in the neighborhoods has been identified by means of questionnaires conducted with the headmen. It was stated that the pasturelands in the villages do not occupy a large amount of area. Therefore, there will not be a major impact in terms of pastureland in the villages where fieldwork is carried out. According to GDRS (2001) database the neighborhoods where the pastureland is located along the route can be listed as Gödrenli and Alanlı (see Figure 5.2).

5.2.2 Property and Ownership within the Expropriation Corridor

According to ownership, the lands corresponding to the Motorway and its components including the Camp Sites and Quarries are categorized as follows:

- Privately owned lands
- Lands owned by legal entities
- State-owned lands (i.e. treasury lands, pasture lands, etc.)
- Lands under the authority of Forestry Directorates
- Out of registration areas
- Others (i.e. river, road, etc.)

According to present status 2,473,861.07 m^2 of project parcel area is located in Efeler and 3,105,295.21 m^2 is located in Yenipazar District. The total parcel area for the South Alternative is 5,579,156.28 m^2. Table 5.15 explains the Land ownership types and in detail within the Project Area. Major part of the project parcel for Efeler (73.15%; 1,809,561.10 m^2) and for Yenipazar (63.52%; 1,972,452.95 m^2) are privately owned.

Table 5.15 Distribution of Lands According to Type of Ownership and Number of Corresponding Parcels within the Expropriation Corridor

Land Ownership Type		Project Parcel Area (m^2)	Number of Project Parcels	Project Parcel Rate (%)
AYDIN/EFELER	Private Property	1,809,561.10	574	73.15
	Legal Entity	29,163.79	18	1.18
	Treasury Real Estates	83,612.45	35	3.38
	Pasturelands	348,196.52	30	14.07
	Forest lands	-	-	-
	Out of registration areas	64,657.64	6	2.61
	Others (river, road, etc.)	138,669.57	-	5.61
Total for Aydın/Efeler		**2,473,861.07**	**663**	**100.00**

Land Ownership Type		Project Parcel Area (m^2)	Number of Project Parcels	Project Parcel Rate (%)
AYDIN/YENİPAZAR	Private Property	1,972,452.95	675	63.52
	Legal Entity	71,189.85	37	2.29
	Treasury Real Estates	131,668.62	8	4.24
	Pasturelands	262,514.75	33	8.45
	Forest lands	441,472.83	7	14.22
	Out of registration areas	107,576.88	12	3.47
	Others (river, road, etc.)	118,419.33	-	3.81
Total for Aydın/Yenipazar		**3,105,295.21**	**772**	**100.00**
Total for Aydın		**5,579,156.28**	**1,435**	

Regarding the construction compounds, cadastral information obtained from the database of the General Directorate of Land Registry and Cadastre for the registered lands are summarized in Figure 5.7.

Dalama Construction Camp Site		
	Province	Aydın
	District	Efeler
	Neighborhood	Kırıklar
	Plot no.	0
	Parcel no.	1499
	Title Deed Area	7.80 ha
	Type	Pasture
Dalama Quarries (Dalama 2 Quarry, Dalama 3 Quarryand Dalama 7 Quarry)		
	Province	Aydın
	District	Efeler
	Neighborhood	Dalama
	Plot no.	0
	Title Deed Area	24.68 ha, 20.79 ha, 24.88 ha
	Type	Forest

Akçaköy Quarry		
	Province	Aydın
	District	Köşk
	Neighborhood	Akçaköy
	Plot no.	258
	Parcel no.	6
	Title Deed Area	4.20 ha
	Type	Forest
Kuyucak Construction Camp Site		
	Province	Aydın
	District	Kuyucak
	Neighborhood	Karapınar
	Plot no.	0
	Parcel no.	457-477
	Title Deed Area	34.59 ha
	Type	Pasture

Figure 5.7 Cadastral Information for the Construction Compounds that are Located on Registered Lands

5.3 Potential Impacts

Land use and transportation are intrinsically related. Motorway development projects result in changes in the land use patterns and ownership structure along their route. Depending on the length of the route and the width of the road and expropriation corridor, magnitude of the impacts would change. Similarly, the sensitivity of the lands (i.e. ecological importance, social and economic value to users, etc.) to be crossed by the motorway changes depending on their value, which in turn, together with the magnitude of the impact, determines the level of impact significance.

South Alternative will have a total length of 26 km, including the main carriageway and the access roads. The width of the expropriation corridor will be minimum 100 meters, whereas it may expand up to 350 meters depending on the scale of excavation and fill requirements and siting of the road structures such as interchanges, service areas, etc. Lands (within the expropriation corridor) required for the development and operation of the motorway and its components will be acquired by the KGM prior to the start of construction activities in accordance with the relevant provisions of the national legislation (i.e., Expropriation Law numbered 2942, Forestry Law numbered 6831, Pastures Law numbered 4342, Law on Soil Conservation and Land Use numbered 5403). Total area to be acquired within the expropriation corridor will be 558 ha.

Following the acquisition of lands, Project activities including vegetation clearing, top soil stripping, cut and fill operations and construction of motorway components and other buildings/facilities will result in permanent and temporary impacts that need management.

In addition to the direct physical impacts of the activities on the lands and socio-economic dimensions of the land acquisition, transportation projects possibly trigger further land developments in the vicinity of route, especially when the motorway provide access to lands.

In this context, direct potential impacts of the motorway development on the land use and property and probable indirect impacts are listed below. Further assessment of the direct impacts for the land preparation and construction and operation phases, in consideration of the baseline conditions, are provided in the following headings, while evaluation of socio-economic impacts associated with land acquisition and changes in the existing land use patterns (e.g. physical or economic displacement) are provided in Chapter 14 ("Socio-economic Environment").

- Permanent land take resulting in changes in the existing land use characteristics (i.e. agricultural, forest, pasture, etc.), physical or economic displacement;
- Temporary land takes for construction facilities resulting in degradation of lands that need rehabilitation;
- Fragmentation of lands and restrictions on the access to lands;
- Changes in the land use characteristics of temporary project sites (i.e. Construction Camp Sites, quarries);
- Planned and unplanned urban development in the expansion areas;
- Increased demand in residential and commercial properties resulting in a trend in increase in the property values;
- Increased demand in infrastructural services (i.e. transportation, electricity, water, wastewater, etc.).

5.3.1 Land Preparation and Construction Phase

Construction of the motorway and its components will result in the changes in the existing land use. Accordingly, forest lands, agricultural areas, pastures, etc. corresponding to the expropriation corridor will be lost. For the forest lands to be used in the scope of the project, permits have been/will be taken from the related forestry authorities. Trees located on the forest lands to be affected by the project will be removed and evaluated by the forestry authorities. Area of the forest and other types of lands to be affected by the project will be identified by analyzing the expropriation plans to be prepared. Number of trees to be removed will be estimated by using suitable tools (i.e. where available by using existing forest management plans, GIS analyses, site surveys, etc.).

5.3.1.1 Temporary Impacts at the Construction Sites

Road construction sites and Construction Camp Sites are the locations where temporary impacts of the construction activities may be encountered. In the scope of road construction works, construction activities are to be normally conducted within the expropriation corridor. For the privately-owned lands, construction activities have to start following the completion of expropriation process (in case of agreement, after payments are done; otherwise in accordance with Article 27 ("Urgent Expropriation") of the Expropriation Law. Since the expropriation corridor is specified wide enough (minimum 100 meters and maximum 350 meters) to allow sufficient space for the works to be conducted by construction machinery and vehicle, intrusion of construction activities onto adjacent lands are normally avoided. On the other hand, there may be exceptional cases when the construction crew may cross the borders of the expropriation corridor (may be unintentionally or with informed decision) and pose risk of damage on the adjacent lands. Similarly, on very rare cases, drilling, land preparation or construction activities may be initiated by construction contractor before the expropriation or court decisions are finalized. To avoid such cases and associated risks or damages on lands and their owner/users, good management of construction crew and strict adherence to the borders of expropriation corridor is essential. If occurs, the impact would most likely be reversible by corrective measures to be taken.

Construction activities of the ADMP including South Alternative will be completed in 3 years thus the changes in the land throughout due to construction components such as camp sites. The lands on which the camp sites have been established will be temporarily affected due to use of land throughout the construction period, which will be maximum 3 years according to BOT Contracts. The land use/ownership information for the selected camp sites is provided in Table 5.16.

In the South Alternative, several quarries are planned to be used thus the impacts on land use may be observed at different locations. The general characteristics of these quarries are presented in Table 5.16 below.

Table 5.16 Areas and Land Use Information for the Construction Compounds

Location	Location			Description of the Site/Plant	Area (ha)	Type of Land Use	Lot/ Parcel No.
	Province	District	Nearest Neighborhood				
Km 20+000	Aydın	Efeler	Kırıklar	Dalama Construction Camp Site	7.80	Pasture	Out of registration
Km 59+500	Aydın	Kuyucak	Karapınar	Kuyucak Construction Camp Site	34.59	Pasture	Out of registration
Total					**42.39**		
Km 20+000	Aydın	Efeler	Dalama	Dalama Quarries	24.68 20.79 24.88	Forest	Out of registration
Km 21+000	Aydın	Köşk	Akçaköy	Akçaköy Quarry	4.20	Forest	Out of registration
Total					**74.55**		

5.3.1.2 Impacts on Forestlands

Impacts of the South Alternative on the forestlands have been assessed based on the area to be affected and number of trees to be lost in economic, ecological and social/cultural forests.

Loss of Forestlands

Impacts of the South Alternative (including the Camp Sites and Quarries) on the forestlands have been assessed based on the area to be affected and number of trees to be lost in economic, ecological and social/cultural forests.

Areas of forests corresponding to the South Alternative corridor (including the Camp Sites and Quarries) to be acquired in the scope of the project are listed in Table 5.17. In addition, the forest areas corresponding to the Aydın-Denizli Motorway Section 1 between Km 15+856 and Km 34+630 are also given in Table 5.17.

In the South Alternative and the Aydın-Denizli Motorway, Section 1 between Km 15+856 and Km 34+630, loss of forestlands will mainly occur near Köşk and Yenipazar. As can be seen from Table 5.17, total forest area corresponding to the area to be acquired for the South Alternative route is 123.98 ha, 15.95 ha (around 12.86%) is formed of degraded forests where the canopy cover rate is lower than 10% that is represented by absent to sparse vegetation cover. Forest area corresponding to the area to be acquired for the Aydın-Denizli Motorway (between Km 15+856 and Km 34+630 in Section 1) route is 50.47 ha, 6.11 ha (around 12.11%) is formed of degraded forests where the canopy cover rate is lower than 10% that is represented by absent to sparse vegetation cover.

Table 5.17 Forest Areas to be Acquired in the Scope of the Project

Section	Regional Directorate	Forestry Management Directorate	Management Sub-directorate	Corresponding Forest Area (ha)	
				Total Area	Area of Degraded Forest Lands
Aydın-Denizli Motorway Project, between Km 15+856 and Km 34+630 in Section 1					
between Km 15+856 and Km 34+630 in Section 1	Muğla Regional Directorate of Forestry	Aydın	Köşk	12.38	6.11
		Nazilli	Yenipazar	38.09	-
			Total	**50.47**	**6.11**
			Percent (%)	**100.00**	**12.11**
South Alternative					
South Alternative	Muğla Regional Directorate of Forestry	Aydın	Köşk	5.27	5.27
		Nazilli	Yenipazar	54.35	4.80
Dalama Quarries	Muğla Regional Directorate of Forestry	Aydın	Köşk	61.87	5.88
Akçaköy Quarry	Muğla Regional Directorate of Forestry	Aydın	Köşk	2.49	0.00
			Total	**123.98**	**15.95**
			Percent (%)	**100.00**	**12.86**

In addition to the South Alternative construction, quarries are located on forest lands as summarized previously in Section 5.2.2. The forest area to be affected by these quarries in each Section is listed in Table 5.18.

Table 5.18 Land Use Information for Quarries

Location	Location			Description of the Site/Plant	Area (ha)	Type of Land Use	Corresponding Forest Function in the Relevant Forest Management Plan.
	Province	District	Nearest Neighborhood				
Km 20+000	Aydın	Efeler	Dalama	Dalama Quarries	24.68 20.79 24.88	Forest	Economic Ecological
Km 21+000	Aydın	Köşk	Akçaköy	Akçaköy Quarry	4.20	Forest	Ecological
Total					**74.55**	**Forest**	

Loss of Trees

Trees corresponding to the permitted road construction areas (road footprint and embankment and fill zones), construction camp sites and quarries will be removed and appraised by the relevant Regional Directorate of Forestry in coordination with the KGM and Project Sponsor. In this scope, exact number of trees to be removed is determined by the Regional Directorate after examination of current management plans and field studies. Accordingly, number of trees to be removed in the scope of the South Alternative and the Aydın-Denizli Motorway (between Km 15+856 and Km 34+630 in Section 1) has been estimated by relevant forestry directorates for the project and is summarized in Table 5.19.

The figures given in this table has been calculated for the South Alternative to cover the trees to be removed from the footprint of the motorway construction areas, construction camp sites and quarries including the embankment and fill zone. Table 5.19 also shows the number of trees to be

removed for the Aydın-Denizli Motorway Project (between Km 15+856 and Km 34+630 in Section 1). As can be seen from Table 5.19, Total number of trees that are lost is 24,555 for the South Alternative including construction camp sites and quarries.

Table 5.19 Estimated Number of Trees to be Removed in the Aydın-Denizli Motorway Project (between Km 15+856 and Km 34+630 in Section 1) and the South Alternative Including Construction Camp Sites and Quarries

Section	Regional Directorate	Forestry Management Directorate	Management Sub-directorate	Number of Trees	Corresponding Forest Area (ha)	
					Total Area	Area of Degraded Forest Lands
Aydın-Denizli Motorway Project, between Km 15+856 and Km 34+630 in Section 1						
between Km 15+856 and Km 34+630 in Section 1	Muğla Regional Directorate of Forestry	Aydın	Köşk	1,510	12.38	6.11
		Nazilli	Yenipazar	1,704	38.09	-
			Total	**3,214**	**50.47**	**6.11**
				Percent (%)	**100.00**	**12.11**
South Alternative						
South Alternative	Muğla Regional Directorate of Forestry	Aydın	Köşk	0	5.27	5.27
		Nazilli	Yenipazar	8,844	54.35	4.80
Dalama Quarries	Muğla Regional Directorate of Forestry	Aydın	Köşk	15,619	61.87	5.88
Akçaköy Quarry	Muğla Regional Directorate of Forestry	Aydın	Köşk	92	2.49	0.00
			Total	**24,555**	**123.98**	**15.95**
				Percent (%)	**100.00**	**12.86**

When the forest stand, the types are considered Calabrian Pine stands out as the most common types of species affected by the project. Percentage of trees to be removed according to their stand types is given in Table 5.20.

Table 5.20 Trees to be Removed according their Stand Types

Forest Stand Type		Percentage of Stand Type Among All Trees to be Removed		
		Authority Area of Related Forestry Management Directorate (%)		Total (%)
Turkish Name (Stand Map Code)	**English Name**	**Aydın**	**Nazilli**	
Kızılçam (Çz)	Calabrian Pine	96.97	85.15	92.71
Fıstık Çamı (Çf)	Stone Pine	3.03	13.89	6.94
Meşe (M)	Oak	0.00	0.96	0.35

Secondary Impacts associated with Loss of Forestlands

Besides direct loss of forestlands, as secondary impacts, increased human activity at the construction sites may increase the potential for the start of forest fires. Loss of carbon capture capacity in association with the number of trees lost will be discussed in Chapter 10 (“Air Quality and Climate Change”). Socio-economic impacts of the loss of forestlands on local communities will be covered in Chapter 14 (“Socio-economic Environment”).

5.3.1.3 Impacts on Agricultural Lands

To meet project's land take requirements, agricultural lands located within the expropriation corridor will be expropriated by the responsible agency (KGM). One of the main direct results of the permanent land take to be done in the scope of the project will be the conversion of productive agricultural lands to built-up lands. Consequently, these lands will be permanently lost for agricultural activities of the local people. Besides the direct loss of lands, following impact types are likely to be encountered by local people on a case-by-case basis:

- Difficulties for local people to ensure access to agricultural lands in cases when the settlement center and the agricultural parcels are separated;
- The fragmentation of agricultural lands by the motorway, hence difficulties for local people to ensure access between severed parts of an agricultural plot;
- Difficulties for local people in accessing agricultural lands from the locations of the passages (e.g. underpasses, culverts);
- Economic losses of local people due to partial expropriation of parcels (e.g. loss of viability for use of the remaining part of the parcel to be expropriated);
- Loss of growing crops and trees as a result of the expropriation of agricultural lands;
- Economic impacts on people, who are not legal owners but rent or use the affected lands.

Assuming all of the privately-owned lands to be acquired in the scope of the project are agricultural lands, total amount of agricultural land to be permanently lost in the scope of the project is estimated to be 378.20 ha (67.79%) along the South Alternative. In addition, the total amount of agricultural land to be permanently lost along the Aydın-Denizli Motorway Project (between Km 15+856 and Km 34+630 in Section 1) is estimated to be 1,217.88 ha. Table 5.21 summarizes the extent of impacts on the agricultural areas located within the expropriation corridor.

Table 5.21 Agricultural Areas to be affected by the South Alternative and Aydın-Denizli Motorway Project (between Km 15+856 and Km 34+630 in Section 1)

Province/District	Area of Agricultural Lands (m^2)	Area of Agricultural Lands (ha)	Percent (%)
Aydın-Denizli Motorway Project, between Km 15+856 and Km 34+630 in Section 1			
between Km 15+856 and Km 34+630 in Section 1	12,178,795.37	1,217.88	100
Total	**12,178,795.37**	**1,217.88**	**100**
South Alternative			
Aydın/Efeler	1,809,561.10	180.96	47.85
Aydın/Yenipazar	1,972,452.95	197.25	52.15
Total	**3,782,014.05**	**378.20**	**100.00**

In addition to loss of lands available for agricultural activities, the project will result in the severance and fragmentation of the agricultural lands resulting in restrictions in the access to lands by their owners and/or users. An example to the fragmentation of agricultural lands is shown in Figure 5.8.

Figure 5.8 Example to Fragmentation of Agricultural Lands by Motorways

5.3.1.4 Impacts on Pasture Lands

The ADMP and so South Alternative crosses or passes close to pasturelands in some of the neighborhoods. For the determination of pasturelands located within the expropriation area, expropriation plans (as of the date of the analysis) have been reviewed. In addition, questionnaires done with the neighborhood headmen at selected settlements in the scope of the socio-economic field surveys conducted (see Chapter 14 “Socio-economic Environment”).

Pasturelands to be permanently lost in the scope of the Project is estimated to be 61.07 ha (10.95%) along the South Alternative. In this context, Table 5.22 summarizes the extent of impacts on the pasturelands located within the expropriation corridor.

According to CORINE (2018) database results, pasturelands to be permanently lost in the scope of the Project is estimated to be 85.17ha (6.55%) along the Aydın-Denizli Motorway Project (between Km 15+856 and Km 34+630 in Section 1).

The Aydın-Denizli Motorway Project and the South Alternative sections that pass through the pasture lands will result in loss of entire pasture. However, from the CORINE (2018) database, GDRS (2001) and socio-economic field surveys’ results, it was concluded that the percentage of use of pasture lands is very low along the South Alternative. Therefore, there will not be a major impact in terms of pastureland.

Table 5.22 Pasturelands to be affected by the South Alternative

Province/District	Area of Pasturelands (m^2)	Area of Pasturelands (ha)	Percent (%)	Description of Impact
Aydın/Efeler	348,196.52	34.82	57.01	Loss of entire pasture
Aydın/Yenipazar	262,514.75	26.25	42.99	Loss of entire pasture
Total	**610,711.27**	**61.07**	**100.00**	

5.3.1.5 Impacts on Quarries

Land preparation (i.e., vegetation and top-soil clearing) and excavation activities to be conducted at the quarries will also result in local changes in the land use patterns Table 5.23 summarizes the area to be affected by each quarry.

Table 5.23 Area to be Affected by Quarries

Location	Location			Description of the Site/Plant	Area (ha)	Type of Land Use	Corresponding Forest Function in the Relevant Forest Management Plan.
	Province	District	Nearest Neighborhood				
Km 20+000	Aydın	Efeler	Dalama	Dalama Quarries	24.68 20.79 24.88	Forest	Economic Ecological
Km 21+000	Aydın	Köşk	Akçaköy	Akçaköy Quarry	4.20	Forest	Ecological
Total					**74.55**	**Forest**	

5.3.2 Operation Phase

In the operation phase, the activities will not involve any additional physical interaction thus no additional impact on land use is foreseen. The impacts related with habitat fragmentation/alteration and socio-economic impacts due to land acquisition will be permanent thus this may result in changes (positive or beneficial) in the existing socio-economic conditions of some of the potentially affected households in the long term. Rehabilitation measures will be taken at the Camp Sites following the completion of construction activities thus with the restoration of vegetation at these sites during the operation phase positive impacts will be observed in terms of land use.

5.3.2.1 Future Urban Development Potential

In addition to the direct physical impacts of the activities on the lands and socio-economic dimensions of the land acquisition, transportation projects possibly trigger further land developments in the vicinity of route, especially when the Motorway provide access to lands. Increased access to land raises its potential for development (e.g. residential, industrial, tourism) and need for additional transportation services. This in turn, results in changes of the land use patterns over a period of time (Oruonye, E.D., June 2014). There are other infrastructure projects planned in this region, thus the infrastructural development to be provided by the Aydın-Denizli Motorway Project and so South Alternative and other projects is likely to attract industrial investments first and then the industrial development would result in residential development. Consequently, development and operation of the Motorway is anticipated to result in changes in the existing land use patterns, increased population growth and increased demand for residential and commercial properties and infrastructural requirements in the region. On the other hand, increased overall accessibility in the region would also improve accessibility of cultural sites and tourism areas that may bring social, cultural and economic benefits to the region.

Köşk and Yenipazar districts of Aydın are likely to grow in the direction of east and south, towards the route of the South Alternative.

5.4 Mitigation Measures

The route selection process for the South Alternative has considered sensitivities related with the land use patterns and their socio-economic dimensions. As explained in details in Chapter 18 (“Analysis of Alternatives”), the Project has aimed to establish a balance between the crossing of ecologically sensitive forest areas and impact on agricultural lands to avoid intolerable ecological and

socio-economic impacts associated with Project land take. In the following sections, measures to be taken to minimize and/or mitigate direct impacts on the land use are described for the land preparation, construction and operation phases. It should be noted that implementation of the expropriation works and permitting process for the forests and public lands are under the responsibility of KGM as the administrative authority.

Measures to be taken against potential socio-economic impacts that would be associated with land use changes will further be evaluated in Chapter 14 ("Socio-economic Environment"). Measures to be taken to mitigate impacts on habitats and wildlife due to loss of forestlands are covered in Chapter 9 ("Ecology and Biodiversity").

5.4.1 Land Preparation and Construction Phase

Land use rights for the lands/parcels corresponding to Project components, including the South Alternative route, construction camp sites and quarries will be acquired either permanently or temporarily. Acquisition of land use rights for those lands/parcels located within the South Alternative expropriation corridor has been/will be done by the KGM in accordance with the national legislation. Following the acquisition of land use rights, these lands will be allocated to the Project In this respect;

- Privately-owned lands have been/will be acquired in line with the relevant provisions of the Turkish Expropriation Law;
- Forestry permits have been/will be obtained from the Forestry authorities in line with the Forestry Law;
- For the state-owned lands including treasury lands and pasture lands, applications will be done to acquire easement rights.

KGM will complete the process for the allocation of the private lands under the property of Treasury and the state-owned lands that are required for the Project and allocate those lands to the Project Sponsor for their use during the Contract Duration. In this respect, free of any charge, easement rights for the benefit of Project Sponsor will be constituted for the private lands under the property of Treasury and usage rights for the use of state-owned lands will be provided for the duration of the Contract. At the end of the Contract Duration, lands under the property of Treasury and the state-owned lands will be transferred to KGM free from any debt or commitment and in a well-maintained, operating, in-service condition, without any charge.

5.4.1.1 Construction Sites

In the scope of road construction works, the following measures will be taken to avoid and/or minimize the cases of unauthorized intrusion of construction machinery onto adjacent privately-owned lands that are out of the expropriation corridor:

- Borders of the construction areas and expropriation corridor will be identified by suitable markings.
- Construction crew will be trained to stay within the border of the construction areas and expropriation corridor.
- For exceptional cases when the privately-owned land has to be used but the expropriation or court processes have not been finalized yet, no work will be started until bilateral agreements are settled and official consent letters are taken from the legal owners. In such cases, official commitment letters will be provided to legal owners by the Project Sponsor regarding the scope of works and compensation of probable damages and the works will be conducted in accordance with those consent and commitment letters.
- A Grievance Mechanism has been established and activated for the Project (see Chapter 19 "Public Consultation" for further details of the mechanism). If complaints related with unauthorized use of privately-owned lands, damages on adjacent lands, etc. are received

through Project's Grievance Mechanism, evaluation/inquiry will be conducted on a case-by-case and where necessary, corrective actions will be planned and implemented.

- In accordance with KGM's technical specifications, in case of any direct or indirect damage on state or personal property as a result of the activities of the Project contractor or sub-contractors, Project Sponsor will ensure that relevant corrective measures (e.g. repair, maintenance, rebuilding, restoration, etc.) are implemented at its own cost in line with the instructions of the KGM or other related governmental agencies.

Construction Camp Sites will be used for a temporary period throughout the construction phase. Once the construction activities are completed, following measures will be taken for the rehabilitation of sites:

- Initially above-ground construction compounds including the plants/facilities, prefabricated buildings/houses, relevant infrastructure and installations, etc. of no beneficial use will be dismantled and removed in accordance with the national legislation.
- Any storage tank and pipes will be taken out of operation and fully emptied. Liquid wastes will be removed in accordance with the national legislation.
- Affected lands at the Construction Camp Sites and service roads will be graded and appropriately rehabilitated to acceptable uses.
- Any void area formed as a result of demolition works will be filled with suitable soil or other materials that are compatible with the natural topography and local ground conditions.
- Topsoil stripped prior to the installation of construction compounds will be reapplied and landscaping activities will be conducted in conformity with the surrounding land uses. Lands that will not be restored for a specific community use will be seeded and revegetated with native species.

5.4.1.2 Forestlands

The legislation related to forest areas, their protection and utilization for public benefit is composed of laws and regulations that are based on the constitution of Turkey. The central administrative authority is the Ministry of Agriculture and Forestry. The relevant agency within Ministry of Agriculture and Forestry is the General Directorate of Forestry, which itself has regional directorates (including Muğla Regional Directorate) in the country and operational directorates and sections in those regions. These directorates are responsible for protecting forestry and forestry resources against negative impacts, and developing and managing forestry and forestry resources in a sustainable way.

Within this framework, forestlands corresponding to the South Alternative components are under the authority of the Ministry of Agriculture and Forestry. In accordance with the Forest Law and associated regulations, relevant forestry permits have to be obtained by the KGM from the Ministry of Agriculture and Forestry, for the construction of Project components on forestlands.

Once the forestry permits are obtained, all the works including tree marking, felling, logging, chipping, removal and appraisal (selling, etc.) is performed by the General Directorate of Forestry and its Regional Directorates during the period between permit issuance and delivery of the land to the KGM.

For the forest lands to be used in the scope of the Project, forestry permit applications have been/are being submitted by KGM to related Forestry authorities in accordance with the Forest Law. Measures that have been taken to minimize the impact on forests and that will be taken in the course of the Project to compensate unavoidable impacts are described in the following paragraphs.

Minimization of the Loss of Forestlands

One of the aims of the project is to protect the existing forests to the extent possible. In this respect, protection of forestlands is one of the criteria considered in the route selection process.

In addition, recommended ecological bridges will be constructed in line with the requirements of related forestry directorates after the KGM approval. The points where ecological bridges are going to build will be clarified after the planned monitoring studies are carried out. Location of the recommended ecological bridges is shown in Figure 5.9.

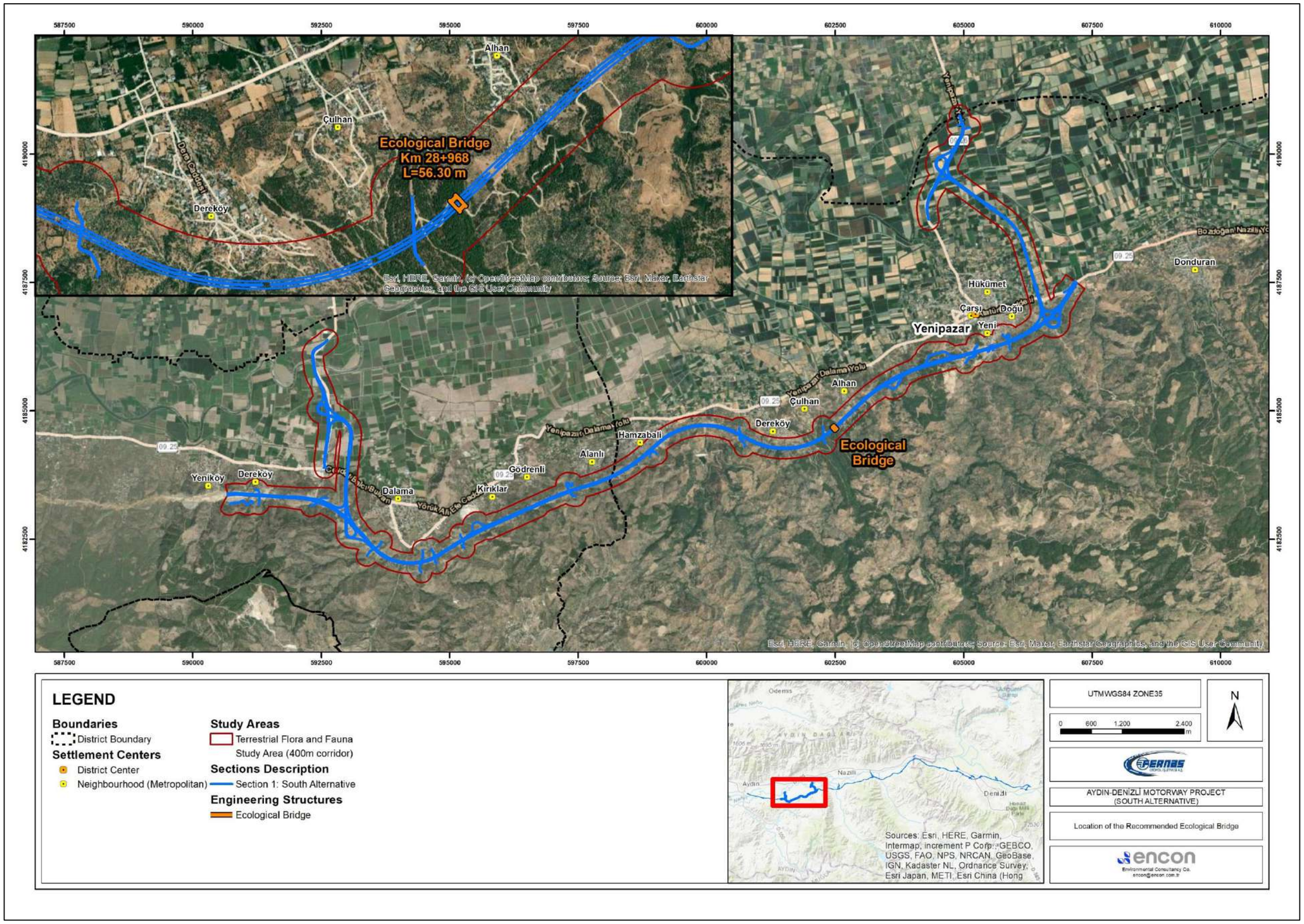


Figure 5.9 Location of Recommended Ecological Bridge

Afforestation

Following the completion of construction activities, measures will be taken to compensate (afforestation/reforestation) the lost forest assets at alternative locations to be determined by the Forestry authorities. In this scope, Project Sponsor will aim to compensate the loss of forest lands by planting trees at alternative areas on a voluntary basis. In the case of voluntary afforestation applications, afforestation is carried out in any region of Turkey in line with the directions of the Forestry authorities. Project Sponsor will make the reasonable efforts to cooperate with the Forestry authorities and if approved by the Forestry authorities, afforestation activities in the scope of the ADMP and so South Alternative will be conducted primarily at suitable locations in the region to adequately compensate the lost forest functions. Afforestation areas will be under the authority of relevant Forestry authorities, which decides for the specific tree species to be planted in each region, depending on the forest habitats and specific requirements of that region. These requirements are determined yearly and are specified on that year's afforestation plans of the Regional Directorate. The relevant Forestry authorities will be informed about the outcomes of the ecology studies done in the scope of the ESIA studies and the proposals for the plant species in consideration of the local ecological sensitivities.

The Afforestation Plan developed for the Project is presented in Annex-4 ("Afforestation Plan") of this ESIA Report. Implementation of the Afforestation Plan will be initiated in the construction phase and may continue through the initial phases of the operation period. In order to compensate for the loss of forest assets in the Project Area, it is advised that the planting would be five times of the number of trees to be removed from the Project Area.

Response to Forest Fires

Regarding potential forest fires, the following measures will be taken in accordance with good site practices and KGM's technical specifications:

- Project Sponsor will require all contractor and sub-contractor personnel to take necessary measures to avoid forest fires and immediately respond to any fire event that could not be avoided by measures taken.
- Project Sponsor will cooperate with relevant governmental agencies to make all the reasonable effort in responding forest fires.
- Project personnel will be trained to immediately inform forestry authorities about the location and scale of any fire incident.
- Adequate number and amount of firefighting equipment will be provided at construction sites. Fire-fighting equipment will not be obstructed. On the field, there will be always proper trained personnel and units who can use fire-fight equipment efficiently.
- Proper fire extinguishers will be kept ready at site where hot/welding works will be performed.
- The operability's of fire-fight equipment will check regularly.
- Construction sites and work areas, which are prone to fire incidents, will be determined and accordingly, locations where smoking is not dangerous will be specified and smoking will only be allowed at these locations. Throwing cigarette butts on the floor will be prevented by means of relevant applications/sanctions (i.e. trainings, placing ashtrays to the locations where smoking is allowed within the construction site, etc.)
- Within the scope of the training program to be given to the personnel, basic field rules for fire protection will be explained, awareness on fire hazard will be raised and personal responsibilities will be defined. Against fire incidents that cannot be prevented by taking relevant measures, personnel will be trained on emergency procedures and use of emergency response equipment.
- Not all fires (e.g. forest fires caused by energy transmission line) will be responded with water. To stop a fire caused by electric current, sufficient amount of dry-type extinguishers will also be kept available at the site. Electric current may be cut off before responding to fire, if deemed necessary.

5.4.1.3 Agricultural Lands

Expropriation of privately-owned agricultural lands will be done by KGM in accordance with the relevant provisions of the Expropriation Law. In the accordance with Turkish Expropriation Law, if the land portion remaining from expropriation would not be viable anymore, eligible persons have the right to request the expropriation of the entire parcel (application has to be in line with the requirements of the Law) including the remaining portion, even if this portion is out of the expropriation corridor. Relevant article of the Law is provided below:

> Article 12: Partial Expropriation
>
> Where only part of a property is to be expropriated its value is estimated in accordance with Article 12 of the Expropriation Law as follows:
>
> a. In cases where no change occurs in the value of the non-expropriated part due to the expropriation, the value of the expropriated part shall be determined in proportion to the total value of the whole property in accordance with Article 11 of the Expropriation Law.
>
> b. If a decrease in the value of the non-expropriated part occurs as a result of expropriation, this loss is estimated and added to the expropriation value of the expropriated part as defined in the relevant paragraph of the Law.
>
> c. If an increase in the value of the non-expropriated part occurs as a result of expropriation, this increase is estimated and subtracted from the value of the expropriated part as defined in the relevant paragraph of the Law.
>
> d. The decreased and increased amounts stated in relevant paragraphs of the Law are determined according to the valuation method under Article 11 of the Expropriation Law.
>
> e. When the remaining part of the property after expropriation remains suitable for use in accordance with the zoning legislation, the expenses and costs for reinstatement of any buildings, surrounding walls, sewerage, water, electricity and gas lines that are damaged shall be determined and added to the expropriation value.
>
> f. When the remaining part of the property is no longer suitable for use, and the expropriation decision is not challenged in the courts, the owner may apply in writing within 30 days of the date of notification of the expropriation decision, for the remaining part also to be expropriated.

In accordance with Expropriation Law, standing crops, trees, irrigation structures, walls, fences, etc. will be considered in the valuation process and the compensations will be provided by responsible agency (in this case KGM) to cover the associated losses.

- Several underpasses and culverts have been included in the design to ensure access of local people to agricultural lands. These underpasses and culverts will ensure sufficient dimensions for the passage of harvesters, vehicles, etc. where required. Detailed lists of underpasses and culverts planned in the Project are provided in Chapter 3 (“Project Description”).
- Access roads will be constructed in parallel to the Motorway near agricultural areas/zones to provide access to agricultural lands, where necessary.
- Legitimate requests of local people regarding the avoidance and/or minimization of the restriction of access between their settlement areas and agricultural lands will be considered by the Project Sponsor’s design team and feasible solutions will be developed and implemented, where possible.

5.4.1.4 Quarries

Where it is planned that construction raw materials will be obtained by state institutions and organizations from forest areas, a raw material production license is required. Based on this permit, permission for all operations and construction associated with this activity is regulated by Implementing Regulation of the 16th Article of the Forest Law. Raw material production license have been obtained for the quarries to be used. Measures to be taken at the quarry site are described below:

- Borders of the quarry will be identified by using proper methods (i.e. fencing, etc.) and material extraction activities will be conducted within these borders.
- Topsoil management measures (see Chapter 6 “Topography, Soils and Geology”) to be taken at Motorway construction sites will be applied at the quarry.
- Appropriate low-impact extraction methods that would result in final site contours supportive of habitat restoration principles and final land use will be selected wherever feasible.
- Preference for extraction will be given to thicker deposits as far as possible and as reasonable to land use changes and consequent loss of soil.
- Quarry will be reclaimed immediately after the completion of extraction activities. Rehabilitated lands will conform with acceptable uses consistent with local and regional land use plans.
- During reinstatement, affected land will be graded and appropriately prepared prior to the reapplication of soil layers that would sustain vegetative regrowth.

5.4.2 Operation Phase

As no additional direct physical impact on land use is not anticipated in the operation phase, mitigation measures to be taken in this phase will be mainly limited with the afforestation activities that would continue in line with the commitments of the Project Sponsor and guidance of the relevant Forestry authorities. On the other hand, in order to minimize the unplanned development potential and meet the infrastructural needs of the potentially growing populations adequately, regional and local planning authorities and administrations should duly assess the future development potential of the region where Aydın-Denizli Motorway Project and so South Alternative and other large-scale infrastructure projects are to be implemented and develop relevant measures.

5.5 Summary of Assessment and Residual Impacts

Table 5.24 provides a summary on the land use assessments. Significance of the identified impacts before and after the implementation of mitigation measures are summarized in this table. As can be seen from the Table, in general, potential impacts on the forestland, agricultural lands, etc. are anticipated to be reduced to low levels in the long-run with effective implementation of mitigation measures, with the exceptions of (i) forests having ecological functions for which the residual impacts have been evaluated as medium due to their importance; (ii) agricultural lands that are suitable for soil cultivation for which the residual impacts have been evaluated as high or medium depending on the land use capability class of the soils to be affected; (iii) pasturelands with Class I-V land use capability class for which the residual impacts have been evaluated as medium. Regional land use character would also change significantly (may be beneficial or adverse depending on the planning measures to be taken by the authorities) in the long-run.

It should be also noted that a certain period of time (from months to years) will be needed to ensure that the residual impacts are adequately mitigated to acceptable levels as measures such as rehabilitation of temporary Project sites or afforestation take time to show their effectiveness. Additionally, the ADMP and so South Alternative may trigger future urban and industrial development in certain locations along the route. The residual impact of the development may be beneficial or adverse for different receptors, in any case being of high significance. It should be noted that the control of the development is under the authority and responsibility of the local and regional administrations and the stress to be put on the forests and agricultural areas surrounding the settlements has to be well balanced to avoid further significant losses of these land uses.

Table 5.24 Summary of the Land Use Assessments

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Forests	Land preparation and construction	Loss of forestland within the Motorway's expropriation corridor, quarries	Adverse	Restricted	Long	Low (5-50 ha) Dalama, Kırıklar, Alanlı Dalama Quarries	Long term irreversible	One-off	Moderate (B)	High (3) (Ecological forest function)	High (B3)	• In accordance with the Forest Law and associated regulations, forestry permits will be obtained by the KGM from the Ministry of Forestry and Water Affairs for all construction sites located at forestlands. • Loss of forest lands will be minimized by taking relevant design measures. • In addition, ecological bridges will be constructed in line with the requirements of related forestry directorates after the KGM approval. • Afforestation Plan will be implemented.	Medium
						Low (5-50 ha) Dereköy, Çulhan, Alhan, Yeni Akçaköy Quarry			Moderate (B)	Low (1) (Economic forest function)	Low (B1)		Low
		Loss of trees	Adverse	Restricted	Long	Moderate	Long term irreversible	One-off	Moderate (B)	Medium (2) (assumed Socio-economic value)	Medium (B2)		Low
		Forest fires initiate within the Motorway corridor and escalate beyond the initial source affecting surrounding forests/shrubberies	Adverse	Wide	Short	Medium (assumed that any fire initiated within the Motorway corridor can be intervened before a large scale effect occurs as the fire fighting capacity of the region is adequate)	Long-term reversible	One-off	Moderate B)	High (3) (Ecological forest function) Forest near Dalama, Kırıklar, Alanlı	High (B3)	• Project Sponsor will require all contractor and sub-contractor personnel to take necessary measures to avoid forest fires and immediately respond to any fire event that could not be avoided by measures taken. • Project Sponsor will cooperate with relevant governmental agencies to make all the reasonable effort in responding forest fires. • Project personnel will be trained to immediately inform forestry authorities about the location and scale of any fire incident. • Adequate number and amount of fire fighting equipments will be provided at construction sites. Fire-fighting equipment will not be obstructed. On the field, there will be always proper trained personnel and units who can use fire-fight equipments efficiently. • Proper fire extinguishers will be kept ready at site where hot/welding works will be performed. • The operability's of fire-fight equipments will check regularly. • Construction sites and work areas, which are prone to fire incidents, will be determined and accordingly, locations where smoking is not dangerous will be specified and smoking will only be allowed at these locations. Throwing cigarette butts on the floor will be prevented by means of relevant applications/sanctions (i.e. trainings, placing ashtrays to the locations where smoking is allowed within the construction site, etc.) • Within the scope of the training program to be given to the personnel, basic field rules for fire protection will be explained, awareness on fire hazard will be raised and personal responsibilities will be defined. Against fire incidents that cannot be prevented by taking relevant measures, personnel will be trained on emergency procedures and use of emergency response equipments. • Not all fires (e.g. forest fires caused by energy transmission line) will be responded with water. To stop a fire caused by electric current, sufficient amount of dry-type extinguishers will also be kept available at the site. Electric current may be cut off before responding to fire, if deemed necessary.	Low
										Low (1) (Economic forest function) Forests near Dereköy, Çulhan, Alhan, Yeni	Low (B1)		
Agricultural lands	Land preparation and construction	Loss of agricultural lands suitable for soil cultivation	Adverse	Restricted	Long	High Hükümet, Donduran	Irreversible	One-off	Major (A)	High (3) (Class I-II soils)	High (A3)	• Expropriation of privately-owned agricultural lands will be done by KGM in accordance with the relevant provisions of the Expropriation Law. In the accordance with Turkish Expropriation Law, if the land portion remaining from expropriation	Medium
						High Dalama			Major (A)	Medium (2) (Class III-IV soils)	High (A2)		Medium

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
		Loss of non-arable lands that are not suitable for soil cultivation				High Yeniköy, Dereköy, (Efeler), Kırıklar, Gödrenli, Alanlı, Hamzabali, Dereköy (Yenipazar), Çulhan, Alhan, Yeni, Çarşı, Doğu			Major (A)	Low (1) (Class V-VIII soils)	Medium (A1)	would not be viable anymore, eligible persons have the right to request the expropriation of the entire parcel (application has to be in line with the requirements of the Law) including the remaining portion, even if this portion is out of the expropriation corridor. • Several underpasses and culverts have been included in the design to ensure access of local people to agricultural lands. These underpasses and culverts will ensure sufficient dimensions for the passage of harvesters, vehicles, etc. where required. • Access roads will be constructed in parallel to the Motorway near agricultural areas/zones to provide access to agricultural lands, where necessarry. • Legitimate requests of local people regarding the avoidance and/or minimization of the restriction of access between their settlement areas and agricultural lands will be considered by the Project Sponsor's design team and feasible solutions will be developed and implemented, where possible.	Low
		Loss of olive trees				Low			Major (A)	High (3)	High (A3)	• The cutting of olive trees will be avoided during the construction of the viaduct pillars. The necessary monitoring activities to be done are specified in Chapter 20.	Medium
Pasturelands	Land preparation and construction	Loss of pasturelands available for public use	Adverse	Restricted	Long	High (Gödrenli, Alanlı, Yeni; affected area of the pasture parcel is more than 25% of the entire parcel area)	Irreversible	One-off	Major (A)	Low (1) Class (VII-VIII soils)	Medium (A1)	• Planning and construction of additional culverts at the immediate locations of the pastures (if not already planned) will be done. • Collaboration with the neighborhood headmen in selecting the exact locations and dimensions of culverts will be made.	Low
						Medium (Hamzabali, Dereköy (Yenipazar); affected area of the pasture parcel is 10-25% of the entire parcel area)			Moderate (B)	Low (1) Class (VII-VIII soils)	Low (B1)		Low
						Low (Dalama, Hükümet, Donduran; affected area of the pasture parcel is less than 10% of the entire parcel area)			Moderate (B)	High (3) (Class I-V soils)	High (B3)		Low
						Low (Yeniköy, Dereköy (Efeler), Kırıklar, Çulhan, Alhan, Çarşı, Doğu; affected area of the pasture parcel is less than 10% of the entire parcel area)			Moderate (B)	Low (1) Class (VII-VIII soils)	Low (B1)		Low
Local Communities	Land preparation and construction	• Crossing of the borders of expropriation corridor resulting in damage of adjacent lands due to unlawful intrusion. • Start of activities on privately owned lands for which expropriation or court processes have not be finalized.	Adverse	Local	Short	Low (cannot be quantified but the risk is likely to be associated with a very local land plot)	Short term reversible	One-off	Minor (C)	High (3) (can be medium or low depending on the quality and socio-economic value of the land plot; assumed as high for the worst case)	Medium (C3) (worst case)	• Borders of the construction areas and expropriation corridor will be identified by suitable markings. • Construction crew will be trained to stay within the border of the construction areas and expropriation corridor. • For exceptional cases when the privately-owned land has to be used but the expropriation or court processes have not been finalized yet, no work will be started until bilateral agreements are settled and official consent letters are taken from the legal owners. In such cases, official commitment letters will be provided to legal	Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												owners by the Project Sponsor regarding the scope of works and compensation of probable damages and the works will be conducted in accordance with those consent and commitment letters. • If complaints related with unauthorized use of privately-owned lands, damages on adjacent lands, etc. are received through Project's Grievance Mechanism, evaluation/inquiry will be conducted on a case-by-case and where necessary, corrective actions will be planned and implemented. • In accordance with KGM's technical specifications, in case of any direct or indirect damage on state or personal property as a result of the activities of the Project contractor or sub-contractors, Project Sponsor will ensure that relevant corrective measures (e.g. repair, maintenance, rebuilding, restoration, etc.) are implemented at its own cost in line with the instructions of the KGM or other related governmental agencies.	
Regional Land Use Character	Operation	Future urban development potential	Adverse or Beneficial	Wide	Long	High	Irreversible	Continuous	Major (A)	High (3)	High (A3)	• Good planning by central authorities/ administrations in consideration of other regional/local large-scale infrastructure development is essential (not under the control of Project).	Medium

CHAPTER 6

TOPOGRAPHY, SOILS AND GEOLOGY

6. CHAPTER – TOPOGRAPHY, SOILS AND GEOLOGY

This Chapter identifies existing topographical, soil, and geological conditions along the South Alternative route and assesses the potential impacts associated with these aspects. Measures proposed for the mitigation of the potential impacts and the residual impacts are also described in this Chapter for the following main types of impacts:

- Permanent changes in the existing topographical features;
- Soil disturbance due to earthworks, construction activities, and materials extraction;
- Acceleration of soil erosion process;
- Risk of soil contamination due to accidental spills or leakage;
- Risks associated with the handling of existing contaminated lands;
- Geological and geotechnical risks.

6.1 Assessment Methodology and Data Sources

Soil properties along the motorway route will be defined for a 400 m study corridor (1,384.70 ha). In this context, major soil groups and erosion levels of soils along the Southern Alternative will be determined based on the Land Use and Soil Database prepared by the former General Directorate of Rural Services for Aydın (2001). In addition, the "Coordination of Environmental Information (CORINE) Land Cover" (2018) database is also used to determine land use characteristics. A soil sampling and analysis program was carried out to determine the quality of representative soil samples at selected locations along the motorway route. Geological-geotechnical investigation reports and readily available internet resources were consulted to characterize the basic geological and geotechnical conditions in the project area.

The data sources to be used in this context are listed below:

- Land Use Database of the former General Directorate of Rural Services (KDRS; Aydın, 2001)
- Coordination of Environmental Information (CORINE) Land Cover (2018)
- Laboratory analysis results for soil samples collected in the project area
- Geological-geotechnical survey reports

Significance Criteria

The significance criteria for the impacts on topography, soils, and geology will be determined as high, medium, or low, based on the evaluation of the magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 (“ESIA Methodology”) will be used for the determination of the magnitude of impact on the land use components, while sensitivity/value criteria to be used in the scope of impact assessment are summarized in Table 6.1. A detailed explanation of the sensitivity components for each ecosystem component is provided in the following “Baseline Conditions” section.

Table 6.1 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	**Medium (2)**	**Low (1)**
Topography	Unique topographical structure	Natural topograpghy	Already disturbed topograpghy
Soil (Erosion)	Soil with severe (Level 3) and very severe (Level 4) erosion potential according to GDRS Database	Soil with moderate (Level 2) erosion potential according to GDRS Database	Soils with none or very little (low) erosion potential (Level 1)
Soil (Contamination)	Soils corresponding to lands classified by CORINE Land Cover Database as "Arable Land", "Permanent Crops", "Pastures" and Heterogenous Agricultural Areas" (under Agricultural Areas) and Forests (under Forests and Semi-natural Areas)	Soils corresponding to lands classified by CORINE Land Cover Database as "Artifical, Non-agricultural and Vegetated Areas") (under Artificial Surfaces) and "Shrub and/or Herbaceous Vegetation Associations" (under Forests and Semi-natural Areas)	Soils corresponding to lands classified by CORINE Land Cover Database as "Urban Fabric", "Industrial, Commericial and Transport", "Mine, Dump and Construction Sites" (under Artificial Surfaces)
Soil (Top Soil)	Agricultural areas, where top soil thickness is 20-30 cm	Forest areas, where top soil thickness is 10-20 cm	Pastures/Steppe, where top soil thickness is 5-10 cm
Geology (Landslides)	Active landslide areas	Former/Ancient landslide areas	Areas with no landslide history
Geological Features	Sites with unique geological sites and features of scientific or social/cultural importance		Sites with no unique geological sites and features of scientific or social/cultural importance
Seismicity	1st Degree Earthquake Zones according to relevant Earthquake Zoning Maps	2nd Degree Earthquake Zones according to relevant Earthquake Zoning Maps	3rd Degree Earthquake Zones according to relevant Earthquake Zoning Maps

6.2 Baseline Conditions

Similar to the land use characteristics, a detailed assessment of the existing topographic, soil and geological conditions along the South Alternative route is provided below.

6.2.1 Topography and Soils

6.2.1.1 Topographical Conditions

Topographical conditions combine terrain features, hills, slopes and elevation levels along the motorway route. The distribution of slopes along the South Alternative is given in Table 6.2. According to the table, steep/very steep slopes of more than 20% cover 49% of the motorway. Relatively flat areas with less than 10% slopes comprise 26% of the motorway.

Elevation and slope maps for the area where the project will be implemented are presented in Figure 6.1.

6.2.1.2 Soil Characteristics

Soil conditions along the motorway route will be described based on the soil groups, erosion levels, and the content of the soils that represent productivity. Slope conditions have been provided under the previous "Topographical Conditions" section, while land use capabilities have been described in Chapter 5 ("Land Use and Property").

Soil Groups

Soil groups corresponding to the study corridor have been described based on the land use and soil database of the former Turkish General Directorate for Rural Services (GDRS) published for Aydın province in 2001. The results of the analyses done in this scope are provided in Table 6.3. A map of soil groups within the study corridor is presented in Figure 6.2

Table 6.2 Slope Groups within the Study Corridor for the South Alternative

Slope (%)	Area (m^2)	Area (ha)	Percent (%)
% 0 - % 2	3,636,000.00	363.60	26.26
% 3 - % 5	1,013,600.00	101.36	7.32
% 6 - % 10	676,800.00	67.68	4.89
% 11 - % 20	1,710.800.00	171.08	12.36
% 21 - % 30	2,688,962.24	268.90	19.42
% > 30	4,120,800.00	412.08	29.76
Total	**13,846,962.24**	**1,384.70**	**100.00**

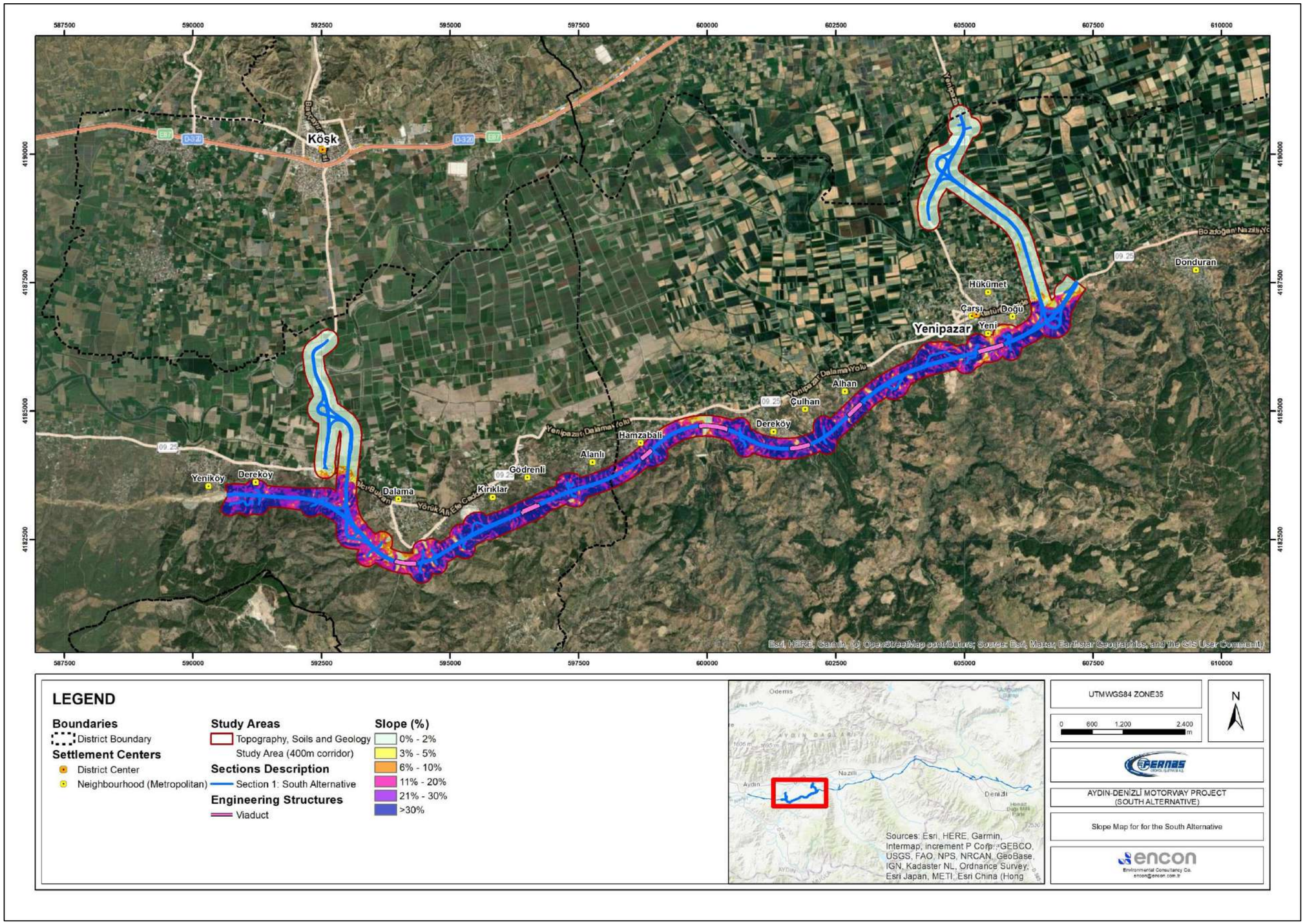


Figure 6.1 Slope Map

Table 6.3 Soil Groups within the Study Corridor for the South Alternative (GDRS. 2001)

Soil Groups	Area (m^2)	Area (ha)	Percent (%)
Non-Calcareous Brown Forest Soils	7,477,638.58	747.76	54.00
Alluvial Soil	3,470,296.06	347.03	25.06
Colluvial Soil	2,315,420.62	231.54	16.72
Settlements	510,025.67	51.00	3.68
River	73,581.31	7.36	0.53
Total	**13,846,962.24**	**1,384.70**	**100.00**

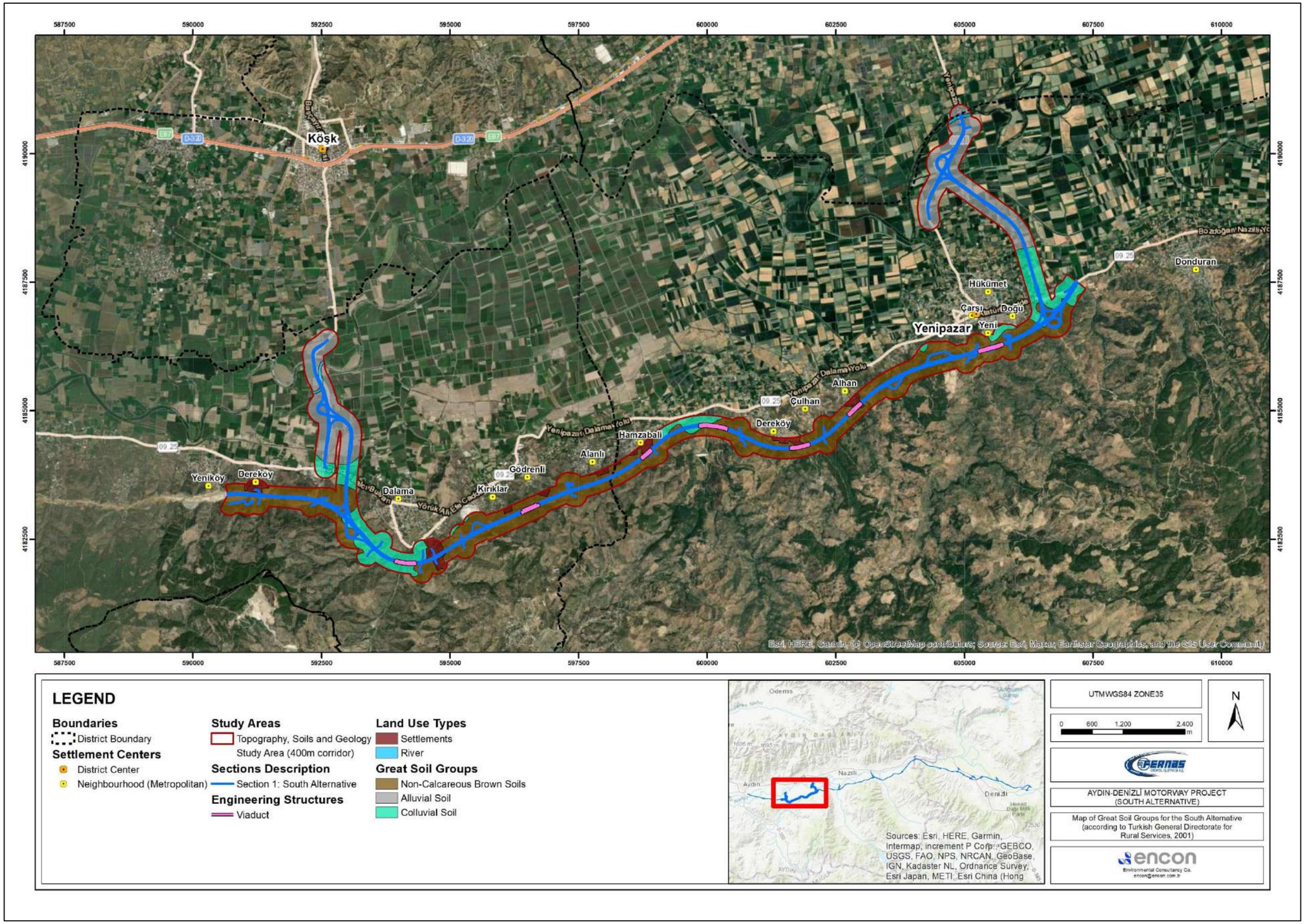


Figure 6.2 Map of Soil Groups

According to the analysis done the study corridor for the South Alternative of the motorway includes the following soil groups: non-calcareous brown soils, alluvial soils, and colluvial soils. A description of the soil group is provided in Table 6.4.

Table 6.4 Description of Soil Groups

Soil Group	Description
Non-Calcareous Brown Soils	Top soil is soft or slightly firm. Subsoil is more heavily textured and firmer. Although the lime is washed out, reaction is neutral or alkaline. Natural drainage is good. Natural vegetation cover is forest mixed with bushes and grass or shrubbery.
Alluvial Soil	In these immature soils, layers are either not present or else very weakly developed even if they are present. On the other hand, various mineral layers with different properties are present. These soils which are very important for agriculture are generally under the influence of groundwater and are suitable for growing up all cultivated plants permitted by the climate. The yield could vary between very low and very high.
Colluvial Soils	These groups of soils is accumulated on the foot of step slopes with the effect of gravity, landslide, surface flow or tributaries as a result of transport from short distances and have formed on colluvial material. These young soils rather show the characteristics of the soil materials available in the upper elevations. They contain layers with varying material sizes depending on the level of precipitation and flow rate and the degree of elevation. Those layers are not parallel to each other as they are with the alluvial soils. The ones that are present at the foot of steep slopes and valleys generally include rough and coarse materials. With decreased rate of flow, material diameters reduce. These well drained soils are occasionally subject to flooding. Natural vegetative structure is dependent on the climate. They are productive under irrigation.

Source: Former Ministry of Agricultural and Rural Services. July 2008

The key findings of the soil group analyses done for the study corridor (1,384.70 ha) are summarized below (settlement and river areas that cover 4.21% of the study corridor and not categorized under any of the soil groups are not taken into consideration in the following figures):

- Non-Calcareous Brown Forest Soils are the dominant soil group along the entire study corridor (54.0%; 747.76 ha), which is followed by Alluvial Soils (25%; 347.03 ha) and Colluvial Soils (16.72%; 231.54 ha).

Soil Erosion

Soil erosion is described as the transportation of soil material resulting in extensive degradation. The process can either occur naturally within its own balance or be accelerated as a result of human activity. The rate of erosion is increased due to improper agricultural practices such as cultivation on relatively high slope lands, plowing of the fields in the direction of the slope, and excessive grazing on pasturelands or deforestation. The agents of soil erosion are water and wind, where the former is more prominent. Water erosion takes place on lands with weak or no vegetative cover where runoff can flow with sufficient energy, transporting loosened soil particles down the slope. Consequently the fertile top layer of the soil is lost from the agricultural lands resulting in reduced agricultural productivity, and water quality of the surface water resources deteriorates as a result of sedimentation and eutrophication (Former Ministry of Agricultural and Rural Services. July 2008).

Evaluation of the erosion level to which soils are exposed is done based on the erosion classification system developed by US Department of Agriculture and adopted by several state authorities including Türkiye. Erosion levels specified in this classification system are listed in Table 6.5. Erosion levels corresponding to the project area are shown on the maps presented Figure 6.3

Table 6.5 Erosion Levels according to Technical Procedure on Soil and Land Classification Standards

Erosion Level	Definition
Level 1	Low
Level 2	Moderate
Level 3	Severe
Level 4	Very severe

Source: Former Ministry of Agricultural and Rural Services. July 2008.

Following the erosion level classification, erosion potential of the soils corresponding to the study corridor (1,384.70 ha; settlement and river areas that cover 4.21% of the study corridor and not categorized under any of the soil groups. and are not taken into consideration in the following figures) have been described based on the land use, and soil database of the former GDRS published for Aydın province in 2001. The results of the analyses done in this scope are provided in Table 6.6.

As can be seen from this table, approximately 42.59% (589.75 ha) of the study corridor corresponds to soils with severe erosion levels (Level 3). This is followed by no or very low erosion level (Level 1), which accounts for about 33.32% (461.33 ha) of the study corridor. Soils with very severe erosion levels (Level 4) occur in about 11.41% of the study corridor. Soils with moderate erosion levels (Level 2) along the study corridor account for approximately 8.47% of the area. In addition, it should be noted that the project area has experienced a rapid urbanization rate, especially in the last 30 years resulting in significant changes in the land use patterns and an increase in the overall area of artificial surfaces, including urban areas, industrial sites, transport networks, mine extraction sites, etc. Consequently it is likely that the erosion rate has accelerated, and the erosion exposure levels of the soils corresponding to the study corridor have increased.

Figure 6.19 present a high-scale map of the status of erosion in the Büyük Menderes Basin, where the Aydın province is located. The map is extracted from the Erosion Combating Action Plan (2013-2017) prepared by the former Ministry of Forestry and Water Affairs and mainly supports the analyses done based on the GDRS database.

Table 6.6 Erosion Potential of the Soils within the Study Corridor for the South Alternative (GDRS. 2001)

Erosion Levels	Risks	South Alternative		
		Area (m^2)	Area (ha)	Percent (%)
None or very low	-	3,578,854.95	357.89	25.85
	Soil insufficiency Drainage problems, oldness, flood damage	1,034,493.33	103.45	7.47
Sub-total (None or very low)		**4,613,348.28**	**461.33**	**33.32**
Moderate	Slope and erosion damage	1,172,368.40	117.24	8.47
Sub-total (Moderate)		**1,172,368.40**	**117.24**	**8.47**
Severe	Slope and erosion damage. Soil insufficiency	5,897,530.79	589.75	42.59
Sub-total (Severe)		**5,897,530.79**	**589.75**	**42.59**
Very severe	Slope and erosion damage. Soil insufficiency	1,580,107.79	158.01	11.41
Sub-total (Very severe)		**1,580,107.79**	**158.01**	**11.41**
Settlements		510,025.67	51.00	3.68
River		73,581.31	7.36	0.53
Total		**13,846,962.24**	**1,384.70**	**100.00**

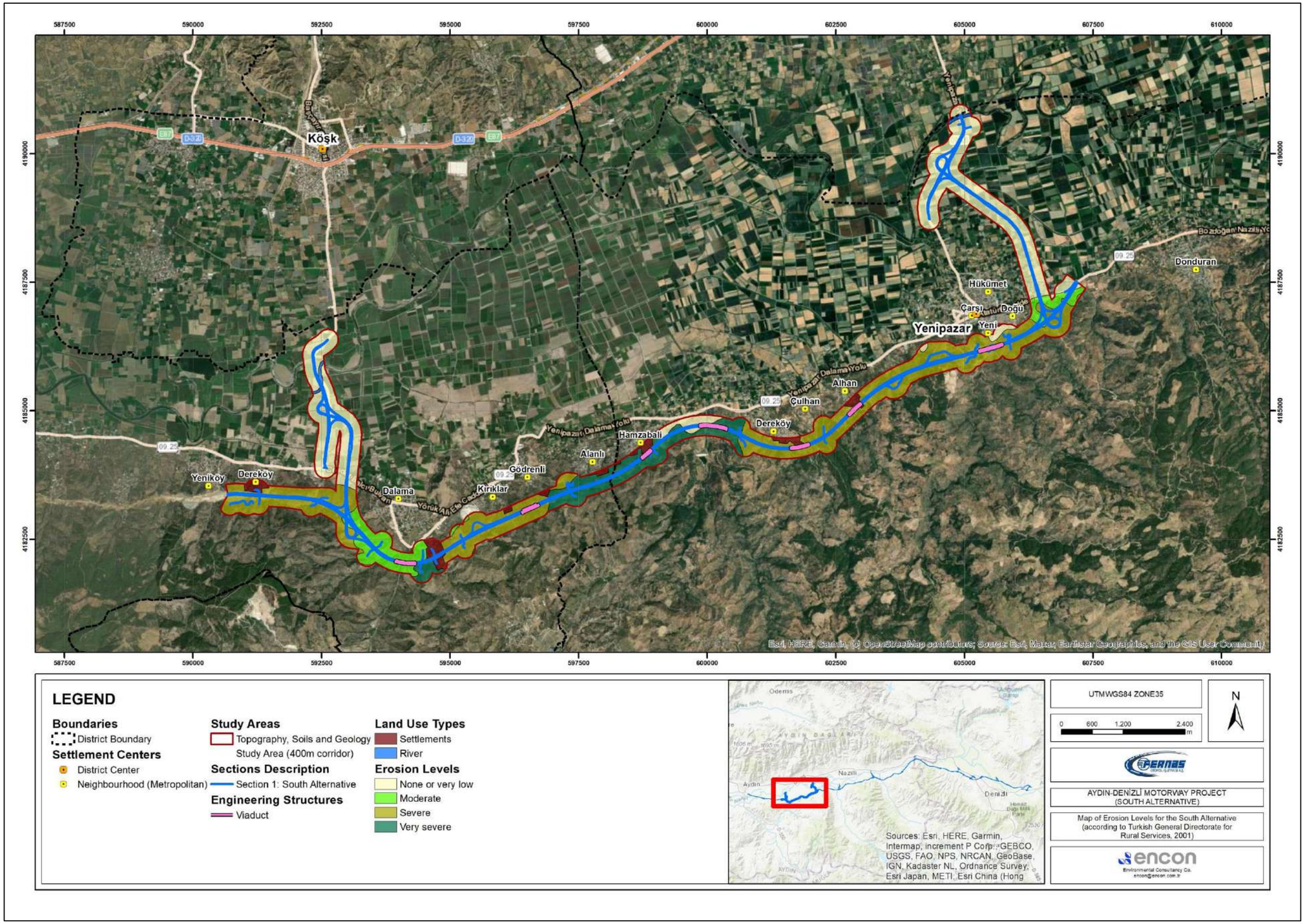


Figure 6.3 Map of Erosion Levels

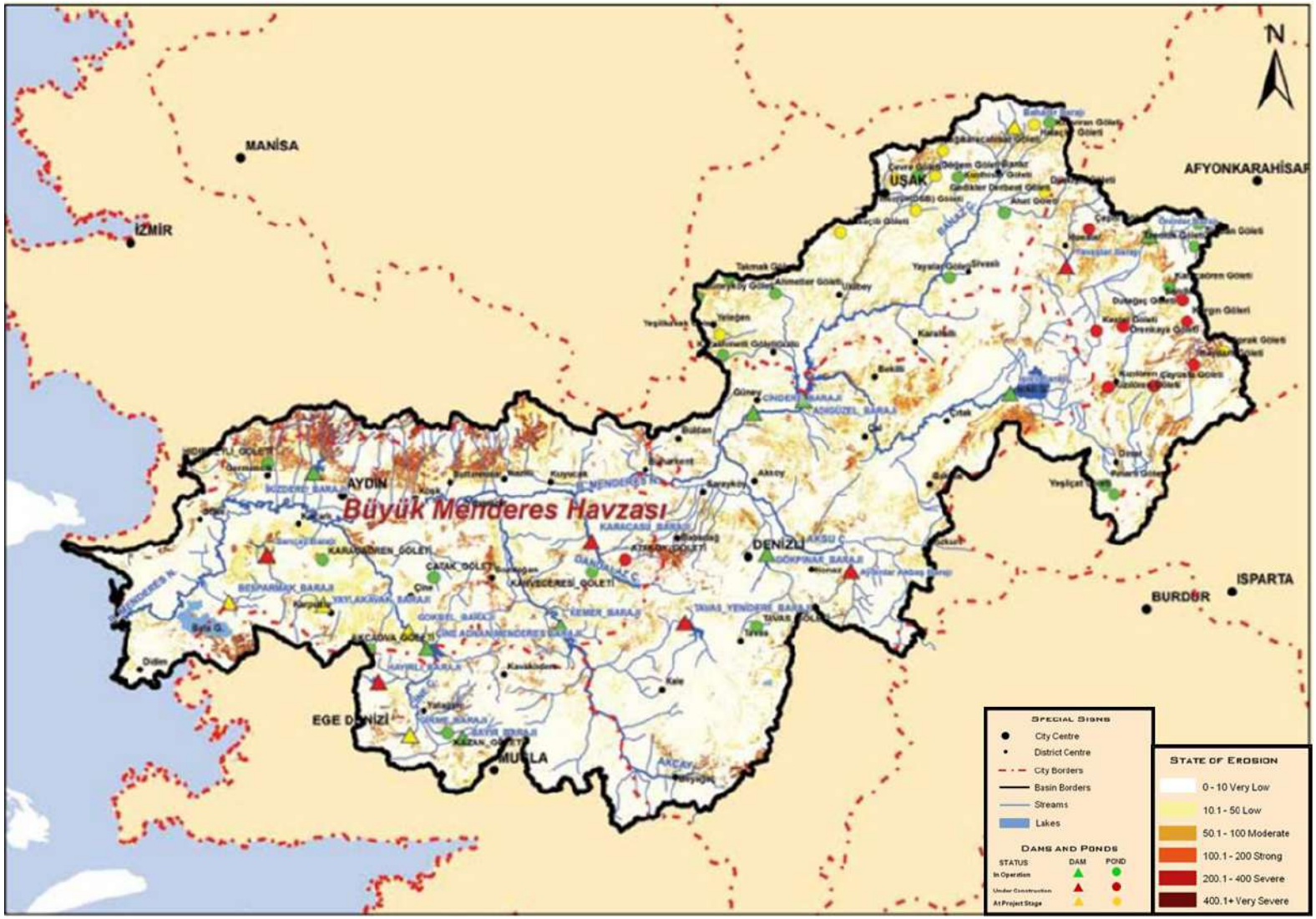


Figure 6.4 Status of Erosion in the Büyük Menderes Basin

Erosion levels of soils for the study area on settlement-basis are presented in Table 6.7.

Table 6.7 Erosion Levels of Soils in Settlement (GDRS. 2001)

Province	District	Neighborhood	Erosion Level
Aydın	Efeler	Yeniköy	Severe
		Dereköy	Severe
		Dalama	Moderate
		Kırıklar	Severe
		Gödrenli	Very Severe
		Alanlı	Very Severe
	Yenipazar	Hamzabali	Very Severe
		Dereköy	Severe
		Çulhan	Severe
		Alhan	Severe
		Yeni	Severe
		Çarşı	Severe
		Doğu	Severe
		Hükümet	None or very low
		Donduran	Moderate

Soil Productivity and Quality

Soil productivity represents the capability of soils to supply primary nutrients in sufficient amounts and ratios proper for sustaining the growth of plants. Elements necessary for plant growth include carbon, hydrogen, and oxygen that are supplied from air and water; and nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulphur (S) as well as certain metals including iron (Fe), manganese (Mn). boron (B), molybdenum (Mo), copper (Cu), zinc (Zn) and chlorine (Cl) that are to be supplied from soil and/or fertilizers.

The top soil that will be stripped along the project route is expected to be about 25-30 cm below the ground surface which will be rich in humus (soil organic content) and have high microorganism activity. providing favorable conditions for the growth of plants. The typical composition of top soil that is to be observed homogenously within the soil content is provided in Table 6.8 (*KGM. 2013*).

Table 6.8 Typical Composition of Top Soil

Parameter	Value / Concentration
pH	6.0 - 7.5
Lime (%)	4.0 - 9.0
Minimum organic material (%)	2.5 -1 2.0
Salt (%)	0.0 - 0.15
Nitrate-N (NO_3-N) (ppm)	25
Phosphoric acid (ppm)	15
Potassium oxide (ppm)	150

Soil Sampling and Analyses

Most of the motorway route passes through agricultural lands where the historical soil contamination potential is considered to be low. However. there are quarries and waste disposal areas corresponding to the motorway route. and also some of the Camp Sites have been established at formerly disturbed areas. Thus. such sites may include contaminated lands.

Soil contamination is evaluated as a risk that may emerge during the construction and operation/road maintenance works as a result of accidental spills during transfer. mixing. and storage of hazardous materials or unexpected accidents.

In the scope of the baseline studies for the South Alternative. a program of soil sampling and laboratory analysis was conducted. Sampling locations are listed in Table 6.9 and shown on the map presented in Figure 6.5. According to the laboratory analysis results, it was determined that there was no exceedance in the values. Laboratory result forms are presented in Annex-5.

Table 6.9 List of Soil Sampling Stations

Code of the Station	Location	Sampling Date	UTMWGS84 Zone35		GEOWGS84	
			X (North)	Y (East)	Longitude (N^o)	Latitude (E^o)
T-11	Yenipazar	September 2023	4187220	606391	37.826198	28.208909
T-12	Alanlı	September 2023	4183671	597832	37.795174	28.111193

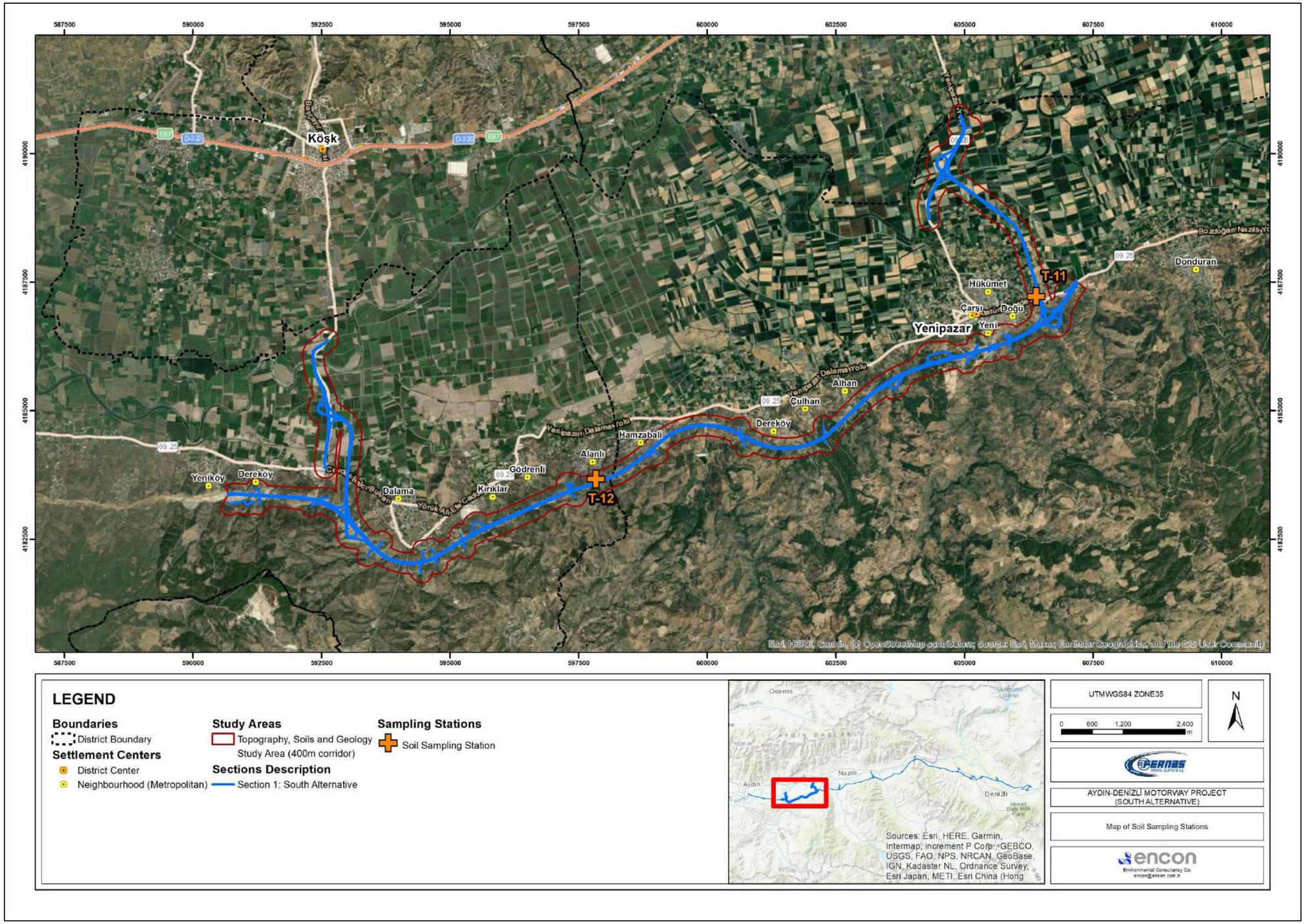


Figure 6.5 Map of Soil Sampling Stations

6.2.2 Geology

The information provided in this Section is based on a detailed literature review of the project route and its vicinity. reports compiled by related authorities such as the General Directorate of Mineral Exploration and Research. Aydın Provincial Environmental Status Report. The detailed investigation reports consisting of geology and geotechnical properties are prepared separately for different parts of the route by expert geotechnical investigation firms. Baseline descriptions are provided under the following sub-topics:

- Regional geology
  - Geological Setting and Tectonic Evolution
  - Stratigraphy
- Project area geology
  - Lithology
  - Geotechnical characteristics
  - Seismicity and Structural Geology
  - Geological features with scientific and/or cultural significance

6.2.2.1 Regional Geology

Geological Setting and Tectonic Evolution

Türkiye's geology. in general. is highly complex. and although studied to the extent of a multitude of studies by several researchers. its main features and their relations with each other are yet to be understood clearly. On the largest scale. Türkiye is separated into three main tectonic units. the Pontides. the Anatolides-Taurides. and the Arabian Platform (Ketin. 1966; from Okay. 2008). Formerly surrounded by oceans. these tectonic units are currently separated by suture zones which mark the closing regions of these oceans. A map presenting the main tectonic units of Türkiye is presented in Figure 6.6.

The Anatolides-Taurides present similarities to the continent Gondwana; however. were separated from the main mass of this continent by the southern branch of Neo-Tethys ocean. This ocean which lies in an approximately E-W direction. at the north of African-Arabian Plates. also closed approximately during Miocene by the continental collision of Anatolian Platform and Arabian Plate. The current eastern section of the Mediterranean is a remnant of this ocean. The ocean closing process is still ongoing and the active subduction zone in the Aegean Region is one of the current indicators of this condition (Okay. 2008). At the end of Middle Miocene. Southern Tethis Ocean was closed due to the continental collision that occurred along Bitlis-Zagros Suture Zone. and also around the same time. towards south of this suture zone. the Red Sea - Aden gulf was formed. pushing the Arabian Plate towards north-northeast. These two large-scale tectonic events caused the formation of North Anatolian Fault Zone (NAFZ) and East Anatolian Fault Zone (EAFZ). On the southwestern boundary of Anatolian-Aegean Plate. Aegean Region tectonic structures were also formed (due to N-S stresses) by north-northeast bound movement of the African Plate. Formation of these fault zones and tectonic structures is considered to be the beginning of Neo-tectonic period in Türkiye and corresponds approximately to Late Miocene – Early Pliocene (Okay. 2008)

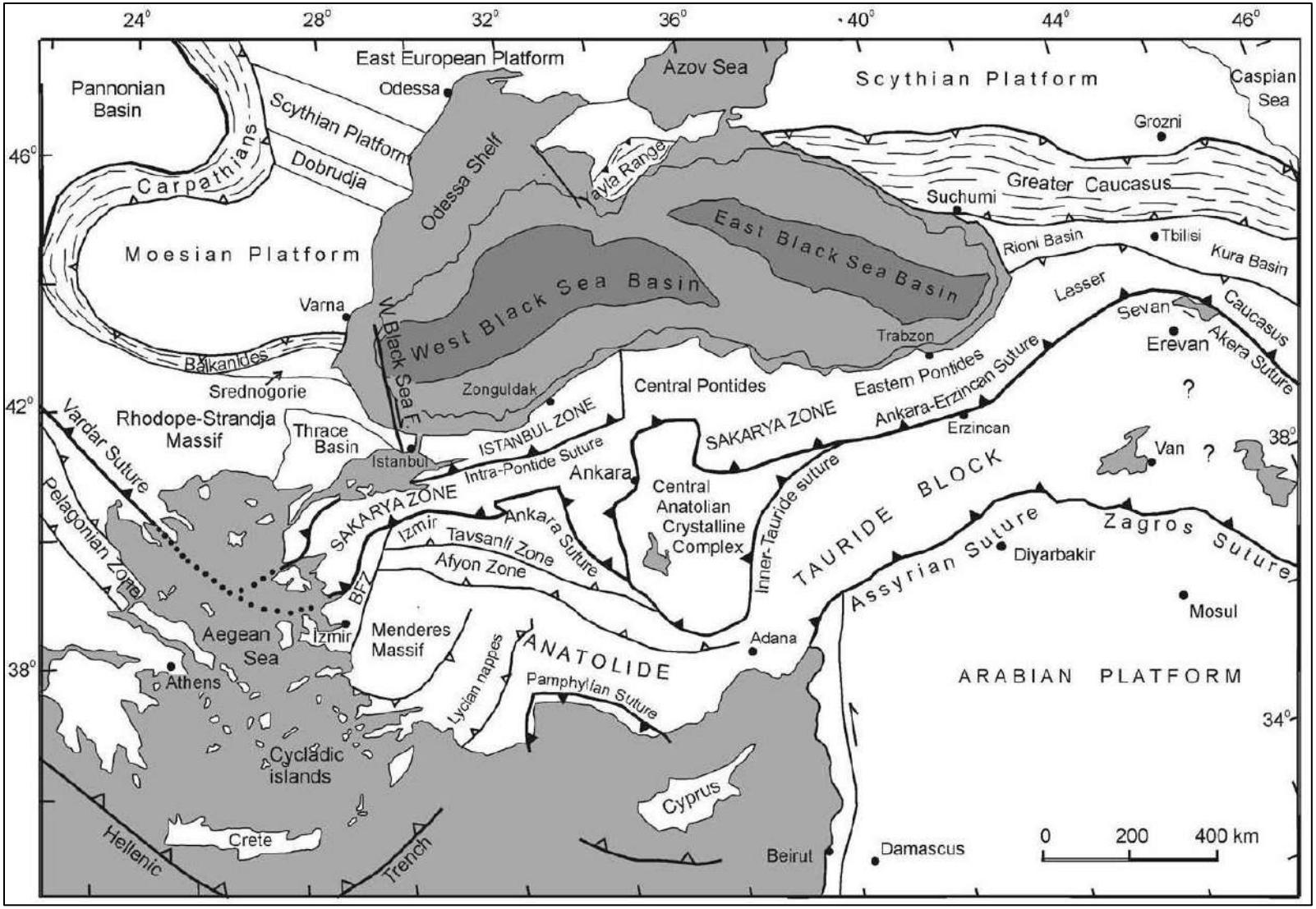


Figure 6.6 Tectonic Map of North-Eastern Mediterranean Region (*Okay, 2008*).

The Menderes Massif which is included in the Anatolides-Taurides is the main tectonic unit along the project route. The Menderes Massif is a major metamorphic complex in western Türkiye; it bears imprints of Precambrian and Eocene metamorphic and deformational events. The Menderes Massif is tectonically overlain in the south by the Lycian nappes. and in the northwest is by the Bornova Flysch Zone. East-west trending Neogene grabens subdivide the Menderes Massif into southern. central and northern submassifs. The Menderes Massif sequence is simplest and best known in the southern submassif (Çine submassif).

Stratigraphy

The South Alternative is 26.016 km long (18.744 km main road and 7.242 km access road) and passes through Aydın province. The project is associated with a significant number of geological units distributed in the geological setting. as described above. Therefore. in order to provide a compact but comprehensive description of the lithology corresponding to the project route and the area through which it passes. the general geological characteristics of Aydın province are summarized below.

Aydın

The "Menderes Massif." which spreads widely in Western Anatolia and the rock units around it are observed within the borders of Aydın province. Three groups of Menderes Massif that have a discordant relationship. the Neogene cover and quaternary aged alluviums overlying these rock units are seen in the region. In addition. the Dilek peninsula-Selçuk-Tire imprinted zone outcrops in the western part.

The Çine Group (the core of the Menderes Massif): It is composed of granitime-origin augmented gneiss meta-granite. sedimentary-origin augmented gneiss. migmatite. fine-grained banded gneiss. metavolcanite. and various schists. showing metamorphism features in almandine-amphibolite facies. It is Precambrian in age. “Kavaklıdere Group” comes over this group inconsistently.

Kavaklıdere Group (Paleozoic aged cover of the Menderes Massif): Rocks consisting of meta-conglomerate. quartzite. quartz schist. mica schist. marble. metabasic and phyllites. showing low-grade metamorphism features. form this group. It is of Lower Paleozoic-Lower Triassic age.

Marçal Group (Mesozoic aged cover of the Menderes Massif) begins unconformably with metaconglomerates and metaclastics over the Kavaklıdere group. It continues upwards with neritic carbonates. The group is of probable Upper Triassic-Lower Paleocene age. The Marçal group begins with a red basal conglomerate. Towards the ceiling. the conglomerate passes into thin-medium-thick metasandstone. metasiltstone. yellowish dolomite. and a thick succession of dolomitic limestone above it.

Muğla Group (young deposits on the Menderes Massif): B. Menderes graben massif is divided into two as North and South. Young tertiary units and the uppermost Quaternary units are alluviums in the depression basin and the basins that cut them. The rocks of the lake-swamp environment (Sekköy Formation). consisting of clayey clastic limestones. siltstone. tuff were filled in the depression basins. Pebblestone. mudstone. sandstone levels. which are the rocks of the old alluvial fan environment (Yatağan Formation). and the rocks of the lake environment (Milet Formation) observed as micritic clayey limestone. and lacustrine limestone also crop out around Didim. The infilled Neogene deposits on the active northern edge of the B. Menderes graben are more widespread than the southern margin. Younger units are encountered in the form of old terraces. mainly in the northern part. Studies on geothermal energy potential are concentrated on the active northern edge. Neogene units are also common in the Bozdoğan basin which cuts perpendicular to the Büyük Menderes graben and in the Karacasu basin. Karacasu basin has different characteristics from the mentioned basins. The products of the brackish water environment can be observed in this region.

The Quaternary Units include the braided river sediments. the Menderes river sediments. the alluvial fan. the accumulation cone. and the slope debris. as well as the young temporary lake

sediments in the Söke plain. They are levels composed of gravel. sand. silt. mud. and clay. The subsidence basin of the B. Menderes graben filled the bottom of the subsidence basin.

6.2.2.2 Project Area Geology

The geological units cropping out along the project route and their lithological features are given below from the oldest to the youngest.

Lithologies

Precambrian-Paleozoic

The Menderes Massif. through which the Gediz. Küçük and Büyük Menderes Rivers pass. covers a huge area in Western Anatolia. Although its northern and southern borders are not certain. it is surrounded by the Western Taurus Mountains in the south and the İzmir - Ankara Ofiolite Belt in the west.

The Menderes Massif contains rock assemblages that have undergone metamorphism at every degree. The core consisting of various gneisses and migmatites and two sheaths consisting of various schists. quartzite. and marbles surrounding the core are distinguished. In the core. there are austere gneisses. granitic gneisses. migmatites. siumanite-disthene-staurolite-almandirui schisted gneisses and amphibolites. The sheath zones consist of garnet-biotite-muscovite-chlorite-chloritoid-zoisite and quartz schists. phyllite. metaquartzite. calcschist. and marbles

Miocene

The Miocene aged deposits consist of sedimentary units. which are deposited in lower basins separated by horsts from which the basement rises between Kuyucak and Denizli region. Although it is claimed that the entire Cenozoic succession was deposited in the lower Pliocene period. Miocene subunits are found along the western. northern. and southern edges of the basin.

Miocene deposits crop out in the SE of Kuyucak. around Azizabat. between Bucak and Yamalak. between Kabaağaç and Kumluca and around Babadağ. The presence of a red-colored conglomerate unit at its base is known from the limited exposures and drilling sections made in the nearby Kızıldere Geothermal Field. Above this. it is observed that a unit consisting of white-cream. pinkish-naphthyous mottled and yellowish colored soft clayey marl and fissured claystones is observed to crop out especially in the north and northwest of Babadağ. Above it. the succession consists of a hard. cherty. cream colored. medium-thick bedded limestone; alternation of white hard limestone and yellowish carbonate sandstone; and white. cream. yellowish beige clayey limestone. marl and claystone.

The dominant lithology in the west includes chalky limestone around Azizabat. hard and thick layered carbonate sandstone and limestone around Bucak. and thick bedded limestone with chert nodules in the south of Tekke and Tırkaz. The remaining units consist of limy or clayey mam and claystone.

Quaternary

Alluvium

The alluvium deposited along the Büyük Menderes River. Akçay valleys. and the streams. accumulation cones. and slope debris on the slopes started to develop in the region from the quaternary. Towards the middle of Büyük Menderes and Akçay Plains. alluviums contain mostly Fine Sandy clay+silt sized material. On the slopes of the slope and towards the Akçay Spring. the alluvial ground gains coarse-grained character.

It is observed mainly on the skirts of the topographic elevations formed by the Paleozoic aged units. It consists of a mixture of reddish. dark brown. clay - sand - gravel. and blocks. The pebbles and blocks are of calcschist, chlorite schist marble and limestone origin and are angular-semi-angular.

Seismicity and Structural Geology

Türkiye is located in one of the most actively deforming regions in the world. The tectonic in and around Türkiye depends on relative motions between the African. the Aegean. the Arabian. the Anatolian. the Black Sea. and the Eurasian plates. Neotectonics in Türkiye is mainly governed by the following three tectonic elements (*Kasapoğlu and Toksöz. 1983; Bozkurt. 2001; from Bayrak et al. 2011*):

- A convergent plate boundary where the African Plate to the south is subducting beneath the Anatolian Plate to the north
- The dextral North Anatolian Fault Zone
- The sinistral East Anatolian Fault Zone

Western Türkiye is located in one of the most seismically active regions in the world. owing to the fact that this region is located close to three large plate boundaries that are in constant movement (Taymaz et al. 1991). The kinematics of the regional deformation of the Aegean-Anatolian region is controlled by three critical factors (Figure 6.7). These are the westward motion of the Anatolian microplate relative to the Eurasian plate. the collision between northwest Greece-Albania and the Apulia-Adriatic platform. and the presence of the Hellenic subduction zone to the south of the Aegean province (Taymaz et al.. 1991).

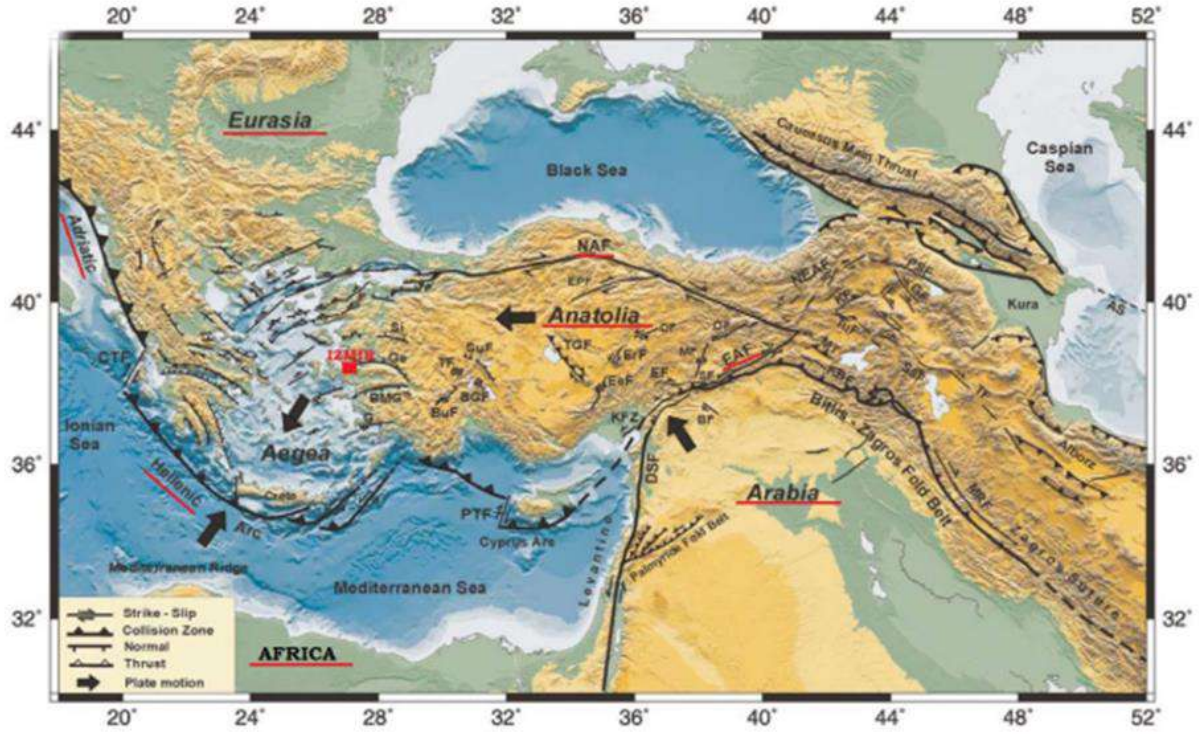


Figure 6.7 The eastern Mediterranean region. including faults and relative motions between plates/microplates

The westward motion of the Anatolian microplate is related to a collision in eastern parts of Türkiye and the Caucasus between the Arabian plate in the southeast and the Eurasian plate in the northwest. This motion is accommodated along two large well known strike-slip faults. namely “North Anatolian Fault Zone (NAFZ)” and “East Anatolian Fault Zone (EAFZ)” which has right lateral and left lateral displacement. respectively (Taymaz et al. 1991). The collision between the Arabian and the Eurasian plate causes a crustal thickening. and the effect of the crustal thickening provides a buoyancy force that drives the Anatolian plate westwards. a process which has started about 12Myr ago back in the mid-Miocene (Taymaz et al. 1991).

The collision of the Arabian plate with the Eurasian plate is still active. This is causing the accumulation of high topography in eastern Türkiye and the Caucasus. driving the westward motion of the Anatolian and the Aegean plate. Continental materials are still being pushed over the oceanic crust of the eastern Mediterranean. forming the Hellenic subduction zone and the subducting slab beneath the Hellenic trench. thus maintain the present extension seen in the Aegean area (Taymaz et al.. 1991). This extension is oriented NNE-SSW direction.

The project area is located in the Aegean region which is dominated by horst and graben systems divided by various normal faults. The Great Menderes Fault Zone (GMFZ) which causes destructive earthquakes at that part of Türkiye. is about 200 km long and 10-100 m wide and has a right lateral character.

The locations of the epicenters of the historical earthquakes with a magnitude greater than 5 that occurred in Aydın province between 1900-2023 are summarized in Table 6.10 and their locations are shown in Figure 6.8.

Table 6.10 M ≥ 5 Earthquakes in the Region

No	Date	Latitude	Longitude	Ms
1	08.03.1908	37.80	27.80	5.0
2	07.08.1910	37.80	28.70	5.3
3	13.11.1918	37.80	27.30	5.2
4	28.09.1920	37.89	28.35	5.7
5	16.07.1955	37.65	27.26	6.8
6	04.05.1966	37.74	27.71	5.2
7	07.05.1966	37.79	27.75	5.0
8	23.03.1969	37.90	27.60	5.0
9	11.10.1986	37.94	28.56	5.6
10	11.11.2010	37.86	27.39	5.0

Source: www.deprem.afad.gov.tr

According to the earthquake hazard map of Türkiye which was prepared by Disaster and Emergency Management Presidency the ground acceleration rate (PGA 475) of the Aydın province vary between 0.4g and 0.6g. except for the Yenipazar region. The ground acceleration rate is about 0.6g at the northern part of the Yenipazar. The earthquake hazard map of Türkiye is presented in Figure 6.9. whereas the active fault map of the project route is given in Figure 6.10.

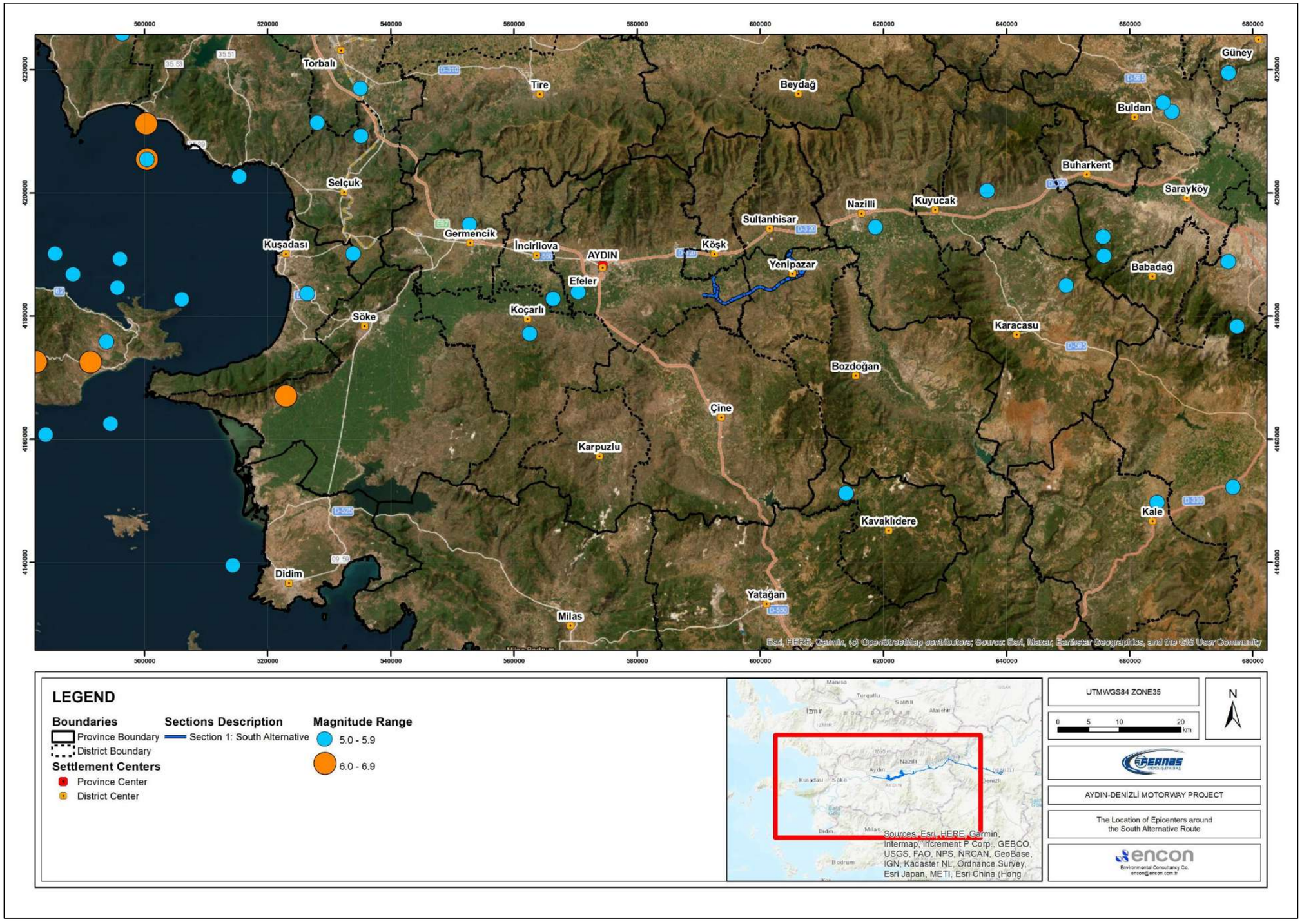


Figure 6.8 The location of epicenters around the South Alternative (Source: deprem.gov.tr)

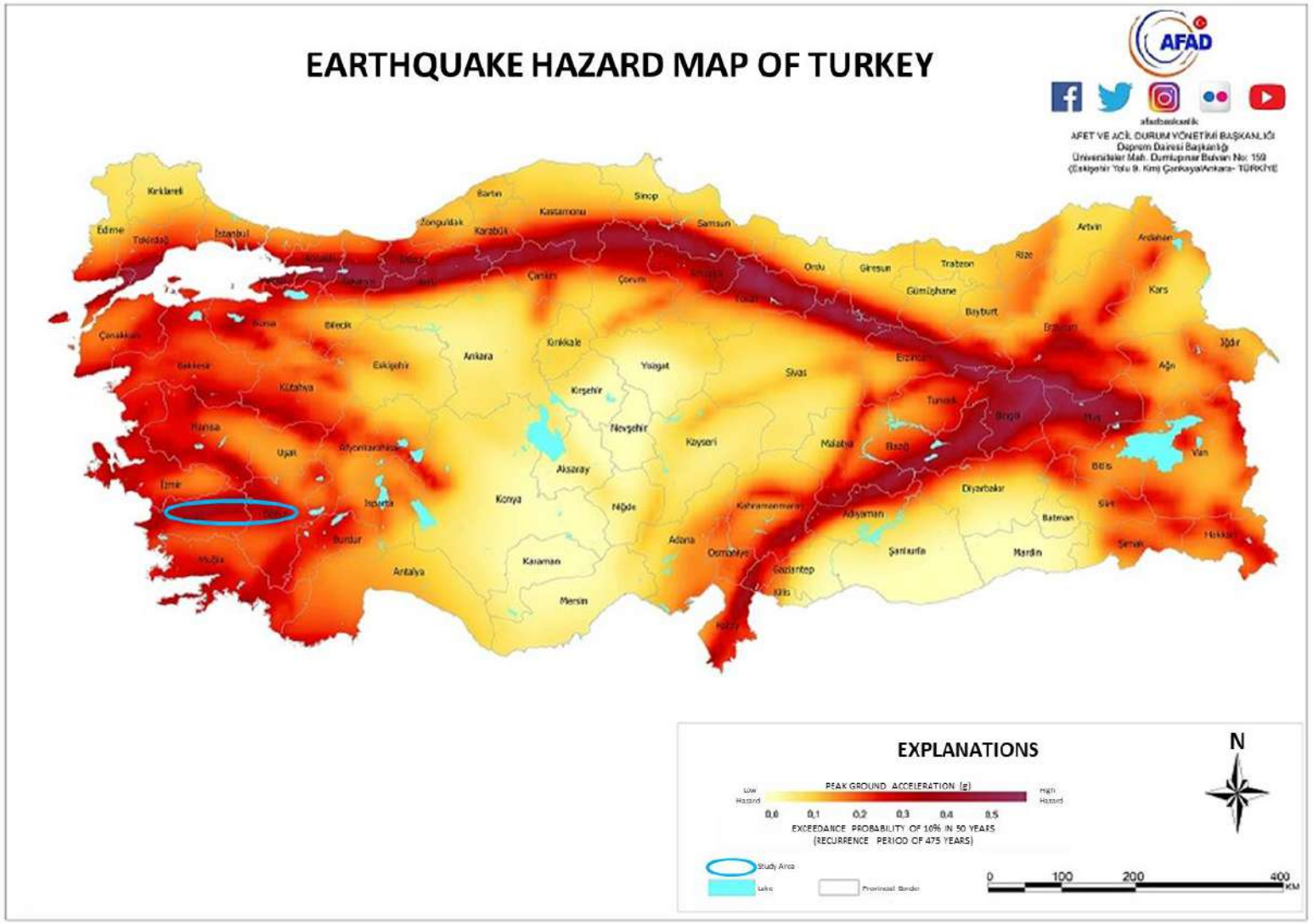


Figure 6.9 The location of Study Area on the Earthquake Hazard Map of Türkiye (Source: deprem.afad.gov.tr)

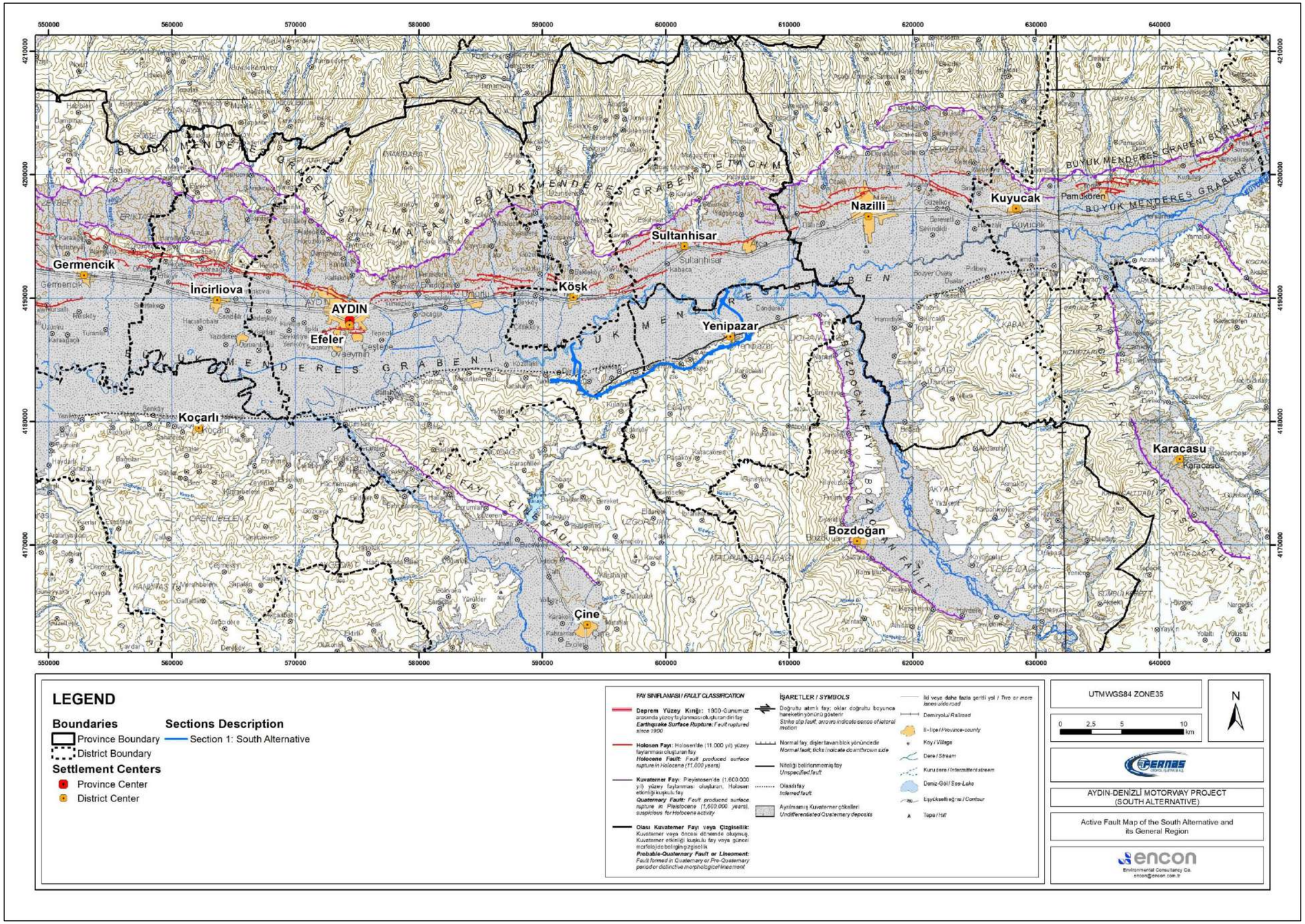


Figure 6.10 Active Fault Map of the South Alternative and its General Region (*yerbilimleri.mta.gov.tr*)

6.3 Potential Impacts

Direct impacts on topography and soil and geotechnical risks will be a concern mainly during the construction phase of the project since the operation activities will not include direct and/or extensive physical interaction with the environmental components. The risk of soil contamination due to accidents and geotechnical and seismic hazards would be the primary concern for the operation phase. Assessment of the impacts for the land preparation and construction and operation phases. in consideration of the baseline conditions. is provided in the following headings.

6.3.1 Land Preparation and Construction Phase

The South Alternative will involve significant earth moving activities and civil works in the construction phase. In this scope. top soil stripping activities. cut and fill operations. and other construction works may cause impacts on the existing soil conditions if not adequately mitigated. Additionally. geotechnical risks along the motorway route have to be accurately identified to ensure the safety and stability of the large project structures to be constructed. Mitigation measures will be taken in order to minimize the risk of erosion. geotechnical risks. and risk of soil contamination during the activities due to any spill or leakage.

6.3.1.1 Impacts on Topographical Conditions

Topographical conditions play an important role in the design and construction of a motorway, as planning of cut and fill; design and construction of the road alignment (e.g. curves) and engineering structures (e.g. viaducts, excavations, embankments, etc.); measures to be taken against geotechnical risks such as landslides, etc. are directly related to topography. In addition, operation and maintenance costs are also affected by the topographical conditions of the selected route.

Excavation (cut) and filling (embankment) operations to deal with the topographic conditions along the selected motorway route will cause permanent changes in the topography along the entire route. Cut and Fill calculations for the South Alternative are ongoing.

6.3.1.2 Impacts on Soil Environment

Potential impacts of the land preparation and construction activities on the soil environment may include soil disturbance (e.g., loss of fertile top layer, mixing of soil layers and types, soil compaction, etc.) due to top soil stripping, cut and fill operations, construction of road structures and extraction of construction materials at the quarry sites; soil erosion and soil contamination due to unexpected leakages or spills. Further evaluation of the potential impacts is provided in the following paragraphs.

Soil Disturbance due to Earthworks, Construction and Materials Extraction

Soil disturbance will occur at all sites where top soil stripping, excavation, construction activities, including operation of heavy machinery and materials extraction operations, will be conducted.

<u>Top Soil Stripping</u>

Top soil corresponding to the footprint of the project components (road body, excavation and embankment sites, engineering structures, quarries etc.) will stripped to a sufficient depth (expected to be about 20-30 cm depending on local soil conditions) prior to the start of construction activities. Table 6.11 presents the estimated amount of top soil to be stripped from project sites. The land-use characteristics along the expropriation area were determined based on the CORINE 2018 database.

Since construction Camp Sites have already been established, these sites have not been included in the assessment. Also, the quarries are not included in the calculations.

If not properly managed, top soil itself or its vegetative properties along the motorway route may be lost throughout the construction phase due to erosion or mixing with coarse or contaminated soils. Thus, top soil management measures have to be applied in the scope of the project as described in the following sections.

Table 6.11 Top Soil Volume Estimated to be Stripped from Project Sites

Top Soil Thickness (m)			Corresponding Area** (m^2)			Estimated Volume of Corresponding Top Soil (m^3)			
Agricultural	**Forest**	**Pasture / Steppe**	**Agricultural**	**Forest**	**Pasture / Steppe**	**Agricultural**	**Forest**	**Pasture / Steppe**	**Total (m^3)**
0.25	0.15	0.075	1,323,820.56	4,217,001.00	-	330,955.14	632,550.15	-	963,505.29

**CORINE 2018 data are used for the area calculations.*
***Camp sites and quarries are not included in the calculations.*

Cut and Fill Operations

Depending on the topographical conditions, excavation and fill works will be conducted along the motorway route and at the foundations/portals of the engineering structures. Excavation works to be conducted in this scope is summarized below:

- Excavations to be done along the motorway route in order to develop road body;
- Excavations to be done in order to remove weak soils corresponding to the road base;
- Excavations to be done at material borrow sites to provide fill material;
- Excavations to be done to prepare foundations of the engineering structures, drainage structures, etc. to be constructed.

Excavation and fill volumes have been given previously in Table 6.11. Depending on the quality and quantity of the excavated materials, they will be used as fill materials as suitable.

The South Alternative have resulted in the removal of vegetative cover along its 26 km route and also at quarries and excavated material storage sites. The earthworks and construction activities will be conducted within the expropriation corridor, which will have a width of 100 to 350 m, but the direct physical interaction with soils will occur at the footprint of the project components (i.e., road body, portals, and foundations of engineering structures, etc.). The potential impacts of soil erosion on the receptors/resources will vary depending on the existing exposure levels of soils. As can be seen from Table 6.6, the South Alternative is sensitive in terms of soil erosion impact. Within the study area, approximately 42.59% (589.75 ha) of the study corridor corresponds to soils with severe erosion levels (Level 3). This is followed by no or very low erosion level (Level 1), which accounts for about 33.32% (461.33 ha) of the study corridor. Soils with very severe erosion levels (Level 4) occur in about 11.41% of the study corridor. Soils with moderate erosion levels (Level 2) along the study corridor account for approximately 8.47% of the area. The amount of soils that will be mobilized will depend on the construction techniques.

Soil Contamination

Soil contamination may occur in several ways during the land preparation and construction phase (e.g., construction and materials extraction works) of the project as described by Joint Assistance to Support Projects in European Regions (*JASPERS, 2010*) in the Sectoral EIA Guideline for motorway and Road Construction Projects. This may contribute to any historical contamination present at the works sites or deposition of pollutant substances (SO_2, NO_x, and Heavy Metals) that occur by means of rain and snowfall. Potential sources of soil contamination for the project, for which mitigation measures will be developed and taken, are listed below (*JASPERS, 2010*):

- Spreading on and infiltration in the soil of pollutant substances as a result of uncontrolled or accidental discharges, spills or leakage of hydro-carbons (oils, lubricants, fuels, dyes, solvents) along the motorway construction corridor (i.e., from construction machinery) and at work sites including asphalt plants, concrete plants, etc. during transfer, mixing, storage or use of substances;
- On soil deposition of dust possibly contaminated with other air pollutants resulting from earthworks, loading, and unloading of raw materials, construction traffic, asphalt plants, concrete plants, etc.;
- On soil spreading of leakage from sewerage network and of water loaded with binders, cement milk, and suspensions from the platforms of concrete plants or from the locations where concrete is used;
- Infiltration in soil of leachate from uncontrolled deposits of wastes and construction materials.

It is not possible to estimate the amount and frequency of accidental spills or leakage of hazardous substances due to the nature of the contamination process. It is anticipated that the incidents would take place only occasionally, and since response measures will be taken immediately, any spill or leakage would be ceased before it reaches significant amounts. It should be noted that, due to its nature, the project will not involve the use of hazardous materials in significant amounts; thus the magnitude of any spill or leakage at one time would be limited.

Contaminated Land

Land is considered contaminated when it contains concentrations of hazardous substances or oil above background or naturally occurring levels due to historical activities. Contaminated land mapping poses a risk to the health of the construction workforce and the ecology. It may also impose liabilities (e.g., remediation costs, damage to the business reputation and/or business-community relations) on the owner planning activities at such sites (IFC, April 2007).

Some of the Campsites were established in formerly degraded areas. Therefore, such sites may contain contaminated land. Furthermore, as part of the preparation of the sites for construction, soil remediation works and/or removal of existing layers of disturbed soils, particularly in disturbed areas, are being considered to ensure geotechnical stability during construction. Therefore, treatment of contaminated soils may be an important issue to avoid interaction of contaminated and uncontaminated land through transport or release of contaminants.

6.3.1.3 Geological and Geotechnical Risks

The geotechnical and geological investigations of the baseline are conducted to ensure the requirements for stability of the road during the construction and operation phase and that the route selection process reflects these characteristics. Geotechnical assessments are also required to assess the stability, settlement, and integrity of the designed structures. Thus, the significance of instability and erosion potential of soils is first and foremost defined by the various applicable minimum design factors and the corresponding geological and geotechnical properties required to achieve the design standards. From a purely environmental perspective, the main concerns would be related to soil erosion so that local environmental quality is not affected adversely.

Stability and Landslide Risks

Boring activities were carried out by the project Sponsor to identify geological formations and geotechnical risks along the motorway route. According to the Final Design Report (2005), the road sections along South Alternative consist of soft rock that is difficult to erode. The assessment of potential landslides along the project route has also been carried out according to the 1/500.000 scale MTA Landslide Risk Map (Figure 6.11). According to Figure 6.11, there are no landslide risk areas along South Alternative. Old and active landslide areas are observed in the northern part of the South Alternative where the nearest active landslide area is located approximately 6 km north of Dalama.

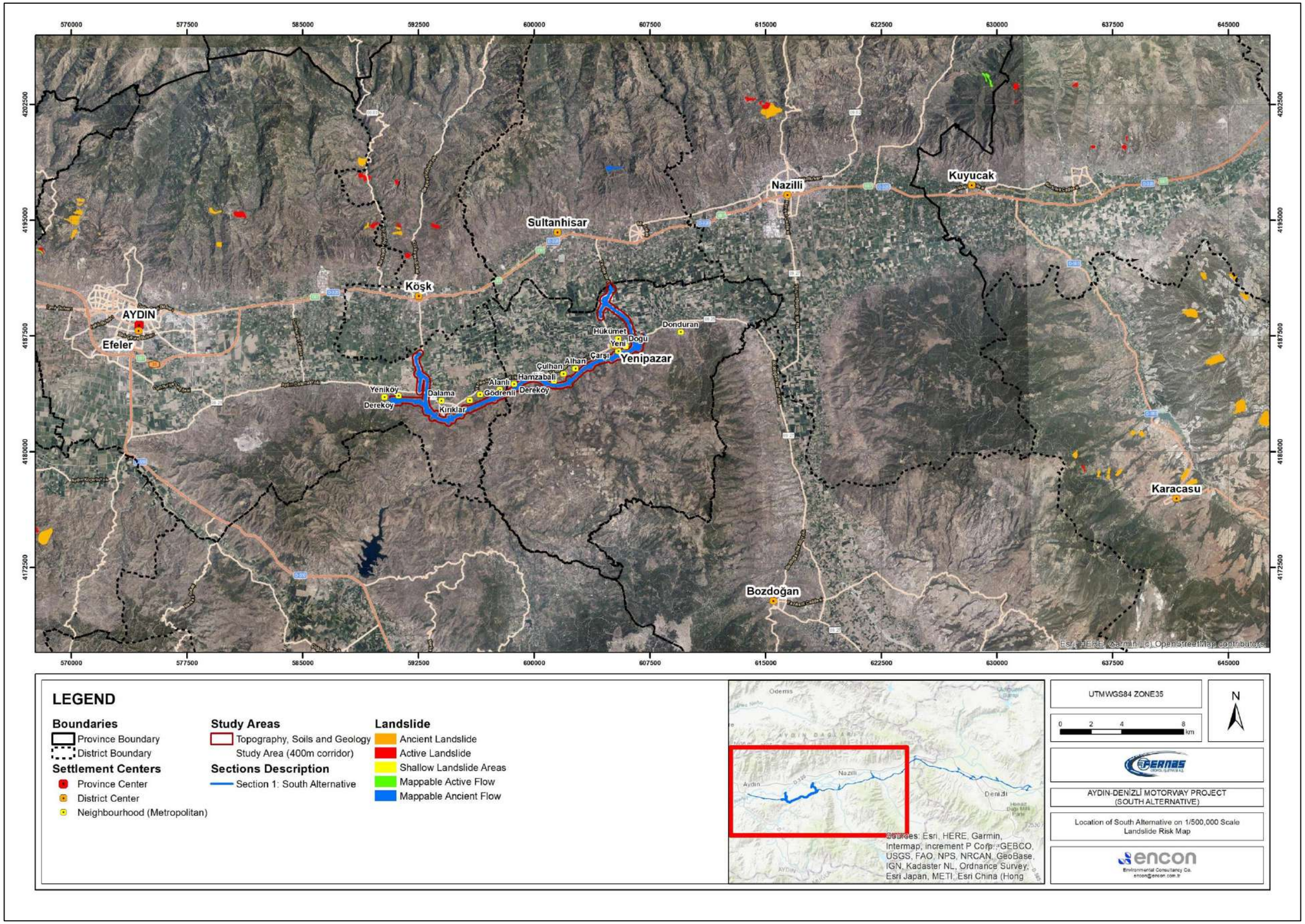


Figure 6.11 Location of South Alternative on 1/500.000 Scale Landslide Risk Map (yerbilimleri.mta.gov.tr)

Seismic Risk

The Earthquake Hazard Map of Türkiye, prepared by the Disaster & Emergency Management Authority Presidential of Earthquake Department, has been prepared with very detailed data, considering the most recent earthquake source parameters, earthquake catalogs, and new generation mathematical models. In the map, the highest ground acceleration values are shown instead of earthquake zones, and the concept of "earthquake zone" is eliminated. It assumes that a normal construction, which has 50 years of economic life, may not be exposed larger than these expected maximum acceleration values with 90% probability. For the important structures or buildings that have longer economic life, maximum acceleration values should be calculated. According to the earthquake hazard map of Türkiye, the ground acceleration rates (PGA 475) of the Aydın province vary between 0.4g and 0.6g, except for the Yenipazar region. The ground acceleration rate is about 0.6g at the northern part of the Yenipazar district.

Consequently, seismic protection is one of the most critical design issues for the motorway. Detailed investigations were conducted for assessing the stability conditions for the structural elements for both normal operation loads and under seismic loads. The motorway is required to be designed and built to stringent Turkish and international engineering standards that will minimize the potential damage in the event of an earthquake. In the design of the engineering structures, the Standard Specifications for Highway Bridges published by the American Association of State Highway and Transportation Officials (AASHTO) has been used. In the seismic calculations, the Standard Specifications used for the seismic design of the highway bridges have been taken as a basis. Where required, project-specific revisions have been/would be done with the approval of KGM to adapt these specifications to the project adequately.

6.3.2 Operation Phase

In the operation phase, the activities will not involve any additional physical interaction; thus no additional significant direct impact on topography, soils, and geological conditions is anticipated under normal operating conditions.

On the other hand, soil contamination risks may be sourced from the improper handling of the hazardous materials to be used in the road maintenance activities and leakage/spill of fuels, chemicals, etc., during unexpected accidents. The associated impacts would be similar to the impacts described for the construction phase, and a similar mitigation strategy would be adopted for the mitigation of the potential effects. On the other hand, seismic risks would be of concern for the entire operational life of the motorway; thus, further evaluation on the potential risks and mitigation approaches is provided below.

Impacts on Soil Environment

Impacts on the soil environment are anticipated to be limited in the operation phase. They may include soil erosion and degradation on road embankments and soil contamination that may be sourced from the improper handling of the hazardous materials to be used in the road maintenance activities and leakage/spill of fuels, chemicals, etc. during unexpected accidents. JASPERS (2010) list the potential impacts for operation phase in its Sectoral EIA Guidelines for motorway and Road Construction Projects as follows:

- Soil erosion and pollution along the road route due to the meteoric water flowing down on road embankments;
- Soil degradation along the route due to works for road embankments maintenance;
- Accidental, incidental, and seasonal soil pollution from:
    - Spreading on and infiltration in the soil of pollutant substances following the traffic accidents or failures (especially but not only in the liquid freight transport), incidental discharges of substances used for road maintenance, snow-melt loaded with de-icing chemical products or sand;

- On soil deposition of traffic pollutant substances (SO_2, NO_x, and heavy metals) from rain and snowfall.

In addition, deicing agents to be used in colder winter conditions and herbicides that may be used for the management of vegetation in the right-of-way may be potential sources of soil contamination during the operation phase.

6.4 Mitigation Measures

Mitigation measures to be taken for the protection of soils and minimization of geological/geotechnical risks during the land preparation and construction and operation phases of the South Alternative is described below. Basically, KGM's technical specifications will be adopted in developing the mitigation strategy as they include well-established practices developed in line with the relevant international standards and guidelines.

An Emergency Preparedness and Response Plan (see Annex-3) has been developed for the project. In addition to the measures described in this Chapter, relevant measures will be taken in case of soil contamination incidents in accordance with this Plan.

6.4.1 Land Preparation and Construction Phase

Mitigation measures to be taken to avoid and/or minimize impacts on soil environment during the land preparation and construction phases of the Project are described below. Topography was one of the most critical environmental criteria considered in the route selection process. It has been aimed that the route and the motorway design conforms with the existing topographical conditions to the maximum extent possible. To avoid the extraction of additional material from quarries/material borrow sites and increased interaction with the topography, excavated materials will be reused wherever the quality and quantity of the material are adequate. Further planning will be done to identify the source of the additional material extraction and storage site requirements. Necessary assessments will be conducted for other sites to be identified outside of the Supplementary ESIA study corridor.

Measures to be taken to Minimize Soil Disturbance

Principally, the area of the temporary work sites and permanent project units will be limited to minimize the amount of soils to be disturbed. For this purpose, working sites will be bordered by means of proper methods (i.e. fencing, marking, etc.), and the construction workforce will be informed about not breaching the predetermined borders. Additionally, drivers of the construction machinery and equipment will be trained to use only prescribed routes to minimize the area to be physically interacted. Other project-specific measures to be taken in each relevant subject are further described below.

Top Soil Management

Measures to be taken to minimize the loss of top soil and its vegetative structure are described below:

Stripping and Temporary Storage of Top Soil

Prior to construction activities, fertile top soil available at the project area (motorway route, quarry/material borrow sites, storage sites, etc.) will be stripped to sufficient depth (expected to be about 20-30 cm depending on local soil conditions). It will be stored separately from other coarse materials/soils (subsoil) at top soil storage areas to be designated along the motorway route (within the expropriation corridor) or other work sites under conditions suitable for the conservation of

vegetative properties. The following procedures will be followed in accordance with KGM's Technical Specifications and good site practices in the scope of top soil stripping and storage practices:

- To avoid soil compaction, stripping operation will not be done when soil is wet.
- Seed, tuber, rhizome, situated on the top soil, which can be reused in rehabilitation works, will be collected and stored separately.
- The average height of top soil stacks will be 1.5 meters. The side slope of these stacks will not exceed 3:1 (h:v).
- Drainage of top soil storage areas will be provided by open channels. In order to minimize the amount of rain water that can infiltrate into the top soil stack, the upper parts of the top soil stacks will be compressed. Excessive compression can cause anaerobic conditions. Therefore, compression operations will be carried out mildly.
- If it is necessary, soil stacks will be protected against the risk of floods by creating berms of adequate height.
- In the case of long term storage of top soil, soil compaction and reduction in organic content of the soil may occur. In this context, if the storage will last for more than three months, the upper part of fertile soil will be planted temporarily in order to conserve organic content. In planting operations, selected species of legume and grails will be used in proper seed mixture ratios.
- Organic (grass, etc.) or inorganic (polyethylene, etc.) materials will be applied on the top soil to be stored to improve its quality and avoid erosion, desiccation or invasion of wild herbs.

Reinstation of Top Soil

Top soil stripped and stored in suitable conditions will be reused in the rehabilitation of temporary construction sites upon completion of construction activities, on the finalization of side slopes and/or in the scope of landscaping activities. The following procedures will be followed in accordance with KGM's Technical Specifications and good site practices to ensure the effectiveness of the reinstatement process:

- Sub soil will be loosened by hand or machinery to a depth of 15 cm prior to the reinstation of top soil. For compact or heavy clay soils, loosening depth is to be increased up to 40-50 cm.
- Following the loosening operation, ground will not be leveled before the reinstation of top soil so that a favorable rough surface is obtained for the adsorption of top soil.
- Average depth of top soil to be reinstated on regular lands will be 15 cm.
- Depth of top soil for areas to be planted will be as follows:
  - Side slopes : 10 cm
  - Areas to be germinated : 15 cm
  - Shrub plantation areas : 45 cm
  - Tree roots : 70 cm
- Following the reinstation of top soil, grading operations will be conducted in alignment with the natural slope and drainage conditions. Any stone, grass, or undesired materials will be removed to the extent possible, and the land will be prepared for the upcoming planting operations.
- The combined thickness of topsoil and the vegetative growth layer will not be less than that prevailing in the undisturbed areas.

Soil Erosion Minimization and Control

The following procedures will be followed in accordance with KGM's Technical Specifications and good site practices to minimize and control soil erosion at the project sites and their surroundings:

- Erosion control measures (e.g., geotextile filter barriers that would reduce the flow velocity and trap the sediments, drainage channels, settling structures, etc.) will be

implemented along the route prior to the start of construction works in order to reduce or prevent off-site sediment transport during construction. Temporary erosion control measures will be moved forward as the construction progresses.

- Mulching will be applied to stabilize exposed areas, where stripping and excavation works will be planned.
- Activities will be modified or suspended during extreme rainfall and high winds to the extent practical.
- Contouring will be applied, and the length and steepness of slopes will be minimized.
- All the earthworks will be structured at the end of each workday to control probable surface run-off due to precipitation and minimize associated erosion.
- All the water flow coming from the areas surrounding the worksites and from the side slopes will be diverted by means of temporary channels, earth banks and temporary engineering structures to avoid mixing of clean (non-contact) and contaminated (contact) runoff.
- Erosion control measures will be implemented at the outlet of culverts.
- At the outlet of the erosion control structures, relevant measures (i.e., use of riprap) will be taken to reduce the flow velocity and erosion impact.
- Following the completion of base excavations, permanent erosion control measures will be taken, and slope improvement works will be conducted.
- Dikes will be formed around the excavated material storage sites in order to prevent the loss of soil due to erosion.
- Channels and ditches will be designed in consideration of post-construction flows.
- Following the completion of the concrete lining of the drainage ditches, temporary erosion control structures will be dismantled, and the sites will be rehabilitated.
- Temporary service road gradients will be limited to reduce runoff-induced erosion.
- All the worksites will be revegetated to the extent possible promptly following the completion of works at that site.

Avoidance and Minimization of Soil Contamination Risk

Oil, fuel, dye etc., may spill or leak at the construction sites during transportation, storage, preparation, or use. Training will be provided to the personnel working with such substances to minimize the risk of accidents. For accidents that cannot be avoided by taking relevant measures, immediate response measures will be implemented in accordance with the Emergency Preparedness and Response Plan presented in Annex-3 in order to prevent dispersion of contamination. The actions to be taken to avoid and/or minimize soil contamination are as follows:

- Any substance/material that would result in soil contamination will not be allowed to be discharged onto the soil environment;
- Any spill or leakage event will be responded in accordance with the procedures described in the Emergency Preparedness and Response Plan (see Annex-3);
- Proper construction machinery and equipment endowed with low polluting engines will be used to minimize deposition of air pollutants on soils;
- Wastes and wastewaters to be generated as a result of project activities will be properly managed in line with the requirements of national legislation as well as IFC EHS Guidelines as described in detail in Chapter 7 (“Use of Resources and Wastes”) and Chapter 8 (“Water Resources”). In this context, direct contact of the uncontrolled wastes and wastewaters with soil environment will be avoided by taking relevant measures;
- Hazardous wastes and materials (i.e., diesel fuel oil, degreasers, solvents, etc.) will be handled at designated areas in accordance with the Hazardous Wastes Management Procedure developed as a part of the project-specific Environmental and Social Management Plan presented in Annex-6. In this respect, contact of hazardous wastes and materials with soil resources will be prevented by taking relevant measures (e.g., storage on the impervious ground, personnel training).

Management of Contaminated Lands

Management of contaminated lands is essential to avoid risks on human health and ecology. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release will be identified and actions will be taken to avoid further releases and associated adverse impacts. The following measures will be taken:

- Relevant provisions of the Turkish Regulation on the Soil Pollution Control and Sites Contamination by Point Sources, which are basically in line with IFC's risk assessment and management approach for the contaminated lands, will be complied with to manage potentially contaminated sites. The collaboration will be made with local authorities for the identification and management of the sites.
- Construction personnel will be trained on the identification and management of potentially contaminated sites. In case of an encounter, local authorities will be informed, and their directions will be followed regarding the management of contaminated sites. Measures will be designed on a case-by-case basis depending on the scale and content of the contamination.

6.4.2 Operation Phase

Even though operation activities will not involve direct physical impact on topography and soils, mitigation measures will be taken to minimize and control soil erosion that may continue to be a risk at the embankment areas, exposed soils, quarry sites, etc. if not properly managed. Similarly, emergency preparedness and response measures will be in place against the risk of soil contamination due to probable road accidents, activities at the maintenance and operation centers and service areas. Similarly, the effectiveness of the design measures taken against geological and geotechnical risks will be ensured throughout the operation phase by taking the required management measures. Measures to be taken during the operation phase are detailed under the following headings.

Soil Erosion Control during Operation

- Soil erosion process during road operation will be prevented and/or minimized by timely strengthening and rehabilitation of the road and scheduling against heavy rainfall periods.
- On-site control of all erosion control structures will be done once a week. In cases when the precipitation amount exceeds 10 mm in 24 hour periods, all the erosion control measures and their conditions will be checked on site. If required, relevant structures will be maintained appropriately.
- Embankment and cutting slopes will be checked by competent persons at least once a year (preferentially following spring months) to identify any erosion, landslide, stability, etc., risks.
- Erosion control structures will be cleaned when half of their capacity is filled with sediment. Damaged structures or structures that are not functioning properly will be maintained/ restructured.
- Stormwater management measures that are designed to slow peak runoff flow, reduce sediment loads, and increase infiltration will be kept functional. These may include vegetated swales planted with salt-resistant vegetation, terracing, detention ponds, and basins, etc.
- Proper erosion and sediment control measures will be used during road paving works to decrease runoff from repair sites.
- Afforestation activities will be conducted according to the Afforestation Plan presented in Annex-4 to reduce the risk of erosion on a large scale.

Soil Contamination Avoidance/Minimization and Response

- Against the risk of soil pollution due to road accidents that may result in the spill of hazardous liquids or substances on the road surface and surrounding areas, actions defined in the Emergency Preparedness and Response Plan (see Annex-3) will be implemented.
- Low polluting de-icing products will be used in the scope of the deicing operations. Additional measures defined in Chapter 8 ("Water Resources") for the road deicing operations will also contribute to the protection of soil resources.
- Treated effluents and wastes from the operation and maintenance centers as well as services areas will be discharged/ disposed of in accordance with the requirements of the national legislation and IFC's EHS Guidelines. Relevant measures for waste and wastewater management are described in Chapter 7 ("Use of Resources and Wastes") and Chapter 8 ("Water Resources").

Geotechnical Safety

In the design of the engineering structures, Standard Specifications for Highway Bridges published by the American Association of State Highway and Transportation Officials (AASHTO) has been used. In the seismic calculations, the Standard Specifications used for the seismic design of the highway bridges have been taken as a basis. Where required, project-specific revisions have been/would be done with the approval of KGM to adequately adapt these specifications to the project.

Foundations and legs of the viaducts as well as other structural elements will be controlled by competent technical personnel at least once a year (preferentially in April) to identify any structural motion, undermining, maintenance requirements, etc. that may pose risks to the durability of the structures and take the relevant corrective measures.

In case of natural disasters (i.e., earthquakes) that may risk the structural safety of the project structures, the operation personnel will conduct visual inspections, take immediate actions (e.g., communication with local people, restricting access to risky areas, etc.) and collaborate with local emergency response authorities to prevent any adverse impact on the health and safety of the local people or users of the motorway.

6.5 Summary of Assessment and Residual Impacts

Table 6.12 provides a summary of the assessments for impacts on topography, soils, and geology. The significance of the effects identified before and after the implementation of mitigation measures are summarized in this table. As can be seen from the Table, potential impacts on the relevant environmental components are anticipated to be reduced to low levels in the long run with effective implementation of mitigation measures, except the changes in the topography. It should be noted that a certain period of time (from months to years) will be needed to ensure that the residual impacts are adequately mitigated to acceptable levels as measures such as rehabilitation of temporary project sites against erosion or afforestation take time to show their effectiveness. Erosion and soil contamination risks are manageable by trained personnel through well-established site management plans. Thus, once the mitigation measures described in the Supplementary ESIA Report are implemented, no significant risk would be posed by the construction and operation activities of the project. Regarding seismic and geotechnical risks, international and national standards have to be strictly complied with the design of the motorway to reduce the residual impacts to acceptable levels and avoid intolerable consequences that may risk the health and safety of the nearby communities and users of the roads and integrity of the motorway components in case of seismic events.

Table 6.12 Summary of the Topography, Soils and Geology Assessments

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Topography and Soils	Land preparation and construction	Change of existing topographical conditions due to cut and fill operations; Disturbance of soils	Adverse	Restricted	Long	Medium (for linear project with 26 km length, 100-350 m expropriation corridor)	Irreversible	One-off	Moderate (B)	Medium (2) (Natural topograpghy)	Medium (B2)	• Motorway have been designed and will be constructed in conformity with the existing topographical conditions to the maximum extent possible. • Excavated materials will be reused whereever the quality and quantity of the material is adequate, to avoid extraction of additional material from quarries/material borrow sites. Further planning will be done to identify the source of the additional material extraction and storage site requirements. Necessary assessments will be conducted for additional sites to be identified outside of the Supplementary ESIA study corridor. • Working sites will be bordered by means of proper methods (i.e. fencing, marking, etc.) and construction workforce will be informed about not breaching the predetermined borders. • Drivers of the construction machinery and equipments will be trained to use only prescribed routes to minimize the area to be physically interacted.	Medium
										Low (1) (Already distrubed topograpghy)	Low (B1)		Low
	Land preparation and construction	Risk of loss of quantity and quality (e.g. vegetative structure) of top soil	Adverse	Restricted	Medium	Medium (for linear project with 26 km length, 100-350 m expropriation corridor) 330,955 m^3 (agricultural area)	Short-term reversible	Continuous	Moderate (B)	High (2) (Agricultural areas)	High (B2)	Stripping and Temporary Storage of Top Soil • Prior to construction activities, fertile top soil available at the project area (Motorway route, quarry/material borrow sites, storage sites, etc.) will be stripped to sufficient depth (may change between 5 to 40 cm depending on local soil conditions) and will be stored separately from other coarse materials/soils (subsoil) at top soil storage areas to be designated along the motorway route or other work sites under conditions suitable for the conservation of vegetative properties. • To avoid soil compaction, stripping operation will not be done when soil is wet. • Seed, tuber, rhizome, situated on the top soil, which can be reused in rehabilitation works, will be collected and stored separately. • Average height of top soil stacks will be 1.5 meters. Side slope of these stacks will not exceed 3:1 (h:v). • Drainage of top soil storage areas will be provided by open channels. In order to minimize the amount of rain water that can infiltrate into the top soil stack, the upper parts of the top soil stacks will be compressed. Excessive compression can cause anaerobic conditions. Therefore, compression operations will be carried out mildly. • If it is necessary, soil stacks will be protected against the risk of floods by creating berms of adequate height. • In case of long term storage of top soil, soil compaction and reduction in organic content of the soil may occur. In this context, if the storage will last for more than three months, the upper part of fertile soil will be planted temporarily in order to conserve organic content. In planting operations, selected species of legume and grails will be used in proper seed mixture ratios. • Organic (grass, etc.) or inorganic (polyethylene, etc.) materials will be applied on the top soil to be stored to improve its quality and avoid erosion, desiccation or invasion of wild herbs. Reinstation of Top Soil • Top soil stripped and stored in suitable conditions will be reused in rehabilitation of temporary construction sites upon completion of construction activities, on the finalization of side slopes and/or in the scope of landscaping activities. • Sub soil will be loosened by hand or machinery to a depth of 15 cm prior to the reinstation of top soil. For compact or heavy clay soils, loosening depth is to be increased up to 40-50 cm. • Following the loosening operation, ground will not be leveled before the reinstation of top soil so that a favorable rough surface is obtained for the adsorption of top soil. • Average depth of top soil to be reinstated on regular lands will be 15 cm. • Depth of top soil for areas to be planted will be suitable for side slopes, shrub plantation areas, tree roots , etc. • Following the reinstation of top soil, grading operation will be conducted in alignment with the natural slope and drainage conditions. Any stone, grass or undesired materials will be removed to the extent possible and the land will be prepared for the upcoming planting operations.	Low
						Medium (for linear project with 26 km length, 100-350 m expropriation corridor) 632,550 m^3 (forest area)				Medium (2) (Forest areas)	Medium (B2)		Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												• Combined thickness of topsoil and the vegetative growth layer will not be less than that prevailing in the undisturbed areas.	
	Land preparation and construction	Erosion of soils due to earthworks	Adverse	Restricted	Long	Medium (assummed for the linear project with 26 km length, 100-350 m expropriation corridor. The amount of material to be mobilized will depend on the construction technique)	Long-term reversible	Continous	Moderate (B)	High (3) (Yeniköy, Dereköy, Kırıklar, Gödrenli, Alanlı, Hamzabalı, Dereköy, Çulhan, Alhan, Yeni, Çarşı, Doğu)	High (B3)	• Erosion control measures (e.g. geotextile filter barriers that would reduce the flow velocity and trap the sediments, drainage channels, settling structures, etc.) will be implemented along the route prior to the start of construction works in order to reduce or prevent off-site sediment transport during construction. Temporary erosion control measures will be moved forward as the construction progresses. • Stripping and excavation works will be planned in a way that maximum 30.000 m2 of exposed land will be created at once. Mulching will be applied to stabilize exposed areas. • Activities will be modified or suspended during extreme rainfall and high winds to the extent practical. • Contouring will be applied and length and steepness of slopes will be minimized. • All the earth works will be structured at the end of each work day in a way to control probable surface run-off due to precipitation and minimize associated erosion. • All the water flow coming from the areas surrounding the work sites and from the side slopes will be diverted by means of temporary channels, earth banks and temporary engineering structures to avoid mixing of clean (non-contact) and contaminated (contact) runoff. • Erosion control measures will be implemented at the outlet of culverts. • At the outlet of the erosion control structures, relevant measures (i.e. use of riprap) will be taken to reduce the flow velocity and erosion impact. • Following the completion of base excavations, permanent erosion control measures will be taken and slope improvement works will be conducted. • Dikes will be formed around the excavated material storage sites in order to prevent loss of soil due to erosion. • Channels and ditches will be designed in consideration of post-construction flows. • Following the completion of concrete lining of the drainage ditches, temporary erosion control structures will be dismantled and the sites will be rehabilitated. • Temporary service road gradients will be limited to reduce runoff-induced erosion. • All the work sites will be revegetated to the extent possible promptly following the completion of works at that site. Operation and Rehabilitation of Quarries and Material Borrow Sites • Open pit mining method will be used at quarries and tunneling will not be applied. Open pit will be developed in benches. • Borders of the quarry and material borrow sites will be identified by using proper methods (i.e. fencing, etc.) and material extraction activities will be conducted within these borders. • During the operation of the quarries and material borrow sites; runoff from rain will be diverted from the face of the slopes, which are exposed in the excavation process. The runoff will then be conveyed in channels to stable disposal points. • Quarries and material borrow sites will be rehabilitated following the completion of material extraction activities.	Low
										Medium (2) (Dalama, Donduran)	Medium (B2)		Low
										Low (1) (Hükümet)	Low (B1)		Low
	Operation											• Soil erosion process during road operation will be prevented and/or minimized by timely strengthening and rehabilitation of the road and scheduling against heavy rainfall periods. • On-site control of all erosion control structures will be done once a week. In cases when the precipitation amount exceeds 10 mm in 24 hour periods, all the erosion control measures and their conditions will be checked on site. If required, relevant structures will be properly maintained. • Embankment and cutting slopes will be checked by competent persons at least once a year (preferentially following of spring months) to identify any erosion, landslide, stability, etc. risks. • Erosion control structures will be cleaned when half of their capacity is filled with sediment. Damaged structures or structures that are not	Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												functioning properly will be maintained/restructured. • Stormwater management measures that are designed to slow peak runoff flow, reduce sediment loads and increase infiltration will be kept functional. These may include vegetated swales planted with salt-resistant vegetation, terracing, detention ponds and basins, etc. • Proper erosion and sediment control measures will be used during road paving works to decrease runoff from repair sites. • Afforestation activities will be conducted in accordance with the Afforestation Plan to reduce the risk of erosion in the large-scale.	
	Land preparation and construction , Operation	Risk of soil contamination due to accidental spills, leakages, etc.	Adverse	Restricted	Medium (Constr.) Long (Operat.)	Low (Cannot be exactly quantified. Depends on the scale of incident (e.g. leakage, spill, etc.). However,since amount of hazardous substances to be used will be limited and response measures can be easily taken immediately by good management, it is likely that any spill or leakage would be ceased before it reaches significant amounts)	Short-term reversible	One-off	Minor (C)	High (3) (If occurs at agricultural areas, pastures, forests)	Medium (C3)	• Emergency Preparedness and Action Plan will be implemented. • Any substance/material that would result in soil contamination will not be allowed to be discharged onto soil environment. • Any spill or leakage event will be responded in accordance with the procedures described in the Emergency Preparedness and Response Plan • Proper construction machinery and equipment endowed with low polluting engines will be used to minimize deposition of air pollutants on soils. • Wastes and wastewaters to be generated as a result of project activities will be properly managed in line with the requirements of national legislation as well as IFC EHS Guidelines. In this context, direct contact of the uncontrolled wastes and wastewaters with soil environment will be avoided by taking relevant measures. • Hazardous wastes and materials (i.e. diesel fuel oil, degreasers, solvents, etc.) will be handled at designated areas in accordance with the Hazardous Wastes Management Procedure developed as a part of the project-specific Environmental and Social Management Plan. In this respect, contact of hazardous wastes and materials with soil resources will be prevented by taking relevant measures (e.g. storage on impervious ground, training of personnel). • During operation, against the risk of soil pollution due to road accidents that may result in the spill of hazardous liquids or substances on the road surface and surrounding areas, actions defined in the Emergency Preparedness and Response Plan (see Annex-3) will be implemented. • During operation Low polluting de-icing products will be used in the scope of the deicing operations. Additional measures defined in Chapter 8 (“Water Resources”) for the road deicing operations will also contribute to the protection of soil resources. • During operation Treated effluents and wastes from the operation and maintenance centers as well as services areas will be discharged/disposed of in accordance with the requirements of the national legislation and IFC’s EHS Guidelines.	Low
										Medium (2) (If occurs at vegetated areas, recreational areas, shrubs,etc.)	Low (C2)		Low
										Low (1) (If occurs at artificial areas such as areas with urban fabric, industrial areas, mine dumps, construction sites, etc.)	Low (C1)		Low
Geology-Geotechnics	Land preparation, construction , Operation	Seismic risks	Adverse	Wide	Medium	High (worst case)	Irreversible	One-off	Major (A)	Medium (The ground acceleration rates (PGA 475) along the project route are generally varying between 0.4g and 0.6g)	High (A2)	• Detailed geological-geotechnical surveys will be completed. • Foundations and legs of the viaducts and bridges as well as other structural elements will be controlled by competent technical personnel at least once a year (preferentially in April) in order to identify any structural motion, undermining, maintenance requirements, etc. that may pose risks on the durability of the structures and take the relevant corrective measures.	Low
		Landslide risks	Adverse	Restricted	Medium	High	Short term Reversible	One-off	Major (A)	High	High (A3)	• In the design of the engineering structures, Standard Specifications for Highway Bridges published by the American Association of State Highway and Transportation Officials (AASHTO) has been used. In the seismic calculations, the Standard Specifications used for the seismic design of the highway bridges has been taken as basis. Where required, project-specific revisions have been/would be done with the approval of KGM to adequately adapt these specifications to the project.	Low
						Medium			Moderate (B)		High (B3)		Low
						Low			Minor (C)		Medium (C3)		Low

CHAPTER 7

USE OF RESOURCES AND WASTES

7. CHAPTER – USE OF RESOURCES AND WASTES

The South Alternative will require the use of construction materials to be extracted from quarries and material borrow sites and supplied from the providers and use of materials for the operation and maintenance activities to be conducted in the operation phase. As a result of the use of resources and other construction and operation/maintenance activities as well as the domestic requirements of the personnel and the users of the road, different types of wastes will be generated throughout the life of the South Alternative. All the wastes to be generated during the construction and operation phases of the South Alternative are required to be properly managed in line with the requirements of national waste management legislation and international good practice in order to avoid impacts on soils, nearby water resources and flora and fauna elements. This chapter identifies the resources to be used in this context and assesses the impacts associated with waste generation. Waste management measures to be applied in accordance with relevant Turkish regulations and international standards (i.e. IFC's General EHS Guidelines) are also described in this chapter. Potential impacts of materials supply and waste generation on soil and water resources, ecological components and socio-economic environment are discussed in the relevant chapters of this report.

7.1 Assessment Methodology and Data Sources

To assess the impacts associated with the use of resources and waste generation, information provided by the Project Sponsor on the quarries, construction camp sites, etc. has been reviewed. To understand the existing waste management infrastructure of the region, public information given in the internet site of Aydın Municipality has been relied on. For the calculation of the amount of municipal solid wastes, waste statistics published by TurkStat (2020) have been considered, together with the maximum number of personnel to be employed.

Significance Criteria

The significance criteria for the impacts on land use and property will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impact on the land use components, sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 7.1.

Table 7.1 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	**Medium (2)**	**Low (1)**
Local waste infrastructure	If the local waste infrastructure has not sufficient capacity; landfills do not meet the requirements of the regulations.		If the local waste infrastructure has sufficient capacity; landfills meet the requirements of the regulations.

7.2 Baseline Conditions

7.2.1 Quarries and Material Borrow Sites

The mining sector in Aydın is mainly based on the extraction of metallic and some non-metallic industrial raw materials used in construction activities. In terms of metallic minerals, there are gold, copper, lead, zinc, mercury, and iron formations in Aydın province. In addition, ceramic, sulphur, marble, mica, and albite extractions are also made in Aydın province. Mineral map of Aydın province is presented in Figure 7.1.

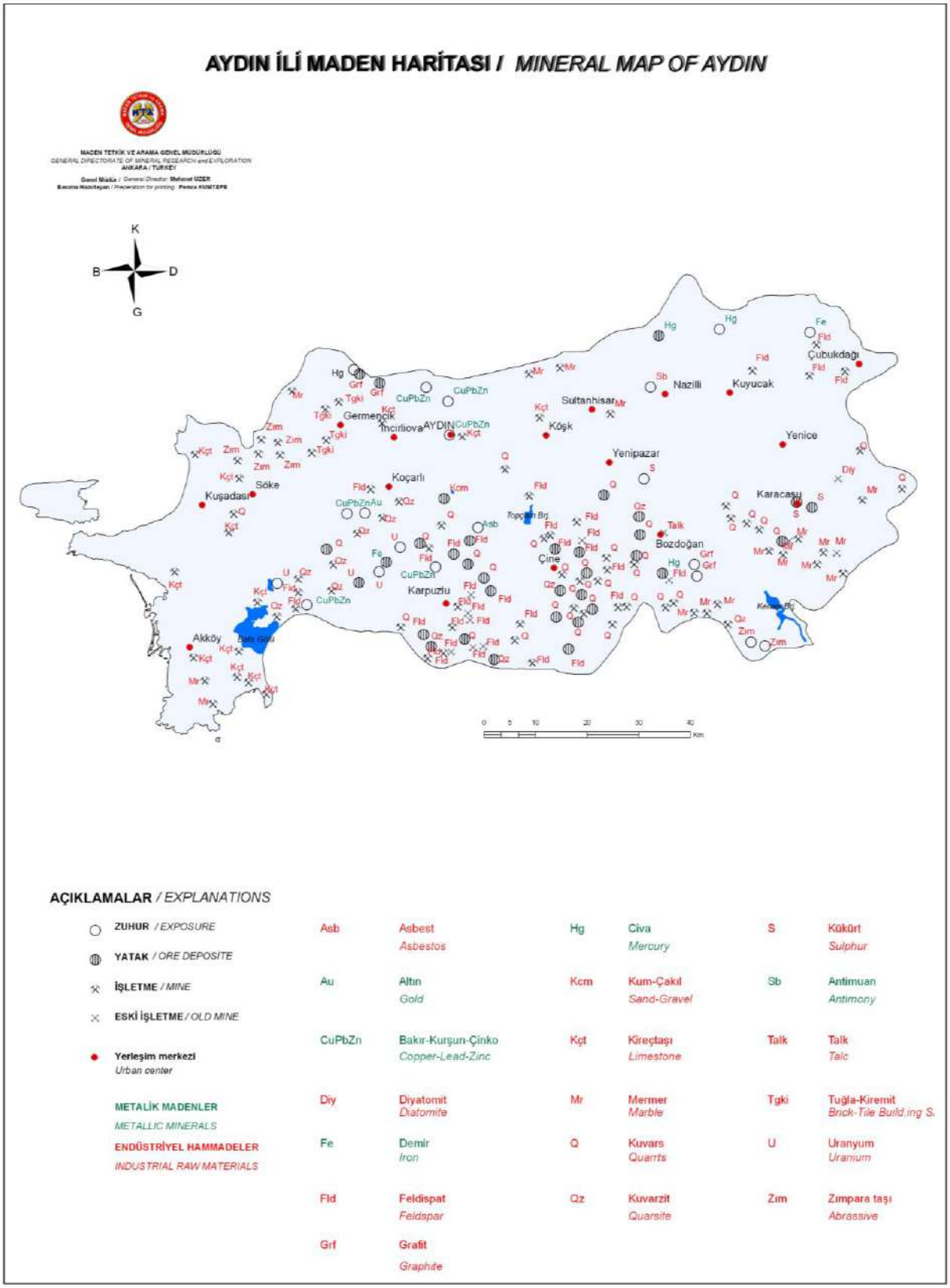


Figure 7.1 Mineral Map of Aydın (www.mta.gov.tr)

As of 2022, 22 mining projects have EIA not required decision and 5 of them have EIA positive decision in Aydın. Types of mining groups and their description were explained in Table 7.2.

Table 7.2 Types of Mining Groups and their Description

Group No	Description of the Group in the Mining Law
I-A Group	Sand and gravel
I-B Group	Brick-tile clay, cement clay, marn, tras, other rock materials used in cement and ceramic industries
II-A Group	Rock material used by producing aggregate, ready-made concrete and asphalt from calcite, dolomite, limestone, granite, andesite, basalt
II-B Group	Stones produced as stone as marble, travertine, granite, andesite, basalt
Group IV	Lignite, coal, gold, silver, copper, zinc, chromium, iron, cobalt, nickel, aluminum, trona, sulphur, etc.
Group V	Diamond, sapphire, opal, amazonite, etc.

Source: Mining Law Numbered 3213

In the scope of the South Alternative, four limestone quarries (Dalama-2, Dalama-3, Dalama-7, and Akçaköy) are planned to be used to supply the material requirements. These quarries have raw material production licenses (see Table 7.3).

Table 7.3 Raw Material Extraction Sites to be Used in the Project

Quarry Site	Area (ha)	Group	Type of Raw Material to be Extracted	Estimated Production	
				Daily (ton/day)	Annual (ton/year)
Dalama-2 Quarry and Crushing & Screening Plant	24.68	II-A	Limestone	6,240.0	1,560,000
Dalama-3 Quarry	20.79	II-A	Limestone	6,375.2	1,593,800
Dalama 7 Quarry	24.88	II-A	Limestone	6,240.0	1,560,000
Akçaköy Quarry and Crushing and Screening Plant	4.20	II-A	Limestone	1.6	332.800

7.2.2 Existing Waste Management Infrastructure in the Region

Municipal Solid Waste

There are three sanitary landfills In Aydın province. The names of the landfills in Aydın Metropolitan Municipality are Central Solid Waste Landfill, Kuşadası Solid Waste Landfill and Didim Solid Waste Landfill (see Table 7.4). Solid wastes produced are collected by the waste trucks of district municipalities, transferred to one of the two solid waste transfer stations, and disposed of at these landfills, which are designed in accordance with the requirements of the Regulation on the Landfill of Wastes. In this context, landfills have proper impermeability layers and the leachate collected at the landfills is treated by means of physical, chemical, and anaerobic processes. In Aydın, the treated wastewater is discharged into the sewerage system of the Aydın Water and Sewerage Administration (ASKI). For the wastewater management of the South Alternative, package WWTP is planned to be used in the construction phase (Aydın Province Environmental Status Reports, 2021).

Table 7.4 Landfills and Transfer Stations in Aydın Province

Province	Type of Facility	Average Waste Amount (ton/year)
Aydın	**Landfill Sites**	
	Central Solid Waste Landfill	201,673.440
	Kuşadası Solid Waste Landfill	128,207.850
	Didim Solid Waste Landfill	48,420.700
	Transfer Stations	
	Bozdoğan Transfer Station	5.143 (summer), 6.943 (winter) (ton/day)
	Sultanhisar Transfer Station	17.501 (summer), 17.380 (winter) (ton/day)

Source: Aydın Province Environmental Status Report, 2021

For the South Alternative, closest and appropriate landfills would be identified and used for the management of project-sourced wastes. Required agreements will also continue for the South Alternative which had been done for ADMP before with the municipalities and the facilities for the transfer, recovery, disposal and landfill services.

Municipal Wastewater

There are 38 wastewater treatment plants (WWTPs) in Aydın. In most of the WWTPs, only physical and biological processes are conducted. Some of them have additional advanced treatment units. Most of the plants discharge their treated water into suitable water bodies when some of them do deep sea discharge. Package WWTPs are constructed for the project at Dalama and Kuyucak construction camp sites. Equivalent populations for those plants are 1,000 people. Domestic type of wastewater will be treated in those treatment plants.

Construction, Demolition Wastes and Excavated Soil

There are several construction and demolition waste disposal sites in Aydın serving for the management of construction and demolition wastes from the efforts of urban transformation, repair and alteration work. There are 2 excavated soil reuse and recovery areas and 9 store construction and demolition wastes. A list of the existing excavated material storage areas and construction and demolition waste disposal sites in Aydın Municipality including their areas and annual collected waste amounts are provided in Table 7.5. Aydın Metropolitan Municipality issues licenses for the transportation of the construction and demolition wastes produced in the city (33,199.21 m^3/year for Aydın Province). A large number of licensed transportation vehicles/trucks serve in the city for this purpose, collecting and disposing of the construction and demolition wastes at the areas designated by the Municipality (Aydın Province Environmental Status Reports, 2021).

Table 7.5 List of Excavated Soil Reuse and Recovery Areas and Construction and Demolition Waste Disposal Sites in Aydın with the Total Collected Waste Amounts

Location of the Disposal Sites	
Aydın Province	
Excavated Material	**Area (decares)**
Aydın Astim Organized Industrial Zone Excavated Soil Reuse and Recovery Site	70.00
Bozdogan Filling Area	24.00
Karacasu Filling Area	1.99
Söke Filling Area	43.00
Söke Argavlı Filling Area	32.34
İncirliova Filling Area	24.15

Location of the Disposal Sites	
Aydın Province	
Excavated Material	**Area (decares)**
Kuşadası Soğucak Filling Area	271.32
Nazilli Sailer Filling Area	17.81
Germencik Alangüllü Filling Area	8.90
Construction and Demolition Waste Disposal Sites	**Total Waste Amount (ton/year)**
Efeler (Tralles Recycling Industry Trade Limited Company Construction/Demolition Waste Recovery Facility)	390,000
Efeler (Unit Mining Petroleum Transport Ship Agency Construction Industry Trade Limited Company Construction/Demolition Waste Recovery Facility)	2,000,000

Source: Aydın Province Environmental Status Report, 2021

Packaging Waste

As of 2021, 16 packaging waste facilities have the relevant environmental permits and licenses in a total of Aydın municipality. These facilities serve for the recovery of packaging materials including plastics, metals, composite packages, paper and cardboard, glass, and wood-produced collection and segregation facilities in Aydın. (Aydın Province Environmental Status Reports, 2021).

Hazardous and Special Waste

Hazardous and special wastes produced in the city of Aydın managed by different methods including recovery, disposal, on-site processes, export, etc. The amount of hazardous waste recorded in 2021 was around 7,508 tons in Aydın. Non-hazardous and special wastes including waste tires, medical wastes, waste vegetable oils, waste batteries, and accumulators produced in these cities are being managed (e.g. recovery) and/or disposed of at licensed facilities (Aydın Province Environmental Status Reports, 2021).

Regarding the management of hazardous wastes, Aydın province has one hazardous waste recovery facility providing services in the field of hazardous waste recovery, disposal, landfill and exportation in the city. In 2020, 5,443 tons of waste recorded for recovery, 1,619 tons were sent for disposal, 27 tons collected for storage. (Aydın Province Environmental Status Report, 2021; https://webdosya.csb.gov.tr/).

Medical Waste

Medical wastes produced within the city limits of Aydın are collected by special vehicles (there are 3 medical waste transportation vehicles that have served in 2021 by the community) and disposed of at the medical waste sterilization and/or incineration facilities of Eman Ege Energy Generation Inc. located within the Efeler Solid Waste Landfill and Medical Waste Sterilization Facility in Efeler, Aydın. The sterilization facility has a capacity of 1,250 kg per day. In 2021, a total of 1,594 tons of medical waste was collected. (Aydın Province Environmental Status Report, 2021; https://webdosya.csb.gov.tr/).

Vegetable Oil Waste

There is no licensed waste vegetable oil interim storage and recovery facility in Aydın. The amount of waste vegetable oil collected in Aydın in 2021 was recorded as 98.007 tons (Aydın Province Environmental Status Report, 2021; https://webdosya.csb.gov.tr/).

Waste Tire

In Aydın, there is no licensed waste tire recovery and disposal facility. In 2021, a total of 70.688 tons of waste tires were sent to recovery facilities waste incineration facilities (Aydın Province Environmental Status Report, 2021; https://webdosya.csb.gov.tr/). Waste tires are planned to be used for landscaping works for ADMP.

Waste Batteries and Accumulators

There is one licensed temporary waste accumulator storage facility in Aydın and one licensed waste accumulator recovery facility is present. In 2021, the amount of waste accumulators and waste batteries collected in Aydın was recorded as 59.175 tons. (Aydın Province Environmental Status Report, 2021; https://webdosya.csb.gov.tr/).

7.3 Potential Impacts

Like other infrastructure projects, raw materials such as rock, sandstone, limestone, basalt, etc. will be used in significant quantities during the construction of the South Alternative. In the operation phase, use of materials will be limited with the maintenance activities to be conducted at the road, operation and maintenance centers and fuel stations. In addition to those mentioned raw materials, chemical materials will also be used for the project. Some of the chemicals, and their names, properties and Material Safety Data Sheets (MSDS) that will be used have been identified by the Project Sponsor.

Different types of wastes (hazardous, non-hazardous or inert) will be generated as a result of the materials used and personnel requirements during the land preparation and construction and operation activities. As use of construction materials and personnel involvement will be at significant levels during the construction phase, waste generation will be a more important issue when compared to operation phase. Types of wastes to be generated in each phase are identified in the following sections, with quantification for certain types of wastes (i.e. municipal, excavated materials) wherever possible.

If not properly managed, waste generation may cause soil contamination, pollution of surface and groundwater resources, and disturbance of flora and fauna components, visual nuisance and risks to public and personnel health and safety. Adverse impacts on ecosystem components including soil, surface and ground water resources as well as flora and fauna components and other social issues associated with waste generation can be avoided and/or minimized with effective implementation of good waste management practices in accordance with the requirements of national legislation and international standards.

7.3.1 Land Preparation and Construction Phase

During the construction works, temporary facilities/sites will be needed. These facilities and sites include construction camp sites, quarries, plants and service roads. Following the completion of construction activities, temporary facilities will be decommissioned. Table 7.6 provides a list of the camp sites, quarries and plants to be used in the scope of the project.

Table 7.6 Locations of the Camp Sites, Quarries and Plants

Location		Description of the Site / Quarry / Plant	Area / Capacity Information
Km 15+600	Aydın, Yeniköy	Yeniköy Mechanical Plant	400 tonnes/hour
Km 17+000	Aydın, Efeler, Dereköy	Dereköy Crushing and Screening Plant	395,000 tonnes/year
Km 20+000	Aydın, Efeler, Dalama	Dalama Construction Camp Site	7.80 ha
		Concrete Batching Plant	90 m^3/hour
		Asphalt Plant	340 tonnes/hour
Km 20+000	Aydın, Merkez, Dalama	Dalama 2 Quarry	24.68 ha
			1,560,000 tonnes/year
		Crushing and Screening Plant	395,000 tonnes/year
	Aydın, Çine, Kasar	Dalama 3 Quarry	20.79 ha
			1,593,800 tonnes/year
	Aydın, Efeler, Dalama	Dalama 7 Quarry	24.88 ha
			1,560,000 tonnes/year
Km 20+000	Aydın, Çine, Kasar	Dalama Mechanical Plant	400 tonnes/hour
Km 21+000	Aydın, Akçaköy	Akçaköy Quarry	16.65 ha
		Crushing and Screening Plant	332,800 tonnes/year
Km 26+000	Aydın, Yenipazar, Hamzabali	Hamzabali Concrete Batching Plant	90 m^3/hour
Km 30+475	Aydın, Yenipazar	Satellite Construction Camp Site *	
Km 38+500	Aydın, Yenipazar, Direcik	Direcik Concrete Batching Plant	90 m^3/hour
Km 42+350	Aydın, Yenipazar, Hamidiye	Hamidiye Asphalt Plant	340 tonnes/hour
		Hamidiye Mechanical Plant	400 tonnes/hour
Km 59+500	Aydın, Kuyucak, Karapınar	Kuyucak Construction Camp Site	34.59 ha
		Concrete Batching Plant	62 m^3/hour
		Precast Beam Plant	90 m^3/hour

** Mobilization (As the area is allocated as Service Area for the operation phase of the project, camp site is planned to be demobilized as per the completion of the construction works of the south Alternative).*

Wastes anticipated to be generated at the camp sites and other work sites during the construction phase of the South Alternative would mainly include cleared vegetation, municipal (domestic) solid wastes, domestic wastewater, treatment sludge, packaging wastes, excavation wastes, construction wastes, debris from settling ponds at concrete plants, hazardous wastes (including packaging wastes that contacted with hazardous substances), waste oils, waste tires, waste vegetable oils and other types of special wastes. Further information on the main types of wastes anticipated to be generated in the scope of land preparation and construction activities are provided below.

Waste Management Regulation includes a list of wastes as an appendix. In this list, hazardous wastes are marked with a star sign (*) plus one of the codes of (A) or (M); where (A) refers to wastes that will be directly categorized as hazardous and (M) refers to wastes for which hazardousness characteristics will be determined by means of analyses to be done in accordance with the Regulation.

Table 7.7 provides an indicative list of probable waste types, which has been extracted from the list of wastes given as an appendix of the Waste Management Regulation, which may be produced during the land preparation and construction activities. The waste codes are as specified in the Regulation and remarks column indicates the hazardousness classification of the wastes as described previously in this paragraph.

Table 7.7 Indicative List of the Potential Types of Wastes that may be produced during the Land Preparation and Construction Activities

Waste Code	Waste Code Definition	Remarks
01	**Wastes Generated During the Exploration, Extraction, Operation and Physical or Chemical Processing of Ores**	
01 01	**Wastes generated due to mining excavations**	
01 01 02	Wastes due to non-metallic ores	
01 04	**Wastes from Physical and Chemical Processing of Non-Metallic Minerals**	
01 04 07*	Wastes containing dangerous substances from the physical and chemical processing of non-metallic minerals	M
01 04 09	Waste sand and clays	
01 04 13	Wastes from stone chipping and cutting operations other than those mentioned in 01 04 07	
01 04 99	Wastes that not otherwise specified	
13	**Oil Wastes and Liquid Fuel Wastes (Excluding Renewable Oils)**	
13 01	**Waste Hydraulic Oils**	A
13 02	**Waste Engine, Transmission and Lubrication Oils**	A
13 03	**Waste Insulation and Heat Conduction Oils**	A
13 04	**Bilge Oils**	A
13 05	**Oil/Water Separator Contents**	A
13 07	**Wastes of Liquid Fuels (Fuel oil, diesel, gasoline, other fuels including mixtures)**	A
15	**Waste Packaging and Absorbents, Wiping Clothes, Filter Materials and Protective Clothing Not-Classified Under Other Waste Types**	
15 01	**Packaging (Including Packaging Material Collected by the Municipality Separately)**	
15 01 01	Paper and cardboard packaging	
15 01 02	Plastic packaging	
15 01 03	Wood packaging	
15 01 04	Metallic packaging	
15 01 05	Composite packaging	
15 01 06	Mixed packaging	
15 01 07	Glass packaging	
15 01 09	Textile packaging	
15 01 10*	Packaging containing traces of hazardous materials or contaminated with hazardous materials	A
15 01 11*	Metallic packaging material containing hazardous porous solid structures (asbestos, for example), including empty pressurized containers	A
15 02	**Absorbents, Filter Materials, Wiping Clothes and Protective Clothing**	
15 02 02*	Absorbents, filter materials (oil filters if not classified in any other way), wiping clothes, protective clothing contaminated with hazardous materials	M
15 02 03	Absorbents, filter materials, wiping clothes and protective clothing excluding 15 02 02	
16	**Wastes not Classified under any other Type of Waste in the List**	
16 01	**Wastes Generated due to Vehicle Maintenance (Excluding 13, 14, 16 06 and 16 08), End-of-life Vehicles and the Dismantling of End-of-life Vehicles (including construction machinery) in Various Transportation Categories**	
16 01 03	End-of-life tires	
16 01 04*	End-of-life vehicles	A
16 01 06	End-of-life vehicles that do not contain liquids or hazardous substances	
16 01 07*	Oil filters	A
16 02	**Electrical and Electronic Equipment Wastes**	A
16 04	**Explosive Wastes**	A
16 06	**Batteries and Accumulators**	A
16 10	**Aqueous Liquid Wastes to be Sent to Off-Site Treatment**	

Waste Code	Waste Code Definition	Remarks
16 10 01*	Aqueous liquid wastes containing dangerous substances	M
16 10 02	Aqueous liquid wastes other than those mentioned in 16 10 01	
16 10 03*	Aqueous concentrated substances containing hazardous substances	M
16 10 04	Aqueous concentrates other than 16 10 03	
17	**Construction and Demolition Wastes (Including Excavations Conducted at Contaminated Sites)**	
17 01	**Concrete, Brick, Tile and Ceramic**	
17 01 01	Concrete	
17 01 02	Bricks	
17 01 03	Tiles and ceramic	
17 01 06*	Mixtures or separated groups of concrete, brick, tile and ceramic containing hazardous substances.	M
17 01 07	Mixtures or separated groups of concrete, brick, tile and ceramic, excluding 17 01 06	
17 02	**Wood, Glass and Plastic**	
17 02 01	Wood	
17 02 02	Glass	
17 02 03	Plastic	
17 02 04*	Wood, glass and plastic containing or contaminated with hazardous substances.	A
17 03	**Mixtures Containing Bitumen, Coal Tar and Products Containing Tar**	
17 03 01*	Mixtures with bitumen, containing coal tar	M
17 03 02	Mixtures containing bitumen, excluding 17 03 01	
17 03 03*	Coal tar and products containing tar	A
17 04	**Metals (Including Their Alloys)**	
17 04 01	Copper, bronze and brass	
17 04 02	Aluminium	
17 04 03	Lead	
17 04 04	Zinc	
17 04 05	Iron and steel	
17 04 06	Tin	
17 05	**Soil (Including Excavations Conducted in Contaminated Sites), Stones and Dredging Mud**	
17 05 03*	Soil and stones containing hazardous substances	M
17 05 04	Soil and stones excluding 17 05 03	
17 09	**Other Construction and Demolition Waste**	
17 09 01*	Construction and demolition waste containing mercury	M
17 09 02*	Construction and demolition waste containing PCB (example: filling paste containing PCB, resin-based base coating material containing PCB, coated enamelling units containing PCB, capacitors containing PCB)	M
17 09 03*	Other construction and demolition waste containing hazardous substances (including mixed waste)	M
17 09 04	Mixed construction and demolition waste, excluding 17 09 01, 17 09 02 and 17 09 03	
19 13 08	Concentrated liquids and aqueous liquid wastes due to groundwater rehabilitation, excluding 19 13 07	
20	**Municipal Waste including Separately Collected Fractions (Household Waste and Similar Commercial, Industrial and Institutional Waste)**	
20 01	**Separately Collected Fractions (Excluding 15 01)**	
20 01 01	Paper and cardboard	
20 01 02	Glass	
20 01 08	Biodegradable kitchen and canteen wastes	
20 01 10	Clothing	

Waste Code	Waste Code Definition	Remarks
20 01 11	Textile products	
20 01 13*	Solvents	A
20 01 14*	Acids	A
20 01 15*	Alkalines	A
20 01 17*	Photo chemicals	A
20 01 19*	Pesticides	A
20 01 21*	Fluorescent lamps and other mercury-containing wastes	A
20 01 37*	Wood containing hazardous substances	M
20 01 38	Wood excluding 20 01 37	
20 01 39	Plastics	
20 01 40	Metals	
20 02	**Garden and Park Wastes (Including Cemetery Wastes)**	
20 02 01	Biodegradable wastes	
20 02 02	Soil and stones	
20 02 03	Other non-biodegradable wastes	
20 03	**Other Municipal Wastes**	
20 03 01	Mixed municipal waste	
20 03 04	Cesspit mud	

Source: Turkish Waste Management Regulation, Appendix-4

(*) : Wastes with an asterisk (*) next to the six-digit waste code are hazardous wastes.

(A): The sign in the "Description" column next to the six-digit waste code indicates that the waste is definitely hazardous waste. Wastes marked in this way are classified as definitely hazardous without any analysis.

(M): The sign in the "Description" column next to the six-digit waste code indicates that the waste is potentially hazardous waste. In order to determine whether the wastes marked in this way are hazardous or not, a study is carried out to determine the hazardous characteristics of the waste stipulated in Article 11 of this Regulation.

Wastes ending with 99: Wastes ending with the six-digit waste code 99 define wastes that are not classified as hazardous or non-hazardous waste and are not otherwise defined in the list. "Waste Code Determination Hierarchy" and the provisions of Article 12 of this Regulation shall be applied in the use of this waste code.

Municipal Solid Wastes

According to the data published by TurkStat (2020), the daily average municipal solid waste generated by a person in Turkey is 1.13 kg, in Aydın is 1.22 kg. To calculate the total amount of daily municipal waste generation, generation rates are used according to the construction sites' locations. For Dalama and Kuyucak construction sites, generation rate was used for Aydın province. The maximum number of personnel to be employed in each section and estimated amount of municipal waste to be generated are summarized in Table 7.8. Assuming 20% (Ministry of Environment, Urbanization and Climate Change, 2020) of the municipal solid wastes (by weight) is formed of packaging wastes, estimated amount of packaging wastes within the total municipal wastes to be produced is also provided in the last column of the table. For the handling of the municipal solid wastes, municipalities' landfills and disposal sites that are near the project site will be selected for each province.

Table 7.8 Total Estimated Municipal Waste Generation for the Construction Camp Sites

Location	Total number of personnel foreseen to be employed in each department (including contractors and subcontractors) (persons)	Total Amount of Daily Municipal Waste Generation (ton/day)	Amount of Packaging Wastes within the Daily Municipal Waste Production (kg/day)
Dalama, Satellite, Kuyucak Construction Camp Sites	1,000	1.22	**244**

By taking the waste generation rates and landfills' capacities into consideration, necessary actions will be taken by the project sponsor to manage those generated wastes. The facilities that are suitable and close to the camp sites will be selected. The total amount of municipal solid waste to be produced at the camp sites of South Alternative is 2.44 ton/day. Additionally it should be noted that the Camp Sites will be in place for a maximum of 3 years within the construction period of ADMP. Thus, the load to be provided by the project during the construction phase on the capacity of existing waste disposal infrastructure will be negligible.

During the operation phase, personnel to be employed at the toll plazas, control centers and operation/maintenance centers as wells as the employees, visitors and users of the service areas will be the sources of municipal waste production. For the visitors who will use the service areas, it is assumed that the daily average municipal solid waste generation would be estimated as the 25% of the daily average municipal solid waste generation by a person in Aydın according to the location of the buildings Thus, the load to be provided by the project during the operation phase on the capacity of existing waste disposal infrastructure will be negligible.

Municipal Wastewater

According to the data published by Turkstats (2020), the daily average municipal wastewater generation by a person is 189 L/capita/day in Turkey, 183 L/capita/day in Aydın. Daily municipal water usage by a person is 224 L/capita/day in Turkey, 196 L/capita/day in Aydın.

According to the maximum personnel numbers in campsites, daily municipal wastewater generation and water usage are calculated in Table 7.9.

Table 7.9 Total Estimated Municipal Waste Generation and Water Use for the Construction Camp Sites

Location	Total number of personnel foreseen to be employed in each department (including contractors and subcontractors) (persons)	Total Amount of Daily Municipal Wastewater Generation (L/ day)	Total Amount of Daily Water Demand (L/day)
Dalama, Satellite, Kuyucak Construction Camp Sites	1,000	274,500	294,000

For municipal wastewater, package WWTPs are planned to be used as mentioned in previous sections. Those WWTPs and non-leaking septic tanks were constructed for municipal wastewater at the construction camp sites. Each package WWTP has a capacity equivalent for 1,000 people, thus no significant impact is anticipated due to domestic wastewater discharges.

Excavated Materials

In the scope of road construction works, excavated materials are planned be used in the fill operations wherever the properties and the quality of the materials are suitable. When there is a surplus of excavated materials, excess material will be needed to be stored at designated storage areas. In this regard, list of storage sites identified to be used for the South Alternative is presented in Table 7.10.

Table 7.10 List of Storage Sites Planned to be Used

Location	Location			Description of the Site	Area (ha)	Storage Capacity (m^3)
	Province	District	Nearest Neighborhood			
Km: 20+000	Aydın	Efeler	Kırıklar	Kırıklar Storage Site	37	1,500,000
Km: 37+500	Aydın	Yenipazar	Direcik	Direcik Storage Site	21	3,000,000
TOTAL					**58**	**4,500,000**

Potential impact of the project due to construction materials extraction will be minimized by reusing the excavated materials as fill material to the extent possible. This will also minimize the area required for storage. These temporary areas can also be used for the storage of vegetative soil that will be reclaimed and separated from the project area. These will be placed as close to the route as possible and used vegetatively.

Construction and Demolition Wastes

Fences, barriers, buildings, walls, former engineering structures, etc. corresponding to the motorway route will be dismantled and removed prior to construction resulting in generation of construction and demolition wastes. Those wastes will be handled with the use of appropriate construction and demolition waste areas.

Hazardous and Special Wastes

Hazardous waste shares the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed. Wastes may also be defined as “hazardous” by local regulations or international conventions, based on the origin of the waste and its inclusion on hazardous waste lists, or based on its characteristics (IFC, April 2007). Turkish Waste Management Regulation specifies the hazardousness properties (explosive, oxidizing, flammable, irritating, toxic, and carcinogenic, etc.) of wastes and lists the types of wastes that are to be handled directly as hazardous or after tests to be done if their hazardousness properties and concentrations are confirmed. Additionally, specific regulations are in force for the management of special wastes such as waste tires, medical wastes, waste vegetable oils, waste batteries and accumulators.

In the scope of the South Alternative, it is likely that special wastes, hazardous wastes (e.g. spent solvents) or wastes contaminated with substances having hazardous properties (e.g. packaging wastes, personal protective equipment, oily cleaning rags, empty paint cans, chemical containers, used lubricating oil, used batteries, lighting equipment such as lamps or lamp ballasts, etc.) would be produced during the construction activities, as it is the case in many projects (*IFC, April 2007*).

Amount of waste motor oils may be relatively higher in comparison to other types of hazardous and special wastes due to the large number of equipment to be involved in the construction works. Assuming that the average oil capacity of the construction machineries is 20 liters and motor oils of these machineries will be changed 4 times a year, total amount of waste oil to be produced can be estimated as given in Table 7.11.

Table 7.11 Estimated Amount of Waste Motor Oil to be Produced

Type of Machinery	Number of Machinery	Total Motor Oil Capacity of Machines (L)	Annual Amount of Motor Oil to be Changed (L)
Excavator	50	1,000	4,000
Grader	10	200	800
Crusher	2	40	160
Dozer	10	200	800
Loader	10	200	800
Roller	15	300	1,200
Dump Truck	150	3,000	12,000
Rock Driller	1	20	80
Total	**248**	**964**	**19,840**

7.3.2 Operation Phase

Solid waste generation during operation and maintenance activities may be caused by road resurfacing waste (e.g. removal of the old road surface material); road litter, illegally dumped waste, or general solid waste from rest/service areas; animal carcasses; vegetation waste from right-of-way maintenance; and sediment and sludge from storm water drainage system maintenance (including sediment traps and oil/water separation systems). Hazardous wastes may also be produced in limited quantities at the maintenance and operation centres. Paint waste may also be generated from road and bridge maintenance for example due to removal of old paint from road stripping and bridges prior to re-painting (IFC, April 2007). These wastes are required to be properly managed in line with the requirements of national waste management legislation and international good practice in order to avoid impacts on soils, nearby water resources and flora and fauna elements.

With proper implementation of good waste management practices, waste generation would not cause any significant impact on the soil or water resources or on the ecosystem components that would bring associated risks on health and safety of the community and/or project personnel.

7.4 Mitigation Measures

Wastes to be generated in the scope of project activities will be managed in accordance with the waste management hierarchy (see Figure 7.2). In this respect, waste generation will be avoided or minimized at the source to the extent possible. If this is not possible, on-site waste reuse options will be explored and implemented. If this is not possible, alternative external recycling/recovery options will be evaluated. As an ultimate alternative, wastes will be sent to final disposal only if other waste management methods are not possible. Legitimate contractors having proper licenses from the Ministry of Environment, Urbanization and Climate Change for the transportation, recycling/recovery or disposal of specific types of wastes will be used. Detailed procedures to be applied for each type of waste to be generated are provided in the Solid and Hazardous Waste Management Procedures prepared and reviewed as a part of the Environmental and Social Management Plan (ESMP) presented in Annex-6 Section A.4. Training will be provided to project personnel regarding the proper implementation of waste management procedures in line with the requirements of national legislation and good practices.

Figure 7.2 Waste Management Hierarchy (Source: https://www.epa.gov)

As mentioned in ESMP presented in Annex-6, waste management of all project activities will be complied consisting of the following regulations, legislations and laws:

- Turkish Environmental Legislation
- Environmental Law
- Regulation on Waste Management
- Hazardous Wastes Control Regulation
- Water Pollution Control Regulation
- Surface Water Quality Regulation
- Regulation on the Control of Pollution Caused by Dangerous Substances in and around the Water Bodies
- Regulation Concerning Protection of Groundwater against Pollution and Deterioration
- Ordinance on Groundwater Resources
- Regulation on Safety Data Sheet on Harmful Substances and Mixture
- Regulation on the Preparing and Distributing Safety Data Sheets Regarding Dangerous Materials and Preparations
- Regulation on the Classification, Labeling and Packaging of Materials and Mixtures
- Regulation on Transportation of Hazardous Goods on Highways
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 3 and 4
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads
- Regulation on the Control of Packaging Wastes
- Regulation on the Control of Medical Wastes
- Regulation on the Control of Waste Oils
- Regulation on the Control of Waste Batteries and Accumulators
- Regulation on the Control of Waste Tires
- Regulation on the Control of Waste Vegetable Oils
- Regulation on the Control of Excavation Soil, Construction and Demolition Wastes
- Regulation on Mining Wastes
- Regulation on the Landfill of Wastes
- Circular on the Preparation of Implementation Project for Landfills
- Circular on Landfill of Mining Wastes and Technical Arrangement of Other Landfills
- Mining Law

- Forestry Law
- Pasture Law
- Pasture Regulation
- Regulation Concerning the Rehabilitation of the Lands Disturbed by Mining Activities
- World Business Council for Sustainable Development (WBCSD), December 2011. Guidelines on Quarry Rehabilitation

Regarding the management/disposal of project-sourced wastes, written agreements/protocols will be done with the local waste management service providers that have valid permits and licenses from the Ministry of Environment, Urbanization and Climate Change. Copies of the relevant documents will be kept at the camp sites and project offices.

7.4.1 Land Preparation and Construction Phase

Hazardous and special wastes including waste oils, tires, etc. will be sourced from maintenance of vehicles and equipment during the construction phase. These hazardous and special wastes will be separately collected in proper containers/drums and managed in accordance with the requirements of the national waste management regulations. General measures that will be applied to avoid or minimize potential impacts or risks sourced from waste generation are summarized below (see ESMP in Annex-6 Section A.4):

- Wastes will be collected systematically in closed containers and various types of wastes (non-hazardous, hazardous and special wastes) will be sorted for proper handling and disposal.
- Recyclable wastes will be collected separately to be sent to licensed recycling facilities.
- To the extent possible, use of non-hazardous materials will be preferred. Where use of hazardous materials is inevitable, hazardous wastes will be segregated from non-hazardous wastes. Thus, hazardous waste formation will be minimized.
- No waste will be disposed of or buried on site. Illegal dumping will not be allowed.
- It will be ensured that construction camp sites and surroundings are kept clean and that windblown litter is cleared on a daily basis.
- Site personnel will be trained on proper waste management procedures.
- For the temporary storage of the hazardous and non-hazardous wastes at the camp sites, temporary waste storage areas will be established.
- Licensed waste transportation vehicles will be used to remove wastes being temporarily stored at project sites. Private companies and relevant municipalities will be interviewed for this purpose. Possible management options will be evaluated in accordance with the relevant waste management regulations and these actions will be recorded and kept by Project Management.

Temporary hazardous and non-hazardous waste storage areas will have the following features (provided in detail in ESMP section B.2 in Annex-6):

- All chemicals and hazardous materials will be stored in designated hazardous materials storage area that has lean-to roof, concrete floor, secondary containment of at least 110% of the stored volume and proper drainage for spills/leaks
- Roof and sides of the area will be properly covered to prevent rainwater intrusion;
- Floor of the area will be sealed with either reinforced concrete or epoxy material;
- Drainage of the areas will be provided and the channels will drain to blind holes;
- Access to storage areas will be through controlled gates having proper locking systems;
- Necessary signs and boards will be properly placed; name and contact number of the personnel responsible from the area will be put on the boards;
- Separate storage compartments will be provided for the storage of different types of wastes;

- Leak-proof containment structures will be placed under the tanks/drums holding liquid wastes;
- For the storage of liquid wastes greater than 220 liters, secondary containment with an available volume of at least 110% of the largest storage container or 25 percent of the total storage capacity (whichever is greater) will be provided;
- Relevant fire-fighting equipment (i.e. mobile fire extinguishers) will be kept ready outside the storage areas;
- Absorbents will be kept available for response to potential leakage/spill events;
- Adequate ventilation will be provided where volatile wastes are to be stored.

All the hazardous and non-hazardous waste storage areas will be visually inspected by assigned site personnel on a regular basis. Additional information is presented in ESMP in Annex-6 section A.3 and A.4.

Municipal Wastes

Municipal solid wastes to be generated at camps and other work sites will be stored in closed containers and delivered to related municipality trucks or licensed firms for disposal. Separate waste containers (drums, bins, skips or bags) will be provided for different types of waste. As mentioned previously, closest landfills would be the alternatives for the disposal of Project-sourced municipal wastes. Project Sponsor will collaborate with the related municipalities and dispose of the municipal wastes to be produced in accordance with the agreements to be done.

Municipal wastewater to be generated at camps and work sites will be processed in package domestic wastewater treatment plant. Environmental permits for package domestic wastewater treatment plant discharges, wastewater disposal agreements/channel connection permits to be done with municipalities and capacity of package domestic wastewater treatment plant will be checked/monitored. The monitoring will be carried out in compliance with national legislation and international standards. Effluent water quality of the package domestic wastewater treatment plants will be monitored quarterly (by means of sampling and analyses to be done by accredited laboratories). Wastewater management practices at concrete plants will be monitored. Presence and functionality of drainage system will be monitored annually at the operation phase. Additional handling processes are given in detail in ESMP presented in Annex-6.

Excavated Materials

Materials to be excavated from the motorway route will be reused as fill material in the construction of road base, shoulders, side slope arrangements, etc. to the extent the quality and quantity of materials allows in order to minimize the amount of excavated materials to be permanently stored and area (i.e. forest lands) to be disturbed by storage sites.

When there is excess of excavated materials or the materials are not suitable for being used in construction or filling processes, these wastes will be permanently stored in the areas to be designated as storage sites. Permits for the use of to be designated storage sites will be obtained from the related authorities. Transportation of the materials to the storage sites will be performed by using licensed vehicles. Planned to be designated on the excavated materials storage sites' locations are mentioned before in this chapter.

Construction Wastes

Construction and demolition wastes will be disposed of in accordance with the Regulation on the Control of Excavation Soil, Construction and Demolition Wastes. Scrap metals to be generated will be collected separately from other type of wastes. These wastes will be disposed of by the recycling companies which are licensed by Ministry of Environment, Urbanization and Climate Change.

Hazardous and Special Wastes

Hazardous and special wastes (i.e. waste oils, waste tires, waste batteries, waste accumulators, etc.) will be collected separately in closed containers and will be delivered to licensed firms for transportation to licensed recycling, recovery, or final disposal facilities/sites near the area. Hazardous materials will not be stored within excavated areas. Supervision will be used during the handling of all dangerous materials. Impervious bunds and other containment techniques will be used where hazardous materials are handled. All those handling processes will occur according to the Hazardous Wastes Control Regulation.

Waste Oil

Waste oils generated at the facilities will be analyzed at the competent laboratories and will be classified according to their categories. Accordingly, waste oils will be stored separately in tanks, containers, or similar structures placed at temporary waste storage sites on impervious surfaces. Waste oils temporarily stored at the facility will removed from the site to recovery facilities by licensed waste oil transfer vehicles in line with the Regulation on the Control of Waste Oils.

Medical Waste

Medical waste, which might be produced at the Construction Site medical rooms will be stored separately from other kinds of wastes. To achieve this, special storage bags and boxes will be provided. They will be temporarily stored in sealed, labeled containers in a secured area of the infirmary facility until they are sent to disposal in compliance with Turkish Medical Waste Control Regulation. The project will also designate special areas where unauthorized persons would not have access. Until final disposal, un-sharp wastes will be stored in specially designed red bags which are marked by the sign of “International Bio-Hazards” and writing “Warning: Medical Waste” on both sides. Those that are sharp will be stored separately in boxes or containers that are designed (puncture, tearing, breaking and blasting resistance, water resistance and leak-proof, impossible to open or scramble) in accordance to related regulations. The sign of “International Bio-Hazards” and writing “Warning: Sharp Medical Waste” will be visible on these boxes or containers. Medical waste storage during the field research will be transported with the special medical waste transport vehicles operating according to the Regulation on the Control of Medical Wastes.

Waste Batteries and Accumulators

Waste batteries and accumulators to be generated will be stored separately from other type of wastes and wasted accumulators at the temporary waste storage areas. Waste batteries and accumulators temporarily stored at these sites will be removed by means of licensed vehicles in line with Regulation on the Control of Waste Batteries and Accumulators.

Treatment Sludge

Treatment sludge to be produced at the package domestic wastewater treatment plants at the campsites will be analyzed in accordance with the National Waste Management Regulation in order to identify its characteristics (hazardous or non-hazardous). Depending on its hazardousness characteristics, waste treatment sludge will be disposed of at a licensed waste disposal site by means of companies having a license from the Turkish Ministry of Environment, Urbanization and Climate Change.

An agreement was made by the Project Sponsor with a licensed company for waste purchasing of the Project wastes. The types of waste that are planned to be collected according to the contract are waste oils, sludge wastes, contaminated wastes, and other materials that are shown in Table 7.12 with their waste codes and code descriptions. Required agreements will be made for municipal waste management and other potentially generated wastes.

Table 7.12 Wastes to be Collected by the Contractor

Waste Code	Code Description
20 01 40, 17 04 05	Metals (Scrap)
15 01 10	Steel Barrel
	Tin
	Plastic
15 02 02	Cloth, Glove Filter Materials
16 01 07	Oil Filters
16 06 01	Accumulator
15 01 11	Pressure Vessels
20 01 21	Fluorescent and Mercury Containing Wastes
13 01 13	Hydraulic Oil
20 01 26	Vegetable Waste Oil
08 01 11	Waste Paint Varnish
08 03 17	Cartridge - Toner
16 02 15	Discard Electronic Equipment
17 04 09	Contaminated Metal
16 05 06	Laboratory Chemicals
10 13 14	Concrete Mud

7.4.2 Operation Phase

During the operation phase, measures proposed for the management of construction phase wastes will also be taken wherever applicable. Additional waste management measures to be taken to avoid/minimize waste production and manage the unavoidable wastes in sound manner during the operation phase are provided below:

- Chlorine free solvents and lead-free paints will be used within the scope of maintenance activities.
- Any waste identified or generated in the Motorway corridor as a result of the site cleanings, sediment removal, tree/shrub trimming, animal death and spill/scattering of waste tires, metal pieces, etc. will be immediately removed from the road surface and disposed of in accordance with the relevant national regulations within 7 days;
- Road resurfacing wastes will be primarily recycled wherever it is feasible by using in the aggregated or as a base material for the pavement;
- Recyclable materials such as glass, scrap tires, certain types of slags and ashes will be added to the new asphalt and concrete mixes;
- Amount of unused products (e.g. paint, herbicide) that needs disposal will be minimized by managing the inventories properly;
- Any obsolete product will be removed/managed in accordance with the requirements of Turkish regulations;
- Characteristics (hazardous or non-hazardous) of the sediment and sludge that will come out from the drainage system maintenance activities will be identified in accordance with the requirements of Turkish Waste Management Regulation and a disposal method suitable for the identified characteristics will be applied;
- Wherever feasible, vegetation waste will be composted for reuse as landscaping fertilizer;
- Removed, old road surface materials will be reused in paving or stockpiled for being reused in proper applications (e.g. as road base material) wherever feasible.

7.5 Summary of Assessment and Residual Impacts

Table 7.13 provides a summary of waste management. With proper implementation of good waste management practices, waste generation would not cause any significant impact on the soil or water resources or on the ecosystem components that would bring associated risks to the health and safety of the community and/or Project personnel.

Table 7.13 Summary of the Assessments Waste Management

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource/ Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Local waste infrastructure	Land preparation and construction	Incremental load on the capacities of the local waste management facilities (landfills, recycling/recovery facilities, etc.)	Adverse	Wide	Medium	Low Municipal solid waste 5 ton/day corresponding insignificant amount of the daily capacity of landfills	Irreversible	Continous	Moderate (B)	Low (1)	Low (B1)	• Cooperation will be made with the licensed local service providers (e.g. municipal, other private licensed waste transportation/recycling/ recovery firms) and written agreements/protocols will be made regarding the regular and sound management/disposal of Project-sourced wastes. • Amount of wastes to be sent to off-site management will be minimized with the implementation of the Solid Waste Management Procedure that relies on the waste managament hierarchy. • Wastes will be collected systematically in closed containers and various types of wastes (non-hazardous, hazardous and special wastes) will be sorted for proper handling and disposal. • Recyclable wastes will be collected separately to be sent to licensed recycling facilities. • To the extent possible, use of non-hazardous materials will be preferred. Where use of hazardous materials is inevitable, hazardous wastes will be segregated from non-hazardous wastes. Thus, hazardous waste formation will be minimized.	Low
						Low Packaging waste: 1 ton/day	Short-term reversible				Low (B1)	• No waste will be disposed of or buried on site. Illegal dumping will not be allowed. • It will be ensured that construction camp sites and surroundings are kept clean and that windblown litter is cleared on a daily basis. • Site personnel will be trained on proper waste management procedures. • For the temporary storage of the hazardous and non-hazardous wastes at the camp sites, temporary waste storage areas will be established. • Licensed waste transportation vehicles will be used to remove wastes being temporarily stored at Project sites. Private companies and relevant municipalities will be interviewed for this purpose. Possible management options will be evaluated in accordance with the relevant waste management regulations and these actions will be recorded and kept by Project Management. • Temporary hazardous and non-hazardous waste storage areas will have roof and sides of the area will be properly covered to prevent rainwater intrusion; floor of the area will be sealed with either reinforced concrete or epoxy material; drainage of the areas will be provided and the channels will drain to blind holes. • Access to storage areas will be through controlled gates having proper locking systems. • Necessary signs and boards will be properly placed; name and contact number of the personnel responsible from the area will be put on the boards. • Separate storage compartments will be provided for the storage of different types of wastes. • Leak-proof containment structures will be placed under the tanks/drums holding liquid wastes. • For the storage of liquid wastes greater than 220 liters, secondary containment with an available volume of at least 110 percent of the largest storage container or 25 percent of the total storage capacity (whichever is greater) will be provided. • Relevant fire-fighting equipments (i.e. mobile fire extinguishers) will be kept ready outside the storage areas. • Absorbents will be kept available for response to potential leakage/spill events. • Adequate ventilation will be provided where volatile wastes are to be stored. • All the hazardous and non-hazardous waste storage areas will be visually inspected by assigned site personnel on a regular basis.	Low
	Operation			Wide	Long	Low (daily waste amount estimated to be less than 1% of the daily capacity of the landfill) Municipal solid waste estimated to be suitable for the daily capacity to be agreed landfills	Irreversible	Continous	Moderate (B)	Low (1)	Moderate (B1)	• Chlorine free solvents and lead-free paints will be used within the scope of maintenance activities. • Any waste identified or generated in the Motorway corridor as a result of the site cleanings, sediment removal, tree/shrub trimming, animal death and spill/scattering of waste tires, metal pieces, etc. will be immediately removed from the road surface and disposed of in accordance with the relevant national regulations within 7 days; • Road resurfacing wastes will be primarily recycled wherever it is feasible by using in the aggregated or as a base material for the pavement; • Recyclable materials such as glass, scrap tires, certain types of slags and ashes will be added to the new asphalt and concrete mixes; • Amount of unused products (e.g. paint, herbicide) that needs disposal will be minimized by managing the inventories properly; • Any obsolete product will be removed/managed in accordance with the requirements of Turkish regulations; • Characteristics (hazardous or non-hazardous) of the sediment and sludge that will come out from the drainage system maintenance activities will be identified in accordance with the requirements of Turkish Waste Management Regulation and a disposal method suitable for the identified characteristics will be applied; • Wherever feasible, vegetation waste will be composted for reuse as landscaping fertilizer; • Removed, old road surface materials will be reused in paving or stockpiled for being reused in proper applications (e.g. as road base material) wherever feasible.	Low
						Low Packaging waste estimated to be suitable	Short-term reversible						

CHAPTER 8

WATER RESOURCES

8. CHAPTER – WATER RESOURCES

This Chapter identifies the existing water resources' characteristics (physical, biological, and chemical) and usage along the South Alternative and assesses the potential impacts on these aspects. Measures proposed to mitigate the potential impacts, and the residual impacts are also described in this chapter.

8.1 Assessment Methodology and Data Sources

To assess the impacts to the water resources and possible water usage by the Project Sponsor, the main water resources in the area have been determined and evaluated by considering the physical and chemical characteristics of the resources. The data concerning the dam lakes near the project area has been obtained from State Hydraulic Works (DSI) database, Aydın and Denizli Provincial Environmental Status Reports prepared in 2019, and internet resources.

Sampling points for the surface water and groundwater resources are determined, where possible, to represent the locations where potential impacts can be expected. Water quality analyses have been done based on relevant Turkish legislative requirements, which comply with the EU requirements. These sampling and analyses study will provide the baseline quality data for the surface and groundwater resources, which will be the basis for impact assessment.

Significance Criteria

The significance criteria for the impacts on water resources have been determined as high, medium, or low, based on the evaluation of the magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used to determine the magnitude of impact on the water resources. The sensitivity/value criteria to be used in the scope of impact assessment for the resources will be based on the existing and potential use of the resource, existing quality, and expert judgment.

8.2 Baseline Conditions

The motorway crosses of surface water resources including intermittent and perennial rivers, creeks, etc. These resources may be affected by the project activities in various ways during the construction and operation phases of the South Alternative if not properly mitigated.

As a general look, the motorway route passes through Büyük Menderes River basin, where Büyük Menderes River and its tributaries. Hence, engineering structures like bridges were included in the design.

A baseline water quality sampling and analyses program (covering both surface and groundwater resources) has been conducted to characterize the baseline water quality conditions at such areas and other surface water bodies crossed by South Alternative. The program included in-situ measurements, sampling, and laboratory analyses. The interpretation of measurement results is done in accordance with relevant standards, and baseline conditions regarding surface and groundwater resources are provided in this chapter.

8.2.1 Büyük Menderes Basin

The project area mainly passes through the Büyük Menderes Basin. The Büyük Menderes Basin is bounded by Küçük Menderes and Gediz Basins in the north, Sakarya, Akarçay and Antalya Basins in the east, Batı Akdeniz and Burdur basins in the south and Aegean Sea in the west. The borders of Büyük Menderes Basin can be identified as; Samsun, Cevizli, Elma and Murat mountains in the north, Sandıklı Mountains in the east, Madran, Babadağ and Bozdağlar Mountains in the south (see Figure 8.1). Total area of Büyük Menderes Basin is about 2,600,000 ha. The ratio of the

projected area of the basin to the Türkiye's area is 3.3%. On the other hand, population density in this basin is 86 person/km^2 while Türkiye's average is 94 person/km^2 according to the Turkish Statistical Institute (TUIK) as given in the *Catchment Basin Protection Plans Büyük Menderes Basin (TUBITAK MAM, 2013*).

The environmental pressures in the basin include domestic wastewater discharge without treatment, irregular landfills, industrial wastes arising from textile and leather production, wastewater originating from olive oil production, agricultural and livestock activities, pollution from geothermal waters, and climate change. As a result of these pressures, Dokuzsel creek, Banaz stream, Çürüksu stream, Büyük Menderes Plain, Lake Bafa, highly polluted streams, dam lakes, and HEPPs are determined as hot spots.

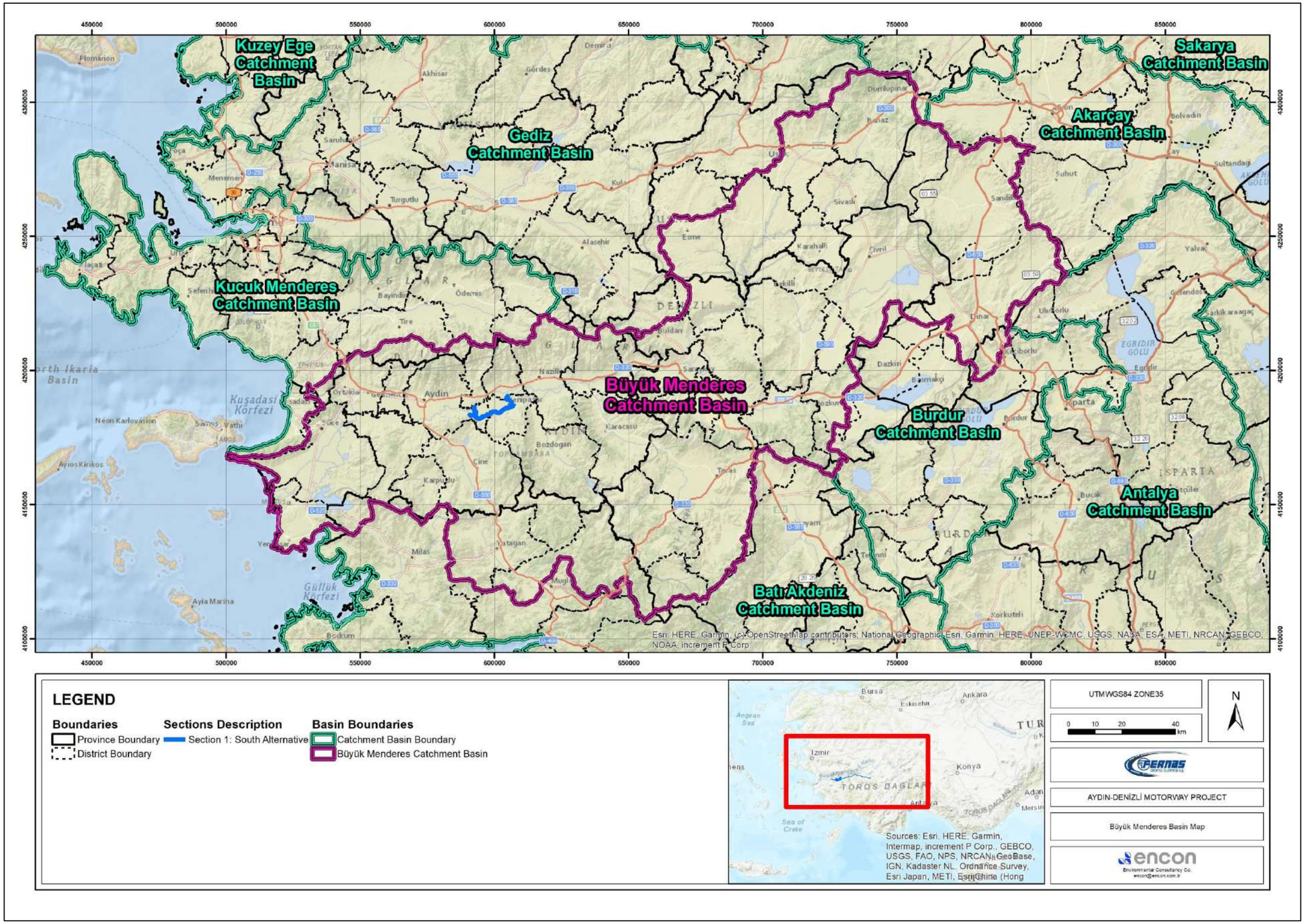


Figure 8.1 Büyük Menderes Basin Map

8.2.2 Water Resources

8.2.2.1 Standing Water Bodies

The dam lakes located within the boundary of the Aydın province is summarized in Table 8.1. The dam lakes that are located in the vicinity of the route are explained in detail below.

Table 8.1 Dams Located in Aydın Province

No.	Dam Lake	Province	Surface Water	Area (ha)	Purpose
1	Kemer Dam Lake	Aydın	Akçay Stream	1,475	Irrigation, Energy, Flood
2	Yaylakavak Dam Lake	Aydın	Kocaçay Stream	100	Irrigation
3	Topçam Dam Lake	Aydın	Madran Stream	420	Irrigation, Flood
4	Çine Dam Lake	Aydın	Çine Stream	934	Irrigation, Energy, Flood
5	Karacasu Dam Lake	Aydın	Dandalaz Stream	107	Irrigation, Drinking
6	İkizdere Dam Lake	Aydın	İkizdere Stream	547	Drinking

Topçam Dam Lake

The dam lake/reservoir is approximately 7.1 km south of the South Alternative (see Figure 8.2). The dam was constructed between 1977-1984 period for irrigation and flood control purposes. The dam's height is about 56 m from the river bed, while reservoir volume is 83,500,000 m^3 and reservoir surface area is 4.2 km^2 on normal water level (*State Hydraulic Works' Website*).

İkizdere Dam Lake

The İkizdere dam lake/reservoir is located approximately 25.4 km northwest of the South Alternative (see Figure 8.2). The construction of the dam was started in 1999 with the purpose of irrigation and drinking water supply. The height of the dam is about 101 m from the river bed, while reservoir volume is 213,220,000 m^3 and reservoir surface area is 5.5 km^2 on normal water level. The dam supplies about 34 million m^3 drinking water annually (*State Hydraulic Works' Website*).

Kemer Dam Lake

The Kemer dam lake/reservoir is located approximately 38.6 km southwest of the South Alternative (see Figure 8.2). Kemer Dam is a dam in Bozdoğan, Aydın, Turkey, built between 1954 and 1958. The development was backed by the Turkish State Hydraulic Works. The height of the dam is is 108,50 m. form the river bed. The lake volume at normal water level is 544.00 hm^3 and the lake area at normal water level is 14.75 km^2. It provides irrigation services to an area of 57,847 hectares, and the HEPP (hydroelectric power plant) generates 143 GWh of electricity per year with a total power capacity of 48 MW.

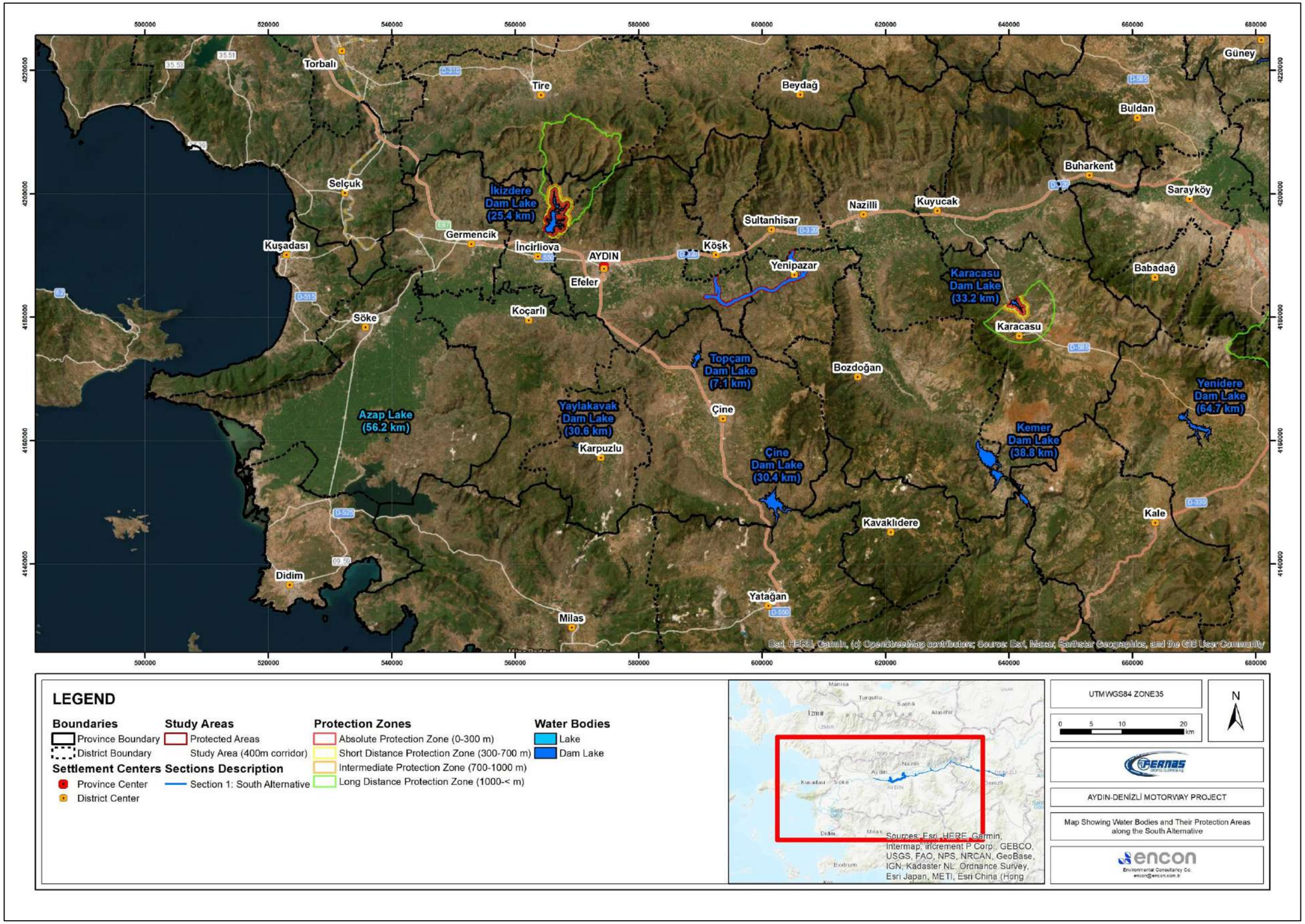


Figure 8.2 Map Showing Water Bodies and Their Protection Areas along the South Alternative

8.2.2.2 Running Water Bodies

Büyük Menderes River is the longest river in the Aegean region with a length of 584 km. Based on its structure Büyük Menderes Basin is not considered as a single river basin since it contains a high number of rivers, creeks, and streams. The quality of water resources in the catchment varies based on the pollution pressures they are exposed to such as industrial and agricultural.

The main rivers in the Büyük Menderes River Basin are namely; Çine, Akçay, Emir, Banaz, Kufi, Dandalaz and Madran streams. There are also several streams and creeks in the region:

- Çine Stream rises from Karagedik Mountains and joins Büyük Menderes River. The total length of the stream is 359 km.
- Akçay Stream has a length of 116 km, and it rises from the mountainous region located in the northeastern part of Muğla province. The important tributaries of the Akçay stream include Karacaören, Doğançay and Mortuma streams.
- Banaz Stream rises from Murat Mountain and has a length of 165 km. Kusura and Yavu creeks form important tributaries of the Banaz stream.
- Kufi Stream has a length of 98 km, and the watershed area is about 2000 km^2. The Kufi stream rises from the springs located at the eastern and northern parts of the Sandıklı plain.
- Dandalaz Stream flows within the SE-NW trending tectonic valley, which is bounded by Akdağ mountain at the east and Karıncalıdağ mountain at the west. The length of the stream is 60 km.

Most of the small streams close to the project area are unnamed. The locations of the river crossings matching the sampling stations for surface water quality analysis within the construction area of the closest motorway sections are provided in Table 8.2 below:

Table 8.2 Location of Running Waters

River name (if available)	District/Province	Basin	Coordinates (UTMWGS84 Zone35)	
			East	North
Tabakhane Stream	Efeler/Aydın	Büyük Menderes	575868	4185802
Büyükmenderes River	Efeler/Aydın	Büyük Menderes	578622	4183933
Büyükmenderes River	Yenipazar/Aydın	Büyük Menderes	605076	4190712
Akçay Stream	Bozdoğan/Aydın	Büyük Menderes	615625	4187485
Büyükmenderes River	Kuyucak/Aydın	Büyük Menderes	631253	4195526

8.2.2.3 Groundwater

Groundwater is the water present beneath Earth's surface in soil pore spaces and the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. Groundwater is recharged to the surface naturally; natural discharge often occurs at springs and seeps and can form oases or wetlands. Groundwater is usually withdrawn for agricultural, municipal, and industrial use by constructing and operating extraction wells.

Groundwater is often cheaper, more convenient, and less vulnerable to pollution than surface water. Therefore, it is commonly used for public water supplies. Groundwater is managed and controlled by State Hydraulic Works under the Ministry of Agriculture and Forestry in Turkey.

Based on the research of State Hydraulic Works, the groundwater operating reserve of Büyük Menderes River basin is about 700x10^6 m^3/year. The usable water potential of the basin is also found to be 1.70x10^9 m^3/year considering the operational reserves of 1.00x10^9 m^3/year usable surfacewater and ~700x10^6 m^3/year groundwater.

Groundwater pollution most often results from improper disposal of wastes on land. Primary sources include industrial and household chemicals and garbage landfills, excessive fertilizers and pesticides used in agriculture, industrial waste lagoons, tailings and process wastewater from mines, leaking underground oil storage tanks and pipelines, sewage sludge and septic systems.

The quality of the groundwater is presented in the next section.

8.2.3 Field Surveys and Findings

A water quality assessment survey was undertaken in the scope of the Supplementary ESIA studies to establish a description of the baseline conditions through the route. In this regard, samples are taken, and relevant analyses were conducted by ENCON Laboratory Inc. in August, 2023. The coordinates of the groundwater and surface water sampling points and corresponding KMs of the project route are given in Table 8.3 and Table 8.4, respectively.

Table 8.3 Groundwater Quality Sampling Stations

Sampling Station	Coordinates	
	East	North
YAS-8	604693	4188167
YAS-9	594210	4183789

Table 8.4 Surface Water Quality Sampling Stations

Sampling Station	Coordinates	
	East	North
YS-3	605076	4190712
YS-13	592249	4185935

Surface water sampling locations were selected from the main streams passing through the route. Similarly, groundwater sampling points were determined such that they would represent the locations where potential impacts can be expected. This way, it was aimed to characterize baseline water quality conditions (including both surface and groundwater resources) at sensitive areas and other surface water bodies crossed by South Alternative. Desktop-based studies and field study findings indicated that selected sampling points represent remaining surface water bodies (fed by sampled streams and therefore not needed to be sampled). The locations of water quality sampling stations are shown in Figures 8.3.

Surface Water Quality Regulation stipulates that a water resource can only be classified into one of the three classes given in Annex-5, Table 2 (Quality Class Criteria of Inland Surface Water Resources According to General Chemical and Physicochemical Parameters), when the measured values for all parameters comply with the values defining that water class. Accordingly, the lowest water quality class observed for a parameter determines the water quality class of that water resource, even though other parameters might indicate higher quality classes (Class III being the lowest water quality class).

The threshold values dictating a water class according to the parameters in Annex-5 Table 2 of this regulation are given in Table 8.5 below, together with the results of the measurements/analyses done in each water quality sampling station concerning these parameters. The samples taken from locations: YS-3 and YS-13 were analyzed for the parameters involved in Annex-5, Table 2 of the regulation.

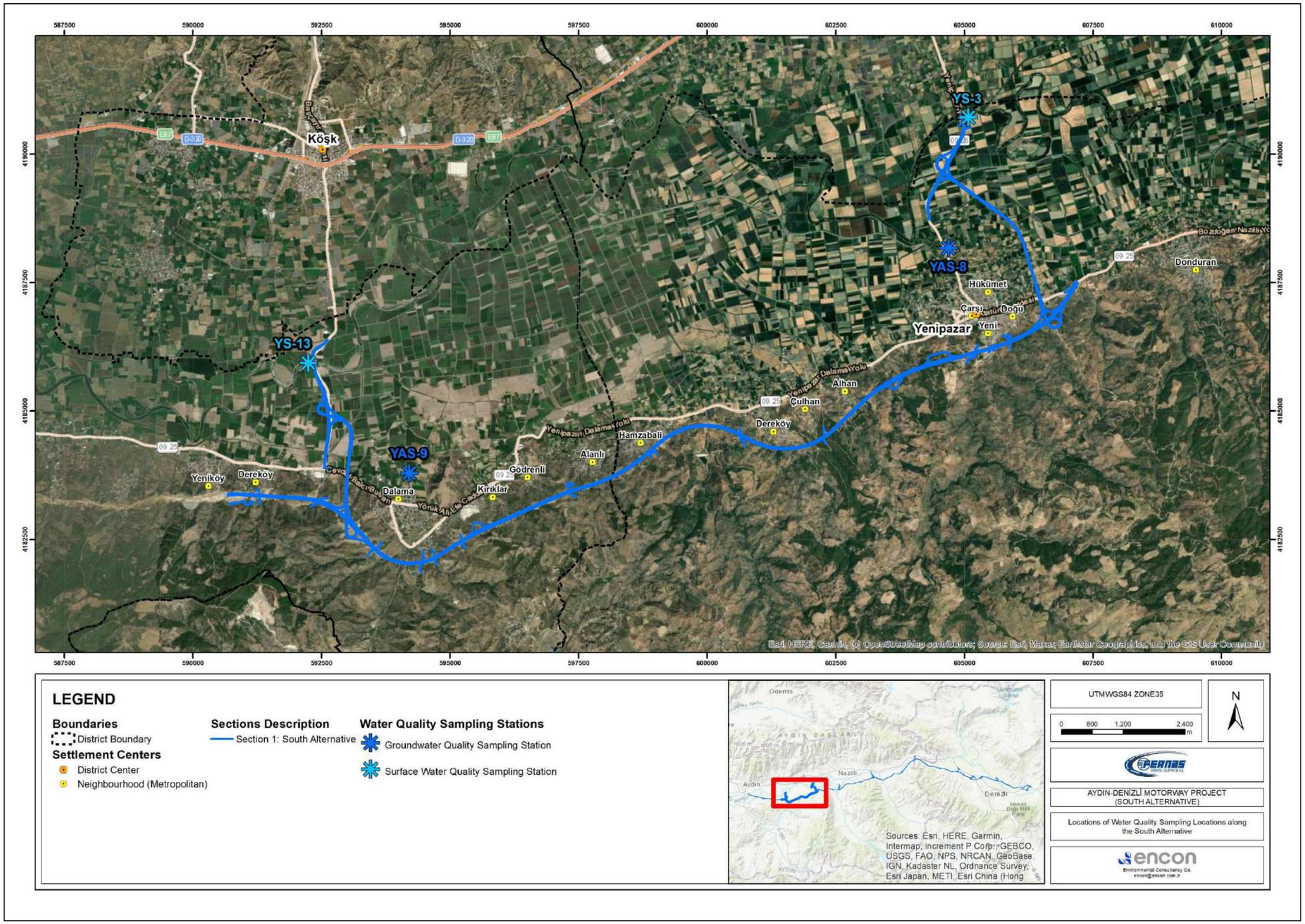


Figure 8.3 Locations of Water Quality Sampling Locations along the South Alternative

Table 8.5 Results of Water Quality Analysis Based on Annex-5 Table 2 of Surface Water Quality Regulation

Parameters	Water Quality Classes			Unit	YS-3	YS-13
	I	II	III		August 2023	August 2023
Color	RES 436 nm: ≤ 1.5	RES 436 nm: 3	RES 436 nm> 4.3	m^{-1}	0.2	0.32
	RES 525 nm: ≤ 1.2	RES 525 nm: 2.4	RES 525 nm> 3.7		0.08	0.12
	RES 620 nm: ≤0.8	RES 620 nm: 1.7	RES 620 nm: 2.5		0.04	0.4
pH	6-9	6-9	6-9	-	9.36	8.78
Conductivity	< 400	1000	>1000	µS/cm	753.0	934.0
Oil and Grease	< 0.2	0.3	>0.3	mg/L	0.4	1.0
Dissolved Oxygen	> 8	6	<6	mg/L	3.4	1.9
Chemical Oxygen Demand	< 25	50	>50	mg/L	7.3	13.9
Biochemical Oxygen Demand	< 4	8	>8	mg/L	<3,0	4.3
Ammonium Nitrogen	< 0.2	1	>1	mg/L	<0.02	<0.02
Nitrate Nitrogen	< 3	10	>10	mg/L	1.6	1.7
Total Kjeldahl Nitrogen (TKN)	< 0.5	1.5	>1.5	mg/L	2.4	<0.5
Total Nitrogen	< 3,5	11.5	>11.5	mg/L	4.5	2,.9
Orthophosphate Phosphorus	< 0.05	0.16	>0.16	mg/L	0.095	0.16
Total Phosphorus	< 0.08	0.2	>0.2	mg/L	0.17	0.27
Fluoride	≤ 1000	1500	>1500	ug/L	<20.0	<20.0
Manganese	≤ 100	500	>500	ug/L	45.3	120.7
Selenium	≤ 10	15	>15	ug/L	<5.0	<5.0
Sulphur (S^{-2})	≤ 2	5	>5	ug/L	<2.0	<2.0

When analysis results given in Table 8.5 are evaluated with respect to the standards provided in the Surface Water Quality Regulation, the water quality class of all samples, for August 2023 sampling period, was determined as Class III. The details of the parameters defining the given water classes are provided in Table 8.6 below.

Table 8.6 Water Quality Classes of the Sampled Water Resources

Sampling Station	Sampling Period	Water Quality Class	Determining Parameters
YS-3	August 2023	Class III	Oil and Grease, Dissolved Oxygen , Total Kjeldahl Nitrogen,
YS-13	August 2023	Class III	Oil and Grease, Dissolved Oxygen, Total Phosphorus, Manganese

As it can be seen from Table 8.6, almost all determining parameters indicate some sort of agricultural activity (mainly irrigation returns) based on pollution in surface waters. This is due to the presence of primarily nitrogen and phosphorus compounds at the levels determining the water quality classes.

In addition to Annex-5, Table 2 of the Surface Water Quality Regulation, Table 5 in the same annex giving the Primary Substances and Environmental Quality Standards for Surface Water Resources parameters. This table was adapted from 2013/39/EU numbered EU Directive. Measuring the parameters in this table aims to determine if there is any problem with the primary substances in the water bodies of concern, which would depend mainly on industrial discharges. Primary substances are measured at two stations, as given in Table 8.7 below.

According to the Surface Water Quality Regulation, analysis results (annual) of the relevant substances should be compared with Annual Average Environmental Quality Standard (AA-EQS) and Maximum Environmental Quality Standards (MAX-EQS), which are given in Annex-5, Table 5. If analysis results are lower than both standards, the environmental quality standard is met. The results given in Table 8.7 show that all surface water sampling points meet the limit values.

Table 8.7 Results of Water Quality Analyses with respect to Primary Substances given in Annex-5, Table 5 of Surface Water Quality Regulation

Parameters	SW-EQS	SW-EQS	Unit	YS-3	YS-13
	Rivers/Lakes	Coastal and Translational Water Bodies		August 2023	August 2023
Alochlor	0.3	0.3	µg/L	<0.3	<0.3
Anthracene	0.1	0.1	µg/L	<0.1	<0.1
Atrazine	0.6	0.6	µg/L	<0.1	<0.1
Benzene	10	8	µg/L	<0.2	<0.2
Bromic Diphenyl Ether[1]	-	-	µg/L	<0.005	<0.005
Cadmium and Compounds[2]	< 0.08 (Class 1)	0.2	µg/L	<0.08	<0.08
	0.08 (Class 2)				
	0.09 (Class 3)				
	0.15 (Class 4)				
	0.25 (Class 5)				
C10-13 Chloroalkane	0.4	0.4	µg/L	<0.005	<0.005
Chlorfenvinphos	0.1	0.1	µg/L	<0.1	<0.1
Chlorpyrifos (Chlorpyrifoss-ether)	0.03	0.03	µg/L	<0.03	<0.03
1,2Dichloroethane	10	10	µg/L	<0.2	<0.2
Dicholoromethane	20	20	µg/L	<0.2	<0.2
Diurone	0.2	0.2	µg/L	<0.05	<0.05
Endosulfan	0.005	0.0005	µg/L	<0.0005	<0.0005
Floranthene	0.0063	0.0063	µg/L	<0.0063	<0.0063
Hexacholorobenzene	-	-	µg/L	<0.1	<0.1
Hexachloro-butadiene	-	-	µg/L	<0.1	<0.1
Hexachloro-cyclohexane	0.02	0.002	µg/L	<0.002	<0.002
Isoproturon	0.3	0.3	µg/L	<0.05	<0.05
Lead and Compounds[3]	1.2	1.3	µg/L	<0.5	<0.5
Mercury and Compounds	-	-	µg/L	<0.1	<0.1
Naphthalene	2	2	µg/L	<0.1	<0.1
Nickel and Compounds[3]	4	8.6	µg/L	<1.0	<1.0
Nonyl Phenols	0.3	0.3	µg/L	<0.30	<0.30
Octhyl Phenol	0.1	0.01	µg/L	<0.01	<0.01
Pentachlorobenzene	0.007	0.0007	µg/L	<0,0007	<0.0007
Pentachlorophenol	0.4	0.4	µg/L	<0.4	<0.4
Polycyclic Aromatic Hydrocarbons (PAH)	-	-	µg/L	<0.1	<0.1
Benzo(a)pyrene	1.7×10^{-4}	1.7×10^{-4}	µg/L	<0.00017	<0.00017
Benzo(b)fluoranthene	-	-	µg/L	<0.1	<0.1
Benzo(k)fluoranthene	-	-	µg/L	<0.1	<0.1
Benzo(g,h,i)preylene	-	-	µg/L	<0.1	<0.1
Indeno (1,2,3-cd) pyrene	-	-	µg/L	<0.1	<0.1
Simazine	1	1	µg/L	<0.05	<0.05
Tributil Tin Compounds	0.0002	0.0002	µg/L	<0.0002	<0.0002
Trichlorobenzenes	0.4	0.4	µg/L	<0.2	<0.2
Tricholoromethane	2.5	2.5	µg/L	<0.2	<0.2
Trifluarilin	0.03	0.03	µg/L	<0.03	<0.03
Dicofol	1.3×10^{-3}	3.2×10^{-5}	µg/L	<0.000032	<0.000032

Parameters	SW-EQS	SW-EQS	Unit	YS-3	YS-13
	Rivers/Lakes	Coastal and Translational Water Bodies		August 2023	August 2023
PFOS	6.5×10^{-4}	1.3×10^{-4}	µg/L	<0.00065	<0.00065
Quinoxyphene	0.15	0.015	µg/L	<0.015	<0.015
Acloniphene	0.12	0.012	µg/L	<0.012	<0.012
Bifenox	0.012	0.0012	µg/L	<0.0012	<0.0012
Sibutrin	0.0025	0.0025	µg/L	<0.0025	<0.0025
Cypermethrin[5]	8×10^{-5}	8×10^{-6}	µg/L	<0.000008	<0.000008
Dichlorvos	6×10^{-4}	6×10^{-5}	µg/L	<0.00006	<0.00006
HBCDD[6]	0.0016	0.0008	µg/L	<0.0008	<0.0008
Heptachlor and Heptachlor-exo-epoxide	2×10^{-7}	1×10^{-8}	µg/L	<0.00000001	<0.00000001
Terbutryn	0.065	0.0065	µg/L	<0.0065	<0.0065

In addition to surface water samples, 2 groundwater samples were collected in August 2023 and analyzed around the project route to get an idea about the groundwater quality in this area. For evaluation of the baseline conditions for groundwater quality again Annex-5, Table 2 of the Surface Water Quality Regulation was used. This approach also provided consistency for evaluating the groundwater and surface water quality together. The results of the groundwater analyses are given in Table 8.8..

The analysis results for groundwater monitoring stations presented in Table 8.8 indicate that the water quality Class is Class III for all stations based on the parameters taken into consideration. This is mainly due to oil and grease, dissolved oxygen, nitrate nitrogen, total kjeldahl nitrogen, total phosphorus and orthophosphate phosphorus parameters, which shows almost similar results with the surface water stations. In addition to these parameters, the conductivity value exceeded the limit value.

Water quality analysis reports are presented in Annex-5.

Table 8.8 Results Groundwater Quality Analysis Based on Annex-5 Table 2 of Surface Water Quality Regulation

Parameters	Water Quality Classes			Unit	YAS-8	YAS-9
	I	II	III		August 2023	August 2023
Color	RES 436 nm: ≤ 1.5	RES 436 nm: 3	RES 436 nm> 4.3	m^{-1}	0.08	0.04
	RES 525 nm: ≤ 1.2	RES 525 nm: 2.4	RES 525 nm> 3.7		0	0
	RES 620 nm: ≤ 0.8	RES 620 nm: 1.7	RES 620 nm: 2.5		0	0
pH	6-9	6-9	6-9	-	10.28	7.94
Conductivity	< 400	1000	>1000	µS/cm	1092.0	2410
Oil and Grease	< 0.2	0.3	>0.3	mg/L	0.8	1.2
Dissolved Oxygen	> 8	6	<6	mg/L	2.2	2.5
Chemical Oxygen Demand	< 25	50	>50	mg/L	7.9	<5.0
Biochemical Oxygen Demand	< 4	8	>8	mg/L	<3.0	<3.0
Ammonium Nitrogen	< 0.2	1	>1	mg/L	<0.02	<0.02
Nitrate Nitrogen	< 3	10	>10	mg/L	4.8	40.0
Total Kjeldahl Nitrogen (TKN)	< 0.5	1.5	>1.5	mg/L	1.7	2.3
Total Nitrogen	< 3.5	11.5	>11.5	mg/L	6.5	42.4
Orthophosphate Phosphorus	< 0.05	0.16	>0.16	mg/L	0.06	0.035
Total Phosphorus	< 0.08	0.2	>0.2	mg/L	0.1	0.19
Fluoride	≤ 1000	1500	>1500	ug/L	937.0	914.0
Manganese	≤ 100	500	>500	ug/L	<10.0	<10.0
Selenium	≤ 10	15	>15	ug/L	<5.0	<5.0
Sulphur (S^{-2})	≤ 2	5	>5	ug/L	<2.0	<2.0

When analysis results given in Table 8.8 are evaluated with respect to the standards provided in the Surface Water Quality Regulation, the water quality class of all samples, for August 2023 sampling period, was determined as Class III. The details of the parameters defining the given water classes are provided in Table 8.9 below.

Table 8.9 Water Quality Classes of the Sampled Water Resources

Sampling Station	Sampling Period	Water Quality Class	Determining Parameters
YAS-8	August 2023	Class III	Conductivity, Oil and Grease, Dissolved Oxygen, Total Kjeldahl Nitrogen,
YAS-9	August 2023	Class III	Conductivity, Oil and Grease, Dissolved Oxygen, Nitrate Nitrogen, Total Kjeldahl Nitrogen, Total Nitrogen

As it can be seen from Table 8.8, almost all determining parameters indicate some sort of agricultural activity (mainly irrigation returns) based on pollution in surface waters. This is due to the presence of primarily nitrogen and phosphorus compounds at the levels determining the water quality classes.

In addition to Annex-5, Table 2 of the Surface Water Quality Regulation, Table 5 in the same annexes giving the Primary Substances and Environmental Quality Standards for Surface Water Resources parameters. This table was adapted from 2013/39/EU numbered EU Directive. Measuring the parameters in this table aims to determine if there is any problem with the primary substances in the water bodies of concern, which would depend mainly on industrial discharges. The primary substances are measured at two stations, as given in Table 8.10 below.

According to the Surface Water Quality Regulation, analysis results (annual) of the relevant substances should be compared with Annual Average Environmental Quality Standard (AA-EQS) and Maximum Environmental Quality Standards (MAX-EQS), which are given in Annex-5, Table 5. If analysis results are lower than both standards, the environmental quality standard is met. The results given in Table 8.10 show that all surface water sampling points meet the limit values.

Table 8.8 Results Groundwater Quality Analysis Based on Annex-5 Table 2 of Surface Water Quality Regulation

Parameters	SW-EQS	SW-EQS	Unit	YAS-8	YAS-9
	Rivers/Lakes	Coastal and Translational Water Bodies		August 2023	August 2023
Alochlor	0.3	0.3	µg/L	<0.3	<0.3
Anthracene	0.1	0.1	µg/L	<0.1	<0.1
Atrazine	0.6	0.6	µg/L	<0.1	<0.1
Benzene	10	8	µg/L	<0.2	<0.2
Bromic Diphenyl Ether[1]	-	-	µg/L	<0.005	<0.005
Cadmium and Compounds[2]	< 0.08 (Class 1)	0.2	µg/L	<0.08	<0.08
	0.08 (Class 2)				
	0.09 (Class 3)				
	0.15 (Class 4)				
	0.25 (Class 5)				
C10-13 Chloroalkane	0.4	0.4	µg/L	<0.005	<0.005
Chlorfenvinphos	0.1	0.1	µg/L	<0.1	<0.1
Chlorpyrifos (Chlorpyrifoss-ether)	0.03	0.03	µg/L	<0.03	<0.03
1,2Dichloroethane	10	10	µg/L	<0.2	<0.2
Dicholoromethane	20	20	µg/L	<0.2	<0.2
Diurone	0.2	0.2	µg/L	<0.05	<0.05
Endosulfan	0.005	0.0005	µg/L	<0.0005	<0.0005
Floranthene	0.0063	0.0063	µg/L	<0.0063	<0.0063
Hexacholorobenzene	-	-	µg/L	<0.1	<0.1
Hexachloro-butadiene	-	-	µg/L	<0.1	<0.1
Hexachloro-cyclohexane	0.02	0.002	µg/L	<0.002	<0.002
Isoproturon	0.3	0.3	µg/L	<0.05	<0.05
Lead and Compounds[3]	1.2	1.3	µg/L	<0.5	<0.5
Mercury and Compounds	-	-	µg/L	<0.1	<0.1
Naphthalene	2	2	µg/L	<0.1	<0.1
Nickel and Compounds[3]	4	8.6	µg/L	<1.0	<1.0
Nonyl Phenols	0.3	0.3	µg/L	<0.30	<0.30
Octhyl Phenol	0.1	0.01	µg/L	<0.01	<0.01
Pentachlorobenzene	0.007	0.0007	µg/L	<0.0007	<0.0007
Pentachlorophenol	0.4	0.4	µg/L	<0.4	<0.4
Polycyclic Aromatic Hydrocarbons (PAH)	-	-	µg/L	<0.1	<0.1
Benzo(a)pyrene	1.7×10^{-4}	1.7×10^{-4}	µg/L	<0.00017	<0.00017
Benzo(b)fluoranthene	-	-	µg/L	<0.1	<0.1
Benzo(k)fluoranthene	-	-	µg/L	<0.1	<0.1
Benzo(g,h,i)preylene	-	-	µg/L	<0.1	<0.1
Indeno (1,2,3-cd) pyrene	-	-	µg/L	<0.1	<0.1
Simazine	1	1	µg/L	<0.05	<0.05
Tributil Tin Compounds	0.0002	0.0002	µg/L	<0.0002	<0.0002
Trichlorobenzenes	0.4	0.4	µg/L	<0.2	<0.2
Tricholoromethane	2.5	2.5	µg/L	<0.2	<0.2
Trifluarilin	0.03	0.03	µg/L	<0.03	<0.03
Dicofol	1.3×10^{-3}	3.2×10^{-5}	µg/L	<0.000032	<0.000032

Parameters	SW-EQS	SW-EQS	Unit	YAS-8	YAS-9
	Rivers/Lakes	Coastal and Translational Water Bodies		August 2023	August 2023
PFOS	6.5×10^{-4}	1.3×10^{-4}	µg/L	<0.00065	<0.00065
Quinoxyphene	0.15	0.015	µg/L	<0.015	<0.015
Acloniphene	0.12	0.012	µg/L	<0.012	<0.012
Bifenox	0.012	0.0012	µg/L	<0.0012	<0.0012
Sibutrin	0.0025	0.0025	µg/L	<0.0025	<0.0025
Cypermethrin[5]	8×10^{-5}	8×10^{-6}	µg/L	<0.000008	<0.000008
Dichlorvos	6×10^{-4}	6×10^{-5}	µg/L	<0.00006	<0.00006
HBCDD[6]	0.0016	0.0008	µg/L	<0.0008	<0.0008
Heptachlor and Heptachlor-exo-epoxide	2×10^{-7}	1×10^{-8}	µg/L	<0.00000001	<0.00000001
Terbutryn	0.065	0.0065	µg/L	<0.0065	<0.0065

8.2.4 Wastewater Management

Wastewater will be generated during land preparation and construction activities and also during the operation phases of the South Alternative.

Wastewater will be generated during land preparation and construction activities from construction sites and accommodation facilities for workers (camp site, kitchen, cafeteria, etc.). The basic approach will be to reuse the wastewater generated by project activities in the activity cycle during construction. This approach will not require any water discharge to environmental media.

For the areas where reusing will not be an option, water should be treated to reduce or eliminate the contaminants before being discharged to receiving media.

According to the data published by Turkstats (2020), the daily average municipal wastewater generation by a person is 189 L/capita/day in Turkey, 183 L/capita/day in Aydın. In this context, the calculation of the total amount of wastewater generated during the construction phase is shown below.

Total Number of Personnel Planned to Work: 1,000 people
Daily Water Consumption per Person: 183 L/capita/day

Amount of wastewater to be produced in the construction phase:
1.000 people x 183 L/capita/day = 183,000 L/day

Throughout the project construction phase, package Waste Water Treatment Plants (WWTP) and non-leaking septic tanks were constructed for each construction camp site. WWTP has a capacity equivalent for 1,000 people; thus no significant impact is anticipated due to domestic wastewater discharges.

Treated wastewater shall be analyzed in order to ensure that the quality and quantity of the wastewater to be discharged will be in compliance with the limit values indicated in national and international regulations. In addition, necessary permits will be obtained from regulating administrations. The quality of the wastewater shall be in compliance with the limit values indicated in Regulation on Water Pollution Control, Table 8.10.

Table 8.10 Domestic Wastewater Discharge Requirements

Parameter	Turkish Legal Requirement ([a])		IFC ([b])
	2-hr Composite Sampling	24-hr Composite Sampling	
Biochemical Oxygen Demand (BOD_5) (mg/L)	50	45	30
Chemical Oxygen Demand (COD) (mg/L)	180	120	125
Total Suspended Solids (TSS) (mg/L)	70	45	50
pH	6-9	6-9	6-9
Total Nitrogen (mg/L)	-	-	10
Total Phosphorus (mg/L)	-	-	2
Oil and Grease (mg/L)	-	-	10
Total Coliform Bacteria MPN([c])/100 ml	-	-	400

([a]) Water Pollution Control Regulation, Table 21.1 Domestic Wastewater Discharges (Class 1: BOD load 5-120 kg/day, Population: 84-2000)
([b]) Table 1.3.1-Indicative Values for Treated Sanitary Sewage Discharges, IFC Environmental, Health, and Safety General Guidelines, April 30, 2007.
([c]) MPN: Most Probable Number

In the operation phase, service areas and toll collection areas will be the sources of wastewater generation. The wastewater generated may contain organic and inorganic pollutants, suspended solids, heavy metals or toxic substances, etc. At the service areas, wastewater will be treated in a 50-100 m^3 /day/ wastewater treatment plant and discharged to the appropriate receiving environment. At the toll collection areas, it will be collected on-site and transported by tanker for disposal in local sewage treatment plants. Table 8.11 below shows the total amount of wastewater that will be generated during the construction phase.

Table 8.11 Estimated Amount of Wastewater to be produced in Operation Phase

Location	Estimated Number Personnel/Visitors	Daily Municipal Wastewater Production (l/day)
Service areas (visitors)	100	15.000
Service areas & Tool Collection areas (personnel)	60	9.000
Total	**160**	**24.000**

There is no planned discharge to the riverbeds (dry or running) that are used for the drinking water supply to the settlements.

8.3 Potential Impacts

In order to assess potential impacts of the South Alternative on water resources, the project is considered in two phases: Land Preparation and Construction Phase and Operation Phase. In this way, relevant impacts are evaluated separately for each phase since the project activities and potential releases from these activities are different for each phase.

8.3.1 Land Preparation and Construction Phase

Potential impacts on water resources during the land preparation and construction phase are generally expected to be more significant than the ones during operation phase for motorway projects. The main source of land preparation and construction phase impacts of a motorway project is typically suspended sediment in runoff waters from the work sites and accidental spillages of hazardous materials from construction activities and machinery.

8.3.1.1 Impacts on Surface Water

Potential impacts on surface water bodies and quality can mostly be considered temporary. These impacts can be listed as follows:

- Construction activities on existing surface water bodies such as rivers, creeks, drainage, or irrigation channels may permanently demolish these components without proper design and construction management precautions (including reinstating).
- Silty, soiled, and high turbidity water would arise from construction activities, which might contaminate surface waters. Main construction activities that may cause these impacts are;
  - excavation
  - soil stockpiling
  - quarry activities
  - plant and wheel washing
  - road construction
  - washing of finished road surfaces to remove accumulated soil
- Spills of hazardous substances including fuel, oils, lubricants and cement might take place at construction sites, refueling site or storage depot and reach to close by surface

and groundwater. These would affect the water quality such that aquatic life (mainly fish) and downstream users might also be affected.

- Bitumen and materials used for waterproofing of concrete surfaces will be used during the construction phase of the project. These materials are also a contamination source for surface water, especially when they are mixed with surface runoff upon precipitation and reach a surface water body.
- All wastewaters from construction activities (sanitary or process) pose a risk to the water environment if not treated before discharge.

8.3.1.2 Impacts on Groundwater

The potential impacts on groundwater would be on both water quality and water quantity (groundwater levels) in the area. These can be listed as follows:

- Some deeper excavation works may require permanent dewatering of a groundwater component.
- During earthworks and other soil-related activities; in sections cut into the bedrock or shallow overburden, any fissure permeability is at risk of blockage by infiltrating sediment/fines.
- Especially on areas with shallow overburden, accidental discharges of hazardous materials to the ground can contaminate aquifers.
- Site clearance, earthwork, spillages/leakages from construction sites, and refueling vehicles may contaminate aquifers.
- All wastewaters from construction activities (domestic or industrial) pose a risk to the water environment if not treated before discharge.

8.3.2 Operation Phase

Potential impacts on water resources during the operation/use of the motorway are generally more limited than construction phase, and there are temporary, one-time and long term impacts.

8.3.2.1 Impacts on Surface Water

Impacts on Surface Water Quality

- Maintenance activities like using de-icing agents may affect surface water quality if they reach any close surface water, but this impact will be temporary.
- During the operation of the motorway, spills during road accidents and from filling stations might be of concern. This type of water pollution risk is high within all road sections close to surface water bodies. However, this type of impact would be temporary since accidents and/or spillages should be considered as one-time events.
- Routine deposits (tyre and brake deposits, hydrocarbons from engines, liquid exhaust emissions etc.) of vehicles travelling on motorway and leakage of road body itself (tar soils) and road marking materials have the possibility to impact nearby surface water quality. As these events are continuous, such impacts would be considered as permanent.

Structural Impacts on Surface Water

- Construction of viaducts, culverts, etc. might change the hydrological regime with potential impacts on the beds and banks of rivers (scour, erosion, deposition etc.).
- In case of inappropriate design, physical interference of a stream by the installation of culverts and roadways has the possibility to impact the hydrological regime of a stream.

Impacts on Drainage and Flooding

- The final structure of a motorway will increase the impermeable surface area because of its nature. That situation leads to an increase in the rate of surface water runoff, and high storm water flow rates can lead to erosion and flooding.
- During flood times, culverts, and diversion channels may impede flow. This situation causes an increase in the water level at the upstream of relevant structures.

8.3.2.2 Impacts on Groundwater

Impacts on Groundwater Quality

- Runoff from the road pavement is likely to contain some degree of silt/dust and pollutants from atmospheric deposition, vehicle emission, litter, and general road maintenance, as well as from possible accidental road spillage incidents. This runoff has the possibility to infiltrate into the groundwater and contaminate it.
- In areas where groundwater wells are located down-gradient and short distances from fill sections, and at fill sections where the subsoil thickness is shallow, surface water runoff has the potential to infiltrate into the subsoil and migrate to the groundwater.

Impacts on the Groundwater Table

- Deep cuttings are a necessity for project in some areas. Deep cuttings may have impacts on the groundwater regime and also have subsequent impacts on groundwater abstraction wells.
- Water inflow to the underground may be reduced due to the closure of highway surfaces.

8.4 Mitigation Measures

Relevant mitigation measures according to potential impacts identified are described in this section. Impacts of the project should be mitigated by measures to be taken at different phases of project development and implementation. Therefore, mitigation measures to be considered are categorized into three phases, namely, design, land preparation and construction, and operation.

8.4.1 Design Phase

- General hydrological considerations/design of the project will be in accordance with KGM design standards and AASHTO Highway Drainage Principles. In this regard, generally, 100-year flood flow will be taken into account on stream passage designs (Ref. State Highways Technical Requirements, Item 9.3). Minimum dimensions of all culverts will be 2m x 2m except discharge culverts. Culverts will be designed with one outlet whenever possible. Any change in the project design will be implemented once approved by KGM.
- Project elements will be located such that risks on groundwater would be minimized. Groundwater use for project activities would be planned to be limited and would be done only after getting relevant permissions from the authorities.
- In case of a need, new or replacement of irrigation structures will be constructed.
- In order to minimize changes in the hydrology and flow of water courses, design of structures will be done accordingly. The design will also ensure an appropriate capacity for culverts through embankments when flood plains are cut off.
- The design will be done in a way to minimize the risks of flooding. During the operation phase, reviewed Emergency Preparedness and Response Plan (See Annex-3) will be used to mitigate flood events.

- Stormwater management practices that slow peak runoff flow, reduce sediment load, and increase infiltration, including vegetated swales (planted with salt-resistant vegetation), filter strips, terracing, detention ponds or basins, and infiltration trenches, will be planned.
- In order to limit the volume of water requiring specialized treatment (during land preparation and construction, and operation phases), segregation of liquid effluents, principally along industrial, sanitary, and stormwater categories, will be planned.
- Fish and terrestrial animal passages will be located in design where necessary.
- Appropriate designs and structures, such as viaducts will be used for stream and river crossings.
- Drainage projects have been developed to collect surface runoff along the Motorway by means of ditches and diversion of the collected water to the nearest receiving water bodies. The design criteria for the drainage system are in accordance with motorway standards.

8.4.2 Land Preparation and Construction Phase

8.4.2.1 Mitigation Measures for Surface and Groundwater Quality

- Equipment and vehicles will get their fuels at designated areas.
- Hazardous materials will not be stored within excavated areas. Supervision will be used during the handling of all hazardous materials. Impervious bunds and other containment techniques will be used where hazardous materials are handled.
- Throughout the project construction phase, package Waste Water Treatment Plants (WWTP) and non-leaking septic tanks were constructed for each construction camp site. All wastewater discharges from all components of construction must comply with relevant legal requirements.
- When water quality criteria allow, stormwater will be managed as a resource for meeting the project's water needs whenever feasible.
- Drainage water from excavations will be collected and treated to remove contaminants before discharging. Perimeter drains will be constructed around all working areas to collect potentially contaminated run-off and direct it to a system of settlement tanks before discharge in accordance with required permits. Direct discharge of contaminated run-off from work sites will not be allowed.
- Channels, bunds, and sandbag barriers will be used to provide direct run-off to the collection system.
- Biodegradable cleaning agents will be used to remove the asphalt residues.
- High sediment generating activities will be avoided, exposed surfaces and stored materials covered, if necessary, to reduce sediment erosion and reach surface waters.
- For any emergency during construction, reviewed Emergency Preparedness and Response Plan will be implemented.
- Exposure of areas of the open ground will be kept at a minimum in size and duration.

8.4.2.2 Mitigation Measures for Surface Water Bodies and Channels

- Whenever and wherever possible, construction of viaducts, retaining walls, and other structures will be done during dry water season months.
- Fencing will be used in sensitive areas of rivers and drains for protection.
- Isolation techniques such as berming or diversion during construction to limit the exposure of disturbed sediments to moving water will be used during in-stream works.
- In order to protect small drains within construction areas, they will be covered with metal plates that construction machines can pass over.
- Stream crossing works will be carried out from the banks above the channel and avoiding direct intervention in the watercourse unless existing bank reinforcement needs to be replaced. The works will be undertaken during periods of low flow, and the duration of in-stream activities will be restricted.

- Use of grass turf from adjacent areas to cover the soil surface, use of erosion control blankets or mats, and other relevant soil erosion prevention measures will be implemented after the finalization of an earthwork.
- Groundwater from dewatering will be drained to a near surface water course.

8.4.3 Operation Phase

8.4.3.1 Mitigation Measures for Surface and Groundwater Quality

- Sealed basement and bunds with a capacity of the 100% of the storage capacity of the largest tank will be used at fuel stores and other harmful substance stores.
- In case of any large-scale spill, absorbent materials within spill response kits will be used. The kits will be available at relevant centers and locations and will be used by trained personnel.
- Sand layers as filters in seepage pits (detritus basins in the form of a shallow pit connected to drain trenches) would be used, allowing hardly any harmful substance to percolate into deeper soil layers or into the groundwater.
- Inspection and maintenance of permanent erosion and runoff control features will be done regularly.
- Oil separators will be installed at fuel stations.
- Motorway will be paved in dry weather to prevent runoff of asphalt or cement materials.
- In need of deicing, mechanical deicing methods (sweepers and plows) will be used at first. It will be complemented by chemical means if necessary. In addition to that, anti-icing and deicing agents will be selectively applied based on expected pavement temperatures and the use of road weather information systems. Furthermore, employees applying anti-icing and deicing agents will be trained to use these at optimum rates and times. Anti-icing and deicing agents will be selected based on the potential environmental impacts of the particular agent.

8.4.3.2 Mitigation Measures for Groundwater Flow Regime

- Measures will be developed to ensure that no indirect impacts on any important groundwater resource take place. Where medium to long-term or permanent dewatering is required, the water would not be drained to the Motorway drainage system but to a near surface water course.
- Infiltration will be promoted if water depletion arises in areas of groundwater wells to ensure the supply, especially in urban settings.

8.5 Summary of Assessment and Residual Impacts

Table 8.12 provides a summary on water resources assessment. The significance of the identified impacts before and after the implementation of mitigation measures are summarized in this table. With proper implementation of good water management practices, water pollution risks would not cause any significant impact on the ecosystem or bring associated risks on the health and safety of the community and/or project personnel.

Table 8.12 Summary of the Assessments Water Resources

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Surface Water	Land preparation and construction	Disturbance of surface water bodies and irrigation channels due to construction activities	Adverse	Restricted	Long	Low	Irreversible	One-off	Moderate (B)	Medium (2)	Medium B2	• General hydrological considerations/design of the project will be in accordance with KGM design standards and AASHTO Highway Drainage Principles. • In case of a need; new or replacement of irrigation structures will be constructed. • In order to minimize changes in the hydrology and flow of water courses, design of structures will be done accordingly. • Fish and terrestrial animal passages will be located in design where necessary. • Appropriate designs and structures, such as viaducts and bridges will be used for stream and river crossings once approved by KGM.	Low
		Contamination of surface waters with silt/soil	Adverse	Local	Long	Low	Short term reversible	One-off	Moderate (B)	Medium (2)	Medium B2	• Drainage water from excavations will be collected and treated to remove contaminants before discharging. • In order to provide direct run-off to the collection system; channels, bunds and sandbag barriers will be used. • In order to remove asphalt residues, biodegradable cleaning agents will be used. • High sediment generating activities will be avoided and exposed surfaces and stored materials covered, if necessary, to reduce erosion and reaching of sediments to surface waters.	Low
		Contamination of surface waters with hazardous materials	Adverse	Local	Long	Low	Long term reversible	One-off	Moderate (B)	High (3)	Medium B3	• Equipments and vehicles will get their fuels at designated areas. • Hazardous materials will not be stored within excavated areas • In order to remove asphalt residues, biodegradable cleaning agents will be used. • For any emergency during construction, Emergency Preparedness and Response Plan will be implemented • Exposure of areas of open ground will be kept at minimum in size and duration. • Isolation techniques such as berming or diversion during construction to limit the exposure of disturbed sediments to moving water will be used during in-stream works	Low
		Contamination of surface waters due to waste water discharge	Adverse	Local	Long	Low	Long term reversible	One-off	Moderate (B)	High (3)	High B3	• In order to limit the volume of water requiring specialized treatment (during land preparation and construction, and operation phases) segregation of liquid effluents, principally along industrial, sanitary and stormwater categories, will be planned. • All wastewater discharges from all components of construction must comply with relevant legal requirements. Treated water will be reused where possible and feasible.	Low
		Contamination of drinking water bodies	Adverse	Wide	Long	Low	Long term reversible	One-off	Moderate (B)	High (3)	High B3	• In order to provide direct run-off to the collection system; channels, bunds and sandbag barriers will be used. • For any emergency during construction, Emergency Preparedness and Response Plan will be implemented.	Low
Surface Water	Operation	Contamination of surface waters with de-icing material	Adverse	Local	Short	Low	Short term reversible	Intermittent	Minor (C)	Low (1)	Low C1	• In need of deicing, mechanical deicing methods (sweepers and plows) will be used firstly, it will be complemented by chemical means if necessary. In addition to that, anti-icing and deicing agents will be selectively applied based on expected pavement temperatures and the use of road weather information systems. Furthermore, employees in the application of anti-icing and deicing agents will be trained to use these at optimum rates and times. Anti-icing and deicing agents will be selected based on the potential environmental impacts of the particular agent.	Low
											Low C1		Low
		Contamination of surface waters with hazardous materials due to spills from stations	Adverse	Local	Short	Low	Short term reversible	One-off	Minor (C)	High (3)	Medium C3	• Sealed basement and bunds with a capacity of the 100% of the storage capacity of the largest tank will be used at fuel stores and other harmful substance stores. • For case of any large scale spill, absorbent materials within spill response kits will be used. They kits will be available at relevant centers and locations and will be used by trained personnel. • Sand layers as filters in seepage pits (detritus basins in the form of a shallow pit connected to drain trenches) would be used allowing hardly any harmful substance to percolate into	Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												deeper soil layers or into the groundwater. • Oil separators will be installed at fuel stations.	
		Contamination of surface waters due to dumped waste from vehicles	Adverse	Local	Long	Low	Long term reversible	Continuous	Moderate (B)	Low (1)	Low B1	• In order to provide direct run-off to the collection system; channels, bunds and sandbag barriers will be used. • Spill accidents will be responded immediately with disaster recovery centers.	Low
		Increase on the rate of surface water runoff and high storm water flow rates can lead erosion and flooding	Adverse	Wide	Long	Moderate	Long term reversible	Continuous	Major (A)	High (3)	High A3	• Motorway will be paved in dry weather to prevent runoff of asphalt or cement materials • Inspection and maintenance of permanent erosion and runoff control features will be done regularly. • In order to minimize changes in the hydrology and flow of water courses, design of structures will be done accordingly. Design will also ensure an appropriate capacity for culverts through embankments when flood plains are cut off. • Design will be done in a way to minimize risks of flooding. During operation phase; reviewed Emergency Preparedness and Response Plan will be used in order to minimize flood events. • Flow design for the drainage system has been done to meet 100 years recurrent flood conditions.	Low
Groundwater	Land preparation and construction	Permanent dewatering of groundwater resources due to deep excavation	Adverse	Local	Short	Low	Irreversible	One-off	Moderate (B)	High (3)	High B3	• Measures will be developed to ensure that no indirect impacts on any important groundwater resource take place. Where medium to long-term or permanent dewatering is required, the water would not be drained to the Motorway drainage system but to a near surface water course. • Project elements will be located to minimize risks on groundwater. Groundwater use for project activities would be planned to be limited and would be done only after getting relevant permissions from the authorities.	Low
		Contamination of groundwater resources with hazardous substances due to accidents and leakages	Adverse	Local	Short	Low	Irreversible	One-off	Moderate (B)	High (3)	High B3	• Hazardous materials will not be stored within excavated areas Supervision will be used during handling of all hazardous materials. Impervious bunds and other containment techniques will be used where hazardous materials are handled.	Low
		Blockage of permeable layers by infiltrating sediment/fines.	Adverse	Local	Short	Low	Irreversible	One-off	Moderate (B)	Low (1)	Low B1	• Stormwater management practices that slow peak runoff flow, reduce sediment load and increase infiltration; including vegetated swales (planted with salt-resistant vegetation), filter strips, terracing, detention ponds or basins, and infiltration trenches will be planned.	Low
Groundwater	Operation	Contamination of groundwater by possible contaminated runoff from road pavement	Adverse	Local	Long	Low	Irreversible	One-off	Moderate (B)	High (3)	High B3	• Flow design for the drainage system has been done to meet 100 years recurrent flood conditions. • Drainage projects have been developed for the collection of surface runoff along the Motorway by means of ditches and diversion of the collected water to the nearest receiving water bodies. The design criteria for the drainage system are in accordance with motorway standards. • Motorway will be paved in dry weather to prevent runoff of asphalt or cement materials.	Low
		Contamination of groundwater resources with hazardous substances due to accidents and leakages	Adverse	Local	Long	Low	Irreversible	One-off	Moderate (B)	High (3)	High B3	• Sealed basement and bunds with a capacity of the 100% of the storage capacity of the largest tank will be used at fuel stores and other harmful substance stores. • For case of any large scale spill, absorbent materials within spill response kits will be used. The kits will be available at relevant centers and locations and will be used by trained personnel. • Sand layers as filters in seepage pits (detritus basins in the form of a shallow pit connected to drain trenches) would be used allowing hardly any harmful substance to percolate into deeper soil layers or into the groundwater. • Oil separators will be installed at fuel stations.	Low
		Infiltration of surface water run-off to groundwater	Adverse	Local	Long	Low	Irreversible	One-off	Moderate (B)	Low (1)	Low B1	• Stormwater management practices that slow peak runoff flow, reduce sediment load and increase infiltration	Low
		Decrease of groundwater recharge due to expending impermeable surface area	Adverse	Local	Long	Low	Irreversible	Continuous	Moderate (B)	Low (1)	Low B1	• Infiltration will be promoted if water depletion will arise in areas of groundwater wells to ensure the supply, especially in urban settings.	Low

CHAPTER 9

ECOLOGY AND BIODIVERSITY

9. CHAPTER – ECOLOGY AND BIODIVERSITY

This chapter of the Supplementary ESIA report provides determining and assessing the ecological characteristics of the South Alternative. It identifies the potential impacts on the biological environment arising from the project activities.

In the scope of the biological studies for the South Alternative project, biological environment studies, which included terrestrial flora and fauna, aquatic flora and fauna, and protected areas, have been conducted with desktop studies and field surveys, described in detail in the following sections. The assessment will follow the IFC Performance Standard 6 (PS6) recommendations and requirements: Biodiversity Conservation and Sustainable Management of Living Natural Resources.

Within the scope of ADMP, aquatic and terrestrial biodiversity determination studies have been carried out at the survey and sampling points determined along the line during the pre-construction period, during the vegetation period, and then two vegetation period monitoring studies were carried out. In addition, field studies and evaluation studies were carried out at alternative ecological bridge alternative locations.

As a result of all these studies, in the ADMP route and 400 m buffer along the length of the route, biodiversity elements were determined by experts and the South Alternative Route was studied within the scope of ecological bridge alternative location assessing studies. A field study was conducted on 13-14 July 2023 for flora and fauna determination studies within the scope of the South Alternative project by Prof. Dr. Hayri Duman, Prof. Dr. Zafer Ayaş and Asst. Prof. Dr. Şafak Bulut.

To evaluate the project's potential impacts on the biological environment and various species inhabiting natural habitats within and around the project, the terrestrial and aquatic ecosystems have been studied to identify the existing biological conditions.

9.1 Baseline Data Collection

Study Area is defined within a 400 m buffer along the length of the South Alternative route for terrestrial studies. In the scope of the terrestrial field studies, some survey points representing different habitat types and natural and/or sensitive areas choose by analysing appropriate satellite imagery from GoogleTM Earth in a 400 m buffer. Field surveys were carried out at those survey points.

Within the scope of ADMP, the intersecting streams on the route were investigated at the sampling points selected by the hydrobiologist.

Within the scope of the field studies, a review of existing information and the ecological composition of the South Alternative route in terms of terrestrial and aquatic flora and fauna elements, potential sensitive areas and critical species are identified.

The information gathered is included information on the following:

- Biological components on terrestrial environment,
  - Terrestrial flora and ecosystems,
  - Terrestrial habitats and ecosystems
    - Flora species
  - Terrestrial fauna components
    - Amphibians and reptiles,
    - Aves,
    - Mammals,
- Biological components on aquatic environment,
- Potential sensitive areas.

The observation and sampling points are identified based on the previous knowledge regarding the area, the expert's opinion and the available maps, images and information in hand.

Internationally accepted criteria are considered while choosing sampling points in the Study Area together with the species' characteristics and habitat needs. Potential critical habitats in the project are identified. These studies are done by overlaying the route with the distribution of species of conservation concern (SCC); with sites identified as globally significant for migratory species (e.g. IBAs, Ramsar sites); with national parks, protected areas, and key biodiversity areas.

9.2 Assessment Methodologies and Data Sources

9.2.1 International Agreements

In evaluating species' threat/protection status, CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), Bern Convention, and IUCN (International Union for Conservation of Nature) Red List Database were used. Additionally, the hunting status of all fauna elements was determined according to the 2022-2023 Decision of the Central Hunting Commission (CHC) of Turkey.

Species covered in CITES are given under three different appendices according to their conservation status. Appendix I cover the species which are under threat of extinction. Trade in the specimens of these species is not allowed except in extraordinary circumstances. Appendix II includes species not threatened with extinction, but trade in specimens is restricted to prevent utilization incompatible with their survival. Appendix III contains species for which other parties of CITES applied for assistance in controlling trade and which are conserved at least in one country.

Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention), provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Turkey became a contracting party in 1994.

BERN Convention aims at conserving and promoting biodiversity, developing national policies for the conservation of wild flora and fauna and their natural habitats, protecting the wild flora and fauna from planned development and pollution, developing training for protection practices, promoting and coordinating the research made regarding this subject. It has been signed by 26 member states of the European Council (and Turkey) to conserve wildlife in Europe. Species that are protected under the Bern Convention are classified according to the following categories:

- Appendix I: Strictly protected flora species
- Appendix II: Strictly protected fauna species
- Appendix III: Protected fauna species

The IUCN categories were updated in 2001 as ver. 3.1 (previous one was 1994 as ver. 2.3) and are provided in Table 9.1:

Table 9.1 International Union for Conservation of Nature (IUCN) Categories

IUCN Red List Categories and Criteria, 1994 (ver. 2.3)		IUCN Red List Categories and Criteria, 2001 (ver. 3.1)	
EX	Extinct	**EX**	Extinct
EW	Extinct in Wild	**EW**	Extinct in Wild
CR	Critically Endangered	**CR**	Critically Endangered
EN	Endangered	**EN**	Endangered
VU	Vulnerable	**VU**	Vulnerable
LR	Low Risk		
	cd : conservation dependent	**NT**	Near Threatened
	nt : near threatened	**LC**	Least Concern
	lc: least concern		
DD	Data Deficient	**DD**	Data Deficient
NE	Not Evaluated	**NE**	Not Evaluated

9.2.2 Turkish Legal Requirements

It is the responsibility of the Ministry of Agriculture and Forestry (MAF), together with the MoEUCC and their affiliated organizations to formulate policies concerning the conservation of biodiversity in Turkey designate and manage protected areas, develop and implement plans and programs, to carry out activities in this scope and to provide coordination among all relevant institutions.

The affiliated organizations of the MAF are the General Directorate of Forestry, Turkish Water Institute, General Directorate of State Hydraulic Works, and Ataturk Forest Farm Directorate. The provincial organization of the MAF consists of the Provincial Directorates of Agriculture and Forestry, as well as the regional directorates of the affiliated organizations.

The MAF's unit with primary authority and responsibility for the conservation and sustainable use of biological diversity is the General Directorate of Nature Conservation and National Parks. The General Directorate of Nature Conservation and National Parks is the principal unit responsible for the management of protected areas designated under the National Parks Law, for the conservation of wildlife and for the regulation and supervision of terrestrial hunting.

Central Hunting Commission (CHC) was established within the scope of Land Hunting Law and General Directorate of Nature Conservation and National Parks, Gendarmerie General Command, General Directorate of Forestry and Sports Services, relevant faculties of higher education institutions, non-governmental organizations operating in the field of nature protection, hunting organizations consist of representatives of private hunting or sample hunting. CHC prepares a resolution every year, which is published in the official gazette. The recent resolution covers the hunting season for 2022-2023. These resolutions define hunting periods, limits (in terms of the number of individuals that can be hunted and dates for hunting), areas where hunting is banned, as well as the species that can and cannot be hunted. Thus, CHC resolutions provide some measure of regulation over the exploitation of wildlife within Türkiye. In this regard, according 2022 and 2023 Resolutions of the CHC appendixes are as follows:

- Appendix I; Includes game animals which are protected by the CHC,
- Appendix II; Includes game animals which are allowed to be hunted in seasons predefined by CHC.

The legislation listed in Chapter 2 provides some areas protection status based on significant biological diversity, local endemics of importance, and threatened species. These designations include Natural Protected Sites, National Parks, Nature Protection Areas, Wildlife Protection and Development Sites and Specially Protected Areas.

Activities in such designated areas also cover various regulations, but these areas are not explicitly provided with protection status. Türkiye has no conservation status for habitats defined by specific vegetation as provided in European Union (EU) countries where the EU Habitats Directive applies. In Turkey, there is no particular habitat compensation requirement. There is only a policy regarding forested areas, which aims to replant at least as much of the forest area lost due to development activities.

Some laws and regulations are in effect to protect other environmental components, as well as to minimize pollution and promote sustainable development and management of natural resources. Legislation relating to air quality, environmental management and permitting, health and safety, management of chemicals and other dangerous substances, noise, soil quality, water quality and waste management also provide management of issues that might have secondary impacts on biodiversity components. Environmental laws and regulations that do not primarily relate to ecology are referenced in the relevant chapters of the Supplementary ESIA.

In addition, some national studies were used to collect existing baseline information. Birds in the Study Area were assessed according to national threat categories defined in the Red Data Book of Birds of Türkiye (Kiziroglu, 2009) according to the categories defined in Table 9.2.

Table 9.2 National Threat Categories for Bird Species

Category A		
A.1.2	(CR)	Critically endangered and breeding species in Turkey
A.2	(EN)	Endangered and breeding species in Turkey
A.3	(VU)	Vulnerable and breeding species in Turkey
A.3.1	(D)	Declining, vulnerable and breeding species in Turkey
A.4	(NT)	Near Threatened, breeding species not facing risk now, but are likely to qualify for threatened category in the near future in Turkey
A.5	(LC)	Least Concern, breeding species that are widespread in Turkey
A.6	(DD)	Data Deficient, breeding species on which there is deficient information in Turkey
A.7	(NE)	Not evaluated, breeding species which have not been evaluated in Turkey
Category B		
B.1.2	(CR)	Critically endangered and non-breeding species in Turkey
B.2	(EN)	Endangered and non-breeding species in Turkey
B.3	(VU)	Vulnerable and non-breeding species in Turkey
B.3.1	(D)	Declining, vulnerable and non-breeding species in Turkey
B.4	(NT)	Near Threatened, non-breeding species not facing risk now, but are likely to qualify for threatened category in the near future in Turkey
B.5	(LC)	Least Concern, non-breeding species that are widespread in Turkey
B.6	(DD)	Data Deficient, non-breeding species on which there is deficient information in Turkey
B.7	(NE)	Not Evaluated, non-breeding species which have not been evaluated in Turkey

In determining threat statuses of flora species identified within the Study Area Red Data Book for Turkish Plants (Ekim et al., 2000), which was prepared following the 1994 IUCN Red List Categories and Criteria are utilized, and the evaluations.

9.2.3 Standards and Guidelines for International Requirements

The project is committed to implementing the IFC Performance Standards (PS) to manage social and environmental risks and impacts. IFC PS6 covers areas of biodiversity conservation, ecosystem services and sustainable management of living resources, which are all fundamental to achieving sustainable development. The objectives of PS6 are outlined as follows:

- To protect and conserve biodiversity;
- To maintain the benefits of ecosystem services; and
- To promote the sustainable management of living natural resources by adopting practices that integrates conservation needs and development priorities.

The requirements of PS6 are applied to projects: (i) located in modified, natural, and critical habitats; (ii) that potentially impact on or are dependent on ecosystem services over which the client has direct management control or significant influence; or (iii) that include the production of living natural resources (e.g. agriculture, animal husbandry, fisheries and forestry) based on the risks and impacts identification process.

Ecosystem Services Review (ESR)

Ecosystem Services Review (ESR) was prepared in relation to the IFC Biodiversity Conservation and Sustainable Management of Living Natural Resources Guidance Note 6 requirements to determine ecosystem services to The Project.

Biodiversity and ecosystems are closely related concepts. Biodiversity is defined by the Convention on Biological Diversity as “the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems” (*United Nations 1992:Article 2*). Ecosystem services (ES) which are the goods provided by ecosystems upon are the benefits that people obtain from ecosystems (*MA 2003*). For example, a stand of trees can reduce air pollution, purify the water supply, reduce the likelihood of floods and help regulate the climate by capturing and storing carbon. It might also provide timber for buildings, a space for recreation and improve the aesthetic qualities of the landscape.

The environment provides mankind with the food, water and air that are essential for life and with the minerals and raw materials for industry and consumption. Less obviously, it provides the processes that purify air and water, and which sequester or break down wastes. These services that the environment provides as all ecosystem services which require the existence of living organisms for their delivery, but in many cases it is not the diversity of the organisms that is important, but the presence of a viable population of at least one species representing a particular functional group and the delivery of many ecosystem services requires a non-trivial amount of biodiversity, but not necessarily the maximum amount possible in that environment. Also recreation and health are found in which human culture finds its roots and sense of place are included in ecosystem services. Taking into consideration overall ecosystem services are the many different benefits that ecosystems provide to people (*MA, 2005*). Therefore, both ecological and socio-economic studies support to identification ecosystem services of South Alternative project in the line with IFC Performance Standards and the initial literature studies.

The overall aim of the ecosystem service concept is to bring a holistic approach to environmental decision-making by valuing the environment in terms of the benefits people obtain from ecosystems. It is practical and pragmatic, focusing on goals that provide greatest environmental benefit at least cost to society and the natural environment with the aim of avoiding taking decisions with unintended secondary consequences that may be costly, increase risk or be detrimental to ecosystems and human well-being. The evaluation of the effects, both desirable and undesirable, of approaches to landscape management on the delivery of ecosystem services allow for a broader assessment of the true costs and benefits of actions and policies.

Ecosystem service principles and/or cost-benefit analyses are enshrined in European environmental protection legislation and policies such as the Environmental Liability Directive (2004/35/EC), the Habitats Directive (92/43/EEC), the Water Framework Directive (2000/60/EC) and the REACH Directive (1907/2006). Recent initiatives such as the United Nations Millennium Ecosystem Assessment (*2004*), UK National Ecosystem Assessment (2011) and The Economics of Ecosystems and Biodiversity (*TEEB, 2010*) have built on concepts and methods developed over more than 20 years in the United States to deal with legacy contamination (*US Natural Resource Damage Act*). Many of the US approaches have informed more recent European initiatives on environmental liability, habitat banking, biodiversity offsetting, life cycle assessment (foot printing), strategic planning, operational risk reduction and now product registration. ES are depicted within four service subset categories as follows:

- *Provisioning Services are ecosystem services* that describe the material or energy outputs from ecosystems. They include food, water and other resources.
- *Regulating Services* are the services that ecosystems provide by acting as regulators e.g. regulating the quality of air and soil or by providing flood and disease control.
- *Cultural, Spiritual, and Recreational Services* are provide that benefits which are non-material obtains include recreational facilities and tourism, aesthetic appreciation, inspiration, a sense of place, and educational value.
- *Supporting Services* are necessary for the production of all other ecosystem services such as soil formation nutrient cycling and primary production. They differ from provisioning, regulating, and cultural services in that their impacts on people are either indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people.

In addition, when the projects may affect ecosystem services of relevance to local people, Affected Communities attached to biodiversity and ecosystem services will participate in the determination of priority ecosystem services in accordance with the stakeholder engagement process which is one of the key means to understanding impacts on biodiversity and identifying appropriate responses to such impacts as defined in IFC Performance Standard.

The IFC Performance Standards which is in line with the definition provided by the Millennium Ecosystem Assessment are covered divide Ecosystem services into two priority types:

- Priority 1: Provisioning, regulating, cultural and supporting ecosystem services, over which the client has direct management control or significant influence, and where impacts on such services may adversely affect communities.
- Priority 2: Provisioning, regulating, cultural and supporting ecosystem services, over which the client has direct management control or significant influence, and on which the Project directly depends for its operations.

Within the South Alternative project's scope, the ecosystem services relevant to the Project of Influence and impact assessment are summarized in Section 9.7, "Ecosystem Services within the Project Route".

9.3 Ecological Researches

Biodiversity research of the South Alternative has been conducted with experts for terrestrial and aquatic habitats. Biodiversity database field studies were in vegetation periods within the scope of the ADMP. In addition, an ecological field study was carried out on 13-14 July, 2023 within this project's scope. This field study carried out Flora-fauna studies at the selected survey points.

All ecological research is conducted with desk-based and field studies to determine the baseline conditions in the Study Area. These baseline data/information collections provide an overall picture of the conditions and sensitivities in the area that should be considered in assessing potential impacts and developing relevant mitigation measures for design.

For terrestrial habitat studies, the sampling points have been researched by experts according to the representativeness of each habitat type within the Study Area.

Additionally, aquatic studies that cover both desks based and field studies to determine the baseline conditions in the Study Area were conducted. River crossings with the well-conditioned flow during the field studies along the route were determined and studied according to sufficient methodologies during the aquatic field surveys.

The overall approach to determine the baseline conditions in the context and objectives provided above included the following data collection and interpretation means:

- Review of pertinent literature and previous works.
- Field studies carried out in the Study Area.
- Satellite image interpretation, as available.
- Communication with the inhabitants in the Study Area during the field studies.
- Consultation with nature conservation administration and related agencies and institutions concerned.

The distribution of flora-fauna species on the South Alternative motorway route and their biological activities (breeding, feeding, harbouring status) have been determined with the studies carried out, and measures/recommendations regarding the protection of these species are presented in this Supplementary ESIA report.

9.3.1 Definition of the Study Area

The Study Area definition was made for both terrestrial and aquatic environments. In this context for terrestrial environment studies, the survey encompassed as much of the habitat along the proposed South Alternative route as access and topography allowed. At each sampling point and their vicinity, the landscape and environment features include the dominant habitats and species of note. 200m buffers on either side of the route were used to guide the survey to ensure a suitable habitat sample was covered. "Study area" is a total defined 400 m buffer zone.

400 m buffer along the length of the route for biodiversity baseline studies, there are nine survey locations for flora and fauna studies selected by experts according to different habitat types and mainly natural habitats (see Table 9.3). Experts from national universities were conducted field studies between 13-14 July, 2023. Flora and fauna sampling points and Study Area are shown on a map and given in Figure 9.1.

Table 9.3 Flora-Fauna Sampling Points of South Alternative Route

Sampling Point Code	Coordinate (UTMWGS4 ZONE35)	Close Settlement
FF1	606519.00 d E 4186761.00 m N	Yenipazar
FF2	603611.00 d E 4185431.00 m N	Alhan
FF3	600675.00 d E 4184505.00 m N	Dereköy
FF4	597837.00 d E 4183585.00 m N	Alanlı
FF5	595992.00 d E 4182826.00 m N	Kırıklar
FF6	594537.00 d E 4182077.00 m N	Dalama
FF7	591170.00 d E 4183183.00 m N	Dereköy
FF8	590677.00 d E 4181376.00 m N	Dalama (Dalama-7 Quarry)
FF9	591488.00 d E 4201849.00 m N	Akçaköy (Akçaköy Quarry)

9.3.2 Internationally Recognized Areas

Internationally Recognized Areas are located in the surroundings of the South Alternative located in the provinces of Denizli, Aydın, Muğla, and İzmir. These areas include Key Biodiversity Areas (KBA), Important Plant Areas (IPA), and Important Bird Areas (IBA). KBAs are the most critical areas according to their characteristics in terms of supporting biological components.

There are no Internationally Recognized Areas in and around the South Alternative Area.

The Internationally Recognized Areas, which include the provinces covered in the South Alternative, are shown in Figure 9.2. The distance of the KBAs from the South Alternative and the provinces in which the KBAs are located are summarized in Table 9.4.

Table 9.4 The Internationally Recognized Areas Located in Vicinity of the South Alternative

Internationally Recognized Areas	Province	Distance from the South Alternative (km)
Akdag	Denizli	27,1
Bati Mentese Mountains	Aydin, Mugla	26.4
Boz Mountains	İzmir, Manisa	43,9
Bafa Lake	Aydin, Mugla	54,2
Kucuk Menderes Delta	İzmir	54,7
Mahal Hills	İzmir	57,9
Honaz Mountain	Denizli	88.0
Golgeli Mountains	Denizli	91.2
Acigol	Denizli, Afyon	125,9
Salda Lake	Burdur	128,1
Corak Lake	Burdur	134,1

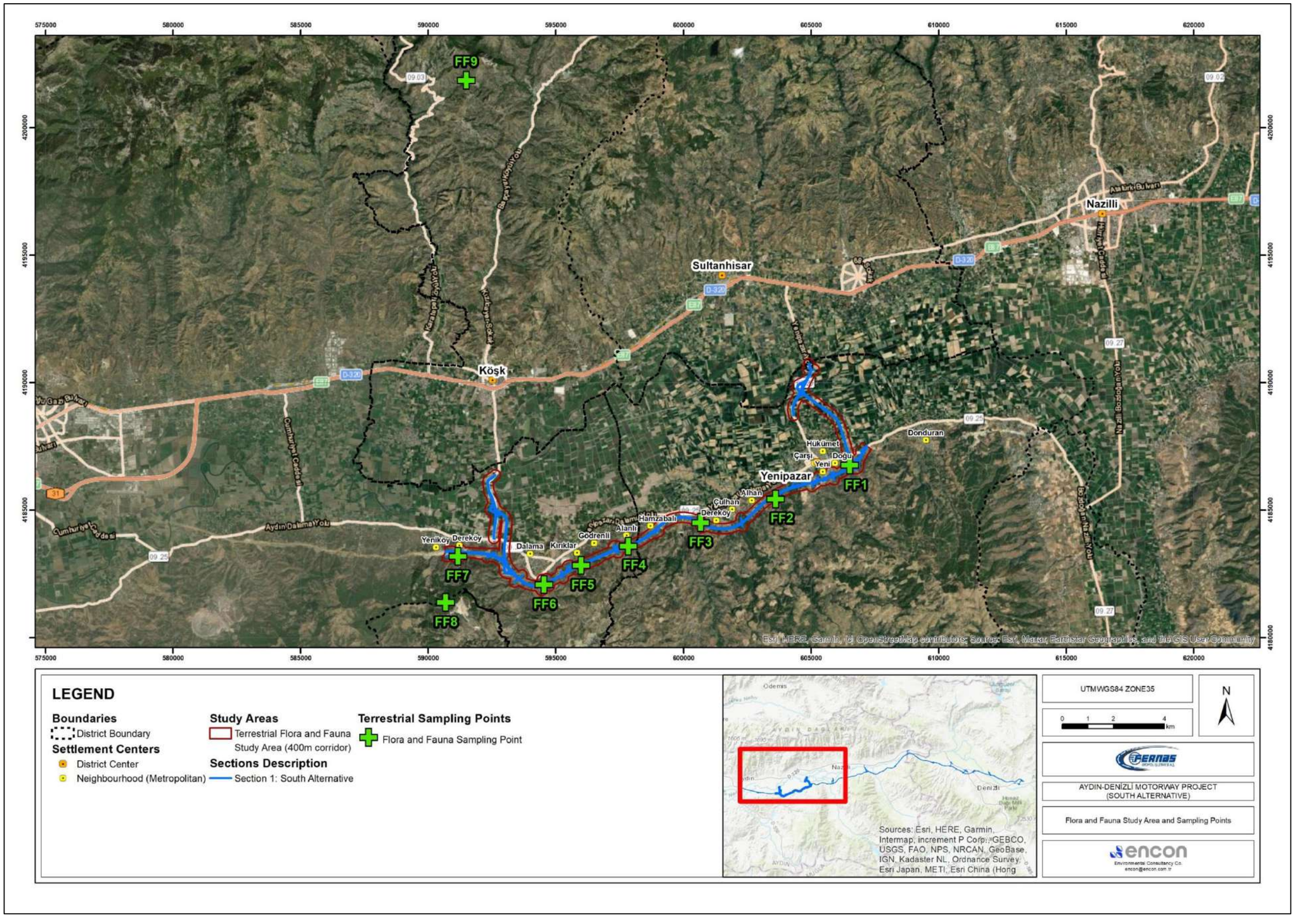


Figure 9.1 Flora and Fauna Study Area and Sampling Points

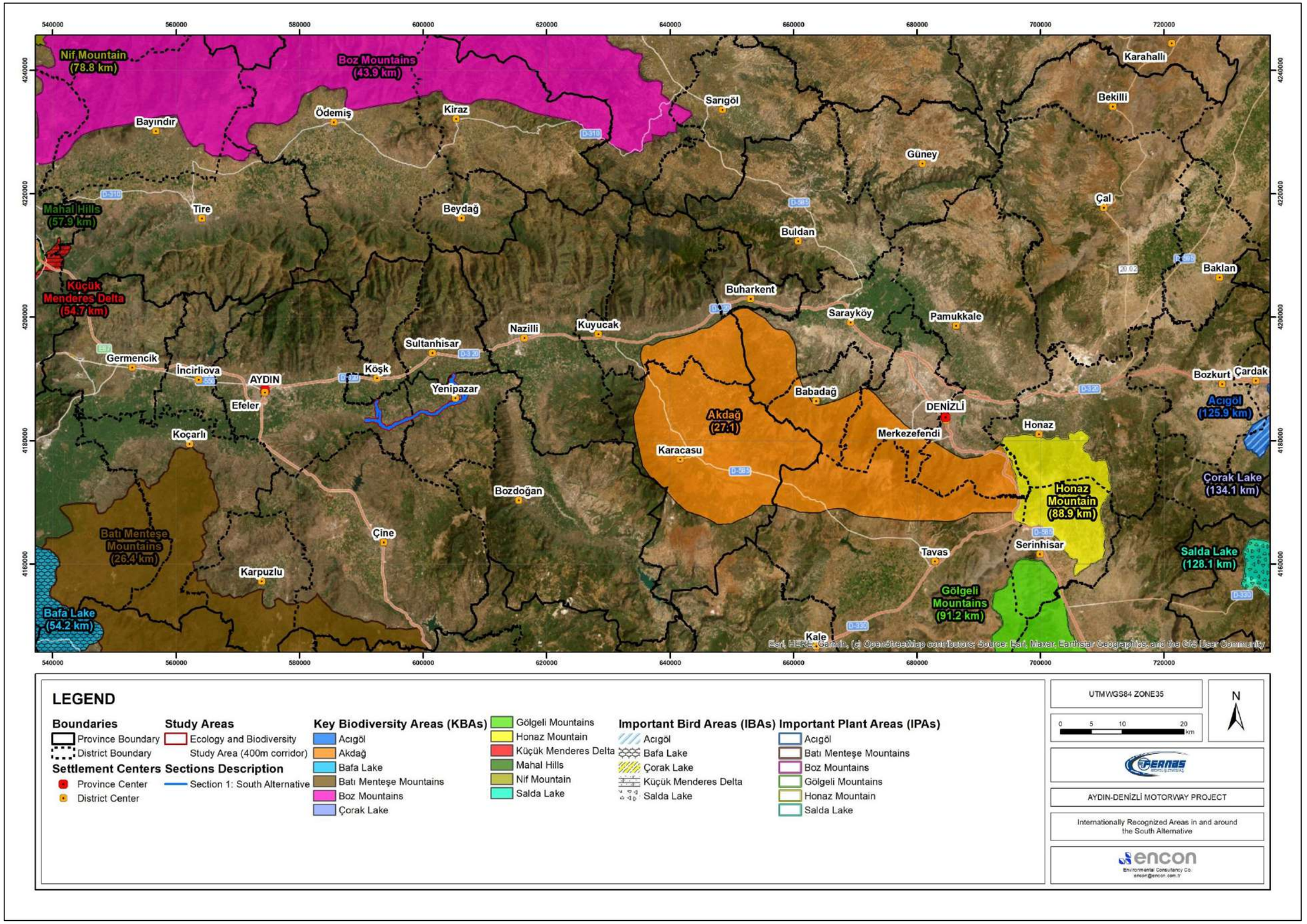


Figure 9.2 Internationally Recognized Areas in and around the South Alternative

9.4 Methodologies

The baseline data/information collection will provide an overall picture of the conditions and sensitivities in the area that were considered in assessing potential impacts and developing relevant mitigation measures for the project's design, construction, and operation phases.

Population, ecology, and reproductive biology of the threatened and endemic flora-fauna species likely to occur within the area of interest are studied. In addition, the literature survey was intended to give information on identifying endemic, endangered, and rare species and species defined under the national and international conservation classes. Accordingly, species at risk of being affected due to the project and, therefore, require special attention and protection measures are determined.

The species identified during the field study were recorded systematically to establish a species inventory for the baseline conditions and a description of the habitats. Also, endemic, protected, and restricted-range flora-fauna species were determined as the target species within the scope of the study. Potential target species of each habitat were identified as a result of the literature review, and the identified target species were confirmed through field studies.

9.4.1 Terrestrial Habitat Analyses

Terrestrial habitats are categorized as modified, natural or critical habitats according to IFC (2012). The definition of critical habitats depends on the presence of endemic, threatened, restricted-range species. As a result, the distribution of the endemic, threatened, restricted-range species and EUNIS Level 3 habitat distribution within the South Alternative are determined.

The habitats within the South Alternative route are determined with desktop studies according to EUNIS Habitat Classifications using satellite imagery. After the field studies, expert observations were verified and revise habitat types. Habitat types determined to exist within the Study Area and their related codes and descriptions according to the situations in the South Alternative are detailed in Section 9.5.

9.4.2 Terrestrial Flora

Within the scope of the terrestrial flora studies, the flora and vegetation types within the Study Area are identified as the basis for determining the impacts of the project on biodiversity and developing appropriate mitigation measures, where necessary. In this context, floristic studies are conducted, including both desk-based and field studies, to determine the baseline conditions in the Study Area.

The objectives of the desktop study are to review and organize the existing information on terrestrial flora, habitats, and ecosystems within the Study Area. Therefore, species of conservation concern, natural habitats potentially, and critical habitats potentially present in the Study Area are determined before the field study and examined during field visits. As a result, terrestrial flora research studies are carried out in light of the following key baseline issues:

- To determine the flora species spreading on the South Alternative route,
- To identify habitat types (EUNIS Level 3) along the route,
- Developing mitigation measures (in-situ and ex-situ) for rare, locally endemic or endangered species (CR, EN, and VU, according to IUCN) that may be affected by construction and operation on the South Alternative route,
- If there are critical habitats in the Study Area, provide habitat protection and development measures and suggestions so that these habitats will be affected by the Project at least or not at all,
- It is to identify the adverse effects that the Project may have on the flora, develop mitigation measures to minimize these effects,
- To prepare a comprehensive flora report by IFC standards.

To determine the flora and vegetation structure on the South Alternative route, to determine if there are critically distributed plant species or habitats on the road, and to minimize the impact of the activity on these species, the numbers of survey points to represent each habitat are determined on Google Earth. The survey points are planned to include the areas representing the natural habitats on the route. Considering the effects that may occur on both sides of the road during the construction activity, 200 meters right and left were included. Accordingly, nine survey points were determined to represent different habitats on the South Alternative motorway route. In addition, two quarry areas where rock and gravel will be purchased were also included in the study. While deciding the survey points, priority is given to natural habitats and areas where critically distributed species are distributed.

The field study was carried out in vegetation periods to study the stations determined on the route. The habitats determined during the field study are examined in detail, and the field notes are recorded in the field book. The habitat-based species in the floristic list were prepared based on the findings and observations obtained during the field study.

Floristic list; ferns (Pteridophyta), gymnosperms (Gymnospermae), and angiosperms (Angiospermae) are given, respectively. Families in each group are presented in phylogenetic order. While writing the species, respectively, if any, Turkish names, phytogeography region, whether they are endemic or not, endemics' danger class, whether they are included in the Bern and Cites lists, EUNIS habitat type and abundance in the area.

The flora species collected from the South Alternative were determined using "Flora of Turkey and East Aegean Islands." The Turkish names of the detected species were prepared mainly using the "Turkish Plant Names" piece written by Prof. Dr Turhan Baytop. While determining the danger categories of endemic species, the "Red Book of Plants of Turkey" prepared by Prof. Dr Tuna Ekim and his friends are used as the primary reference work, and these danger categories are reinterpreted considering the population of endemic species in the area and threat factors determined according to IUCN 2001 criteria.

9.4.3 Terrestrial Fauna

In the South Alternative route with the stated objectives, faunistic and ecological field studies were conducted on 13-14 July 2023.

- A total of nine fauna survey points are identified, representing different habitat types and suitable feeding, sheltering, and breeding areas for fauna species.
- Terrestrial fauna survey point photographs and Mapinr-GPS records were taken.
- "Line-transect method" is used to determine fauna species and abundance. In the Study Area, 200 meters in both directions of the midline were researched.
- The presence of habitats suitable for the preferences of birds, traces of fauna (nests-cubs, feathers, footprints, vomit and faeces, identifiable bone fragments), and feeding signs were also used to identify fauna species.
- Meetings and surveys were conducted with the local people and the hunters in the region about the fauna elements in the study area.
- In addition, the literature information obtained from the studies of this region in the past years and research results from ADMP biodiversity baseline and monitoring studies were used.
- In the species list tables, the systematic categories (Ordo-Family) scientific names, Turkish - English names, threatened categories, and evaluations/recommendations of each species are presented.
- Turkey Vertebrates and Birds Red Lists (Ali Demirsoy 2009-Kiziroglu 2009) and Central Hunting Commission Decisions 2022-2023 determine the species' national hazard categories.
- The IUCN Red List, the Bern Convention, the CMS Convention, and CITES are used to determine the species' international hazard categories.
- It is used in field studies of advanced optical instruments (Binoculars and monocular telescopes).

- In addition, some of the species observed in the field were photographed. Nikon SRL, D70S camera - Telelens F400 were used for this purpose, and photos of the species are given.

9.4.4 Aquatic Environment

Within the scope of the Aydın-Denizli Motorway Project, the effects of the works on the stream/river crossing areas on aquatic ecosystems were studied.

Phytoplanktonic organisms, zooplanktonic organisms, benthic invertebrates, and fish form the food chain links in wetland ecosystems. Sampling and habitat assessments are made of fish, benthic organisms, zooplanktonic organisms, and algae. As a result, the studies evaluate the species belonging to all groups according to the basins, their general abundance, endemism, and conservation status. In addition, habitat descriptions are studied by defining the general ecological characteristics of aquatic environments.

Fish species are assessed within the scope of the monitoring since they are the indicator group that will be primarily affected by the motorway construction works. The availability, relative abundance, and conservation status of the fish caught are evaluated. In addition, the effects of the motorway transit points on the aquatic ecosystems and the mitigation measures to be taken with the results are assessed.

During the construction of the South Alternative route, it may cause some effects on the aquatic ecosystem in the areas where aquatic ecosystem transitions will be made. It is essential to know the reactions of aquatic organisms exposed to these effects and the precautions to be taken. For this purpose, all aquatic organisms at the determined stations are examined, and the results and precautions to be taken are given.

Accordingly, the following studies are carried out within the scope of aquatic studies:

- Habitat assessment of the aquatic stations where the motorway passes made according to EUNIS,
- Sampling and laboratory studies for algae, zooplanktonic organisms, benthic organisms, and fish species from aquatic stations,
- National and international protection status and endemism status of the species,
- The project's impacts on aquatic environments and the mitigation measures.

Sampling methods of Aquatic Organisms

Planktonic Studies (Phytoplankton and Zooplankton) and Attached Algae

To identify phytoplanktonic and zooplanktonic organisms, plankton net with a pore size of 55 µm, a diameter of 20 cm, and a length of 50 cm is used. The plankton net is kept horizontally in the direction of the flow rate of the water for 5 minutes, and the samples are taken into a 250-cc plastic bottle. In addition, since freshwater algae occupy very different habitats in aquatic environments (on plants and Stones, depending on the sediment at the bottom), samples are taken by scraping the surfaces of the plants, stones, and sediments. Planktonic samples are fixed by buffering with 4% formaldehyde.

Temporary slide preparations of freshwater algae other than diatoms are prepared from the samples brought to the laboratory, and their identifications are made under a microscope.

Permanent slides are prepared only for the identification of diatom species. Accordingly, the acid boiling method is used to see the structures, such as raphe and stria, used to identify diatoms (Round, 1973).

The following literature is used in the identification of algae (Krammer & Lange-Bertalot, 1986; 1988; 1991a; 1991b; Bold and Wynne, 1985; Czernecki & Blen, 1982; Foged, 1981, 1982; Germain, 1981; Hustedt, 1930; Patrick & Reimer, 1966; Sreenivasa & Duthie, 1973; Van Heurck, 1962; Cox, 1996; Huber Pestalozzi, 1938; 1941; 1955; 1961; 1968; 1982; Prescott, 1975, and Komarek, 1983)

Two types of slides, temporary and permanent, usually are prepared to identify zooplanktonic organisms. Temporary slides are obtained by covering the coverslip on the samples taken on the slide during the study or by directly examining them. A binocular microscope is used in the preparation of the permanent slides.

The following sources are used in the diagnosis of zooplanktonic organisms, Hutchinson (1967); Pejler (1962); Kuttikova (1970); Kolisko (1974); Koste (1978a; 1978b); Ridder (1981); Kiefer (1978); Illies (1978).

Benthic Invertebrates

Benthic invertebrate specimens are collected at the study sites by dredging the streambed with a Kick net bottom scoop for five minutes. The samples collected are stored in 80% alcohol and are examined and identified with a binocular microscope in the laboratory.

The literature used for diagnosis are as follows; Sennika, 1943; Mann, 1962; Needham and Needham, 1962; Macan, 1982; Quigley, 1977; Pennak, 1978; Illies, 1978; Elliot and Mann, 1979; Biro, 1981; Edington, 1981; Bellman, 1988; Gloer, 1992; Ludwig, 1993.

Fishes

Fishes are sampled using electro-shockers. The fish caught is first taken into 4% formaldehyde, washed in water, and preserved in alcohol, and identifications are made.

According to Geldiay and Balık (1999) and Balık and Ustaoğlu (1992), fish species are identified.

9.5 Findings

9.5.1. Terrestrial Flora and Habitats

The region between the 16th and 32nd kilometers of the Aydın-Denizli Motorway route, where the Dalama and Akçaköy stone quarries are located, is characterized by the Mediterranean climate-influenced vegetation structure. A significant portion of the area between the 15th and 34th kilometres of the Aydın-Denizli Motorway route, as well as the Dalama and Akçaköy stone quarry sites, consists of dry agricultural lands. The natural vegetation within the South Alternative is quite limited and exhibits discontinuous distribution. The areas where natural and modified vegetation thrives include maquis and coniferous plantation forest habitats.

Through the efforts conducted between July 13th and 14th, 2023, within the 16th-32nd kilometer section of the Aydın-Denizli Motorway route, as well as the Dalama and Akçaköy quarry areas, a total of 261 species and subspecies at the family level, belonging to 56 families, were identified from the area. Among these identified species, 4 of them are endemic. Of the endemic taxa, one is regional (*Ziziphora taurica subsp. cleonioides*), and three (*Peucedanum chryseum, Allium proponticum var. proponticum, Stachys cretica subsp. smyrnaea*) have relatively widespread. The regionally endemic species, *Ziziphora taurica subsp. cleonioides*, is found in the maquis and dry agricultural lands of Aydın, Manisa, and İzmir provinces in Türkiye.

Table containing the flora species identified within the Study Area, along with their threat statuses, determined habitat types, and endemism statuses, can be found in Annex-7.

The Status of Flora Species in the South Alternative in Terms of Risk Category and Endemism

Based on the field study conducted in the South Alternative, the subspecies Z*iziphora taurica subsp. cleonioides*, identified within the vicinity of the Akçaköy stone quarry amid the maquis and olive orchards, is regionally endemic. Considering the habitats where this species is distributed and the factors that threaten these habitats, the global IUCN threat category for this species is assessed as "Vulnerable, VU."

Regarding the other endemic species identified from the project route and stone quarries (*Peucedanum chryseum, Allium proponticum var. proponticum, Stachys cretica subsp. smyrnaea*), their relatively broad distributions lead to their global IUCN threat category being classified as "Least Concern, LC."

Coordinates of the distribution of endemic species identified from the South Alternative are presented in Table 9.5 and shown in a map in Figure 9.4. The photographs taken during the field surveys of the endemic species identified within the South Alternative are shown in Figure 9.3.

Table 9.5 Coordinates of Endemic Species in the South Alternative

Taxon	Turkish Name	Threat Status (Red Book, 2000)	Coordinates (UTMWGS4 ZONE35)	Determined Station
Ziziphora taurica subsp. *cleonioides*	Naneruhu	VU	35S 591567 E 4201899 N	Flora 9
Peucedanum chryseum	Hınzırotu	LC	35S 591567 E 4201899 N, 35 S 600702 E 4184387 N; 35 S 597575 E 4183524 N	Flora 9 Flora 3 Flora 4
Allium proponticum var. *proponticum*	Topkörmen	LC	35s 591567 E 4201899 N; 35 S 591057 E 4183194 N	Flora 9 Flora 7
Stachys cretica subsp. *smyrnaea*	Deliçay	LC	35 S 595963 E 4182759 N	Flora 5

Ziziphora taurica subsp. cleonioides (regional endemic)

Peucedanum chryseum (endemic)

Allium proponticum var. proponticum (endemic)

Stachys cretica subsp. smyrnaea (endemic)

Figure 9.3 Photographs of Endemic Flora Species Determined in the Study Area

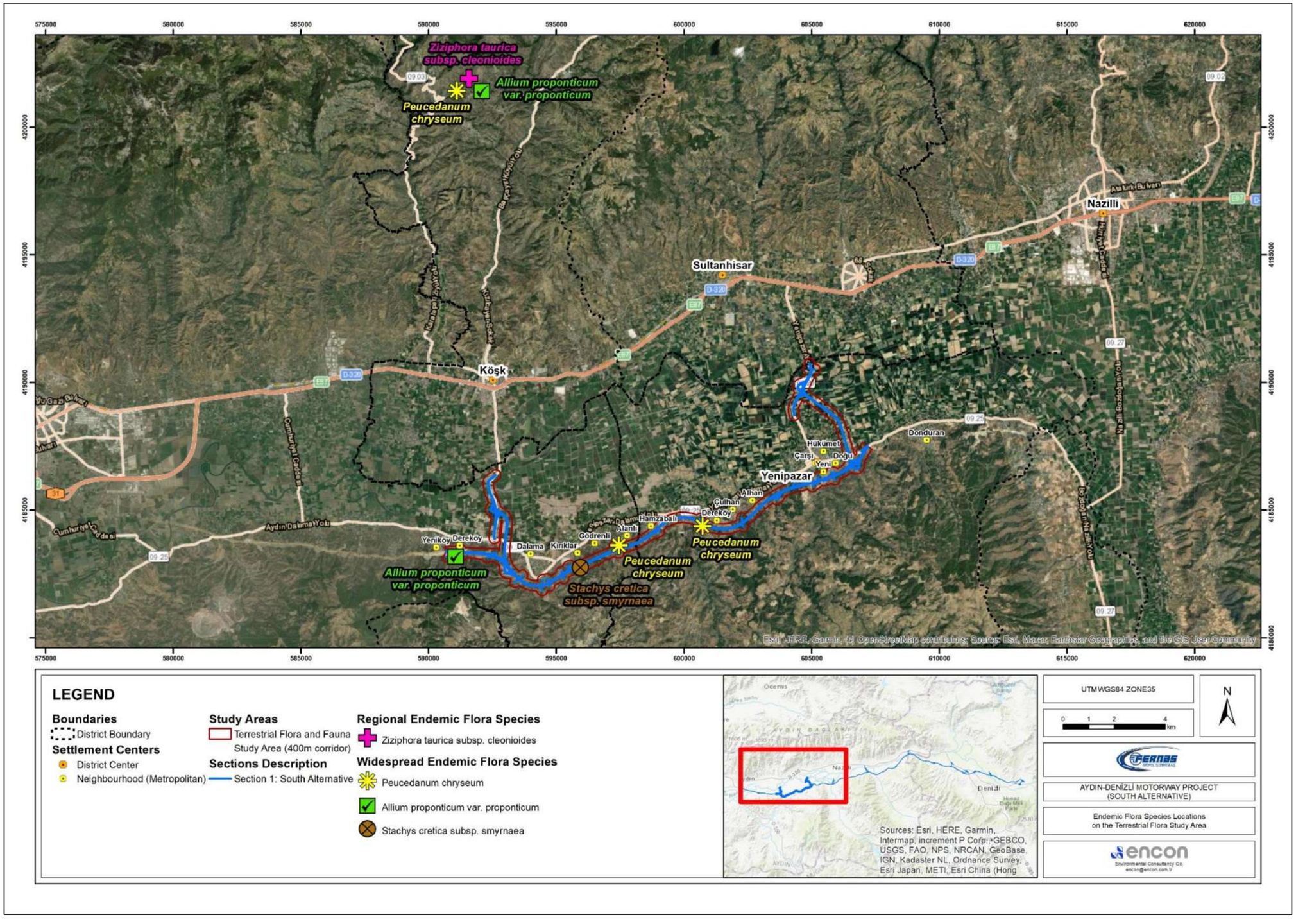


Figure 9.4 Endemic Flora Species Locations on the Study Area

Terrestrial Vegetation and Habitats

The EUNIS habitat types present in the Study Area and their explanations as follows:

F5.2: Maquis: This is the natural habitat type of the Study Area (see Figure 9.5). It is represented both along the route and in the vicinity of the stone quarries. Characteristic species of this habitat include *Quercus coccifera, Arbutus andrachne, Phillyrea latifolia, and Pistacia terebinthus*.

G2.9: Evergreen Fruit Orchards: This is the most common modified habitat type in the Study Area. Olive trees are also frequently found in this habitat (see Figure 9.5).

G3.F: Highly artificial coniferous plantations: Characteristic species of this habitat, created through plantations, include *Pinus pinea* and *Pinus brutia*. This habitat is particularly widespread around the Dalama quarry area (see Figure 9.5).

I1.1: Intensive Non-Mixed Agricultural Areas: This represents the irrigated agricultural fields within the Study Area.

The EUNIS habitat codes, coordinates, survey points and their altitudes identified in the Study Area is given in Table 9.6. Habitat photographs taken in the field studies are given in Figure 9.5 and Annex-7. Photographs of survey points are shown in Annex-7.

Table 9.6 The EUNIS Habitat Codes and Coordinates Identified in the Study Area

Survey Point	Coordinates (UTMWGS4 ZONE35)	EUNIS Habitat Code	Altitude
FF 1	35 S 606759 E 4186666 N	G2.9	143 m
FF 2	35 S 603851 E 4185506 N	G3.F	123 m
		G2.9	
		F5.2	
FF 3	35 S 600702 E 4184387 N	F5.2	143 m
FF 4	35 S 597575 E 4183524 N	G2.9	176 m
		F5.2	
FF 5	35 S 595963 E 4182759 N	G2.9	166 m
FF 6	35 S 594655 E 4182012 N	G2.9	101 m
FF 7	35 S 591057 E 4183194 N	F5.2	150 m
		G2.9	
FF 8	35 S 590982 E 4181091 N	G3.F	495 m
FF 9	35 S 591567 E 4201899 N	F5.2	635 m
		G2.9	

F5.2: Maquis

G2.9: Evergreen Fruit Orchards

G3.F: Highly artificial coniferous plantations

Figure 9.5 Habitats Photographs of the Study Area

9.5.2. Terrestrial Fauna

Amphibian

Amphibian is species that rely on water for their survival. While some spend most of their lives on land, they must return to the water for breeding. There are no permanent water bodies in the Study Area.

The widespread amphibian species identified was the Green Toad seen in the Study Area. These species are neither endemic nor listed in threatened categories of the IUCN.

According to the BERN Convention Appendices, the amphibian species found within the Study Area are included in Annex II. Furthermore, according to the Habitat Directive, this species is listed in Annex IV.

Considering these factors, none of the amphibian species that could potentially spread along the project line is considered a critical species requiring special precautions in terms of conservation efforts.

Based on habitat preferences, species observed during field surveys, general distribution in Turkey, and our previous experiences along the project line, one amphibian species in the Study Area is listed in Annex-7.

Reptilian

Based on habitat preferences, species observed during field surveys, general distribution in Turkey, and our previous experiences along the project line, ten probable reptile species in the Study Area are listed in Annex-7.

The *Testudo graeca* (Common Tortoise) is listed in the threatened categories of IUCN as Vulnerable (VU).

According to the BERN Convention Appendices, seven reptile species in the Study Area are listed in Annex II, and three in Annex III.

Additionally, as per the Habitat Directive, three species are listed in Annex IV, one in Annex II, and six in Annex III.

Since the *Testudo graeca* (Common Tortoise) is widespread in Turkey, can be found around each study point along the project line, and is listed as a threatened species by the IUCN, special precautions are needed for this species.

Aves

Based on the Study Area's location, general habitat types, the overall distribution of species in Türkiye, our previous experiences at the Project Line and literature data within the Study Area of 67 bird species have been identified and documented for the Study Area (see Annex-7).

Among these species, *Streptopelia turtur* and *Falco vespertinus* are categorized as Vulnerable in the threatened categories outlined by the IUCN.

Regarding the BERN Convention Appendices, out of the 68 bird species present at the Study Area, 48 species are listed in Annex II, while 13 are listed in Annex III. Five species in the area are not listed by the BERN Convention.

In alignment with decisions put forth by the Central Hunting Commission (CHC), ten bird species are listed under Annex I and eight under Annex II. Additionally, in accordance with the CITES appendices, one species is categorized in Annex I, and another in Annex II by CITES. Concerning the Habitat Directive, a total of 16 species are encompassed within Annex II, five species are listed under Annex IV, and three species fall under the categorization of Annex V.

Mammalian

Considering the Study Area's geographical location, prevalent habitat types, the overall species distribution across Turkey, our previous experiences at the Project Line and available literature, a comprehensive list of 20 mammal species has been compiled for the Study Area (as detailed in Annex-7).

Among these species, it's noteworthy that one species (*Nannospalax xanthodon*) has been classified under the threatened categories by the IUCN as Data Deficient (DD), and *Rhinolophus euryale* is designated as Near Threatened (NT). The remaining species are categorized as Least Concern (LC) by the IUCN. Per the BERN Convention Appendices, out of the 21 mammal species present within the Project site, six species are included in Annex II, and three are included in Annex III. Eleven species within the area are not currently listed under the BERN convention.

Regarding the CITES appendices, none of the species are listed in Annex I or Annex II, but three species are included in Annex III.

Furthermore, adhering to the guidelines of the Habitats Directive, two species are encompassed within Annex II, four species are listed under Annex IV, and three species are designated under Annex V.

9.5.3. Aquatic Environment

Aquatic Habitat Assessment

Within the scope of the ADMP, aquatic biodiversity identification and evaluation studies were carried out along the route in ten sampling points. An aquatic study was carried out at the intersection of the South Alternative with the Büyük Menderes River, and the results of the study at the Aquatic-3 point are explained in this section.

While making habitat assessments, existing cover, burial characteristics of ground stones, substrate properties of stagnant water environments, velocity, depth, the structure of stagnant water environments, sedimentation, river/streambed occupancy, river bed variability, geomorphological condition of the river bed, stability of river banks, vegetation cover of river banks parameters are taken into account. Habitat parameters considered are directly related to aquatic organisms, and these physical factors significantly affect the presence and density of aquatic organisms.

"AQ3" sampling point had little water in the June and November sampling periods. Detailed evaluations of the aquatic sampling stations are described in Table 9.7 with introductory information.

The sampling point AQ3 is in Büyük Menderes Stream. Considering the width of the riverbed, the amount of water was observed to be low. It did not exceed one m from the deepest point of the sampling area. While there should be more seasonal water flow, a significant part of the water in the riverbed was given for irrigation, and the amount of water had decreased. The bottom of the river is covered mainly with gravel areas, and muddy regions are also common. There is strong riparian vegetation consisting of reeds. There is willow trees observed infrequently.

Table 9.7 Aquatic Sampling Point 3

Sampling Point	**Aquatic_3**			
Basin	Büyük Menderes			
River / Stream	Büyük Menderes River			
Coordinates	603668.00 E 4188483.00 N			
Field Photo				
 **June, 2021**  **November, 2021**				
Habitat Features	Considering the width of the river-bed, it was observed that the amount of water was low. It did not exceed 1 m from the deepest point of the sampling area. While there should be more seasonal water flow, a significant part of the water in the river-bed was given for irrigation and the amount of water had decreased. The bottom of the river is largely covered with gravel areas, muddy areas were also common. There is strong riparian vegetation consisting of reeds. There was willow trees observed infrequently.			
Visual Water Quality	**Good**	**Moderate**	**Bad**	**Very Bad**
			X	

Freshwater Algae

Considering all of the sampling stations, 234 algal species were identified. The most dominant group regarding diversity and density is the Bacillariophyta division. A total of 174 taxa belonging to this group, 17 taxa belonging to Chlorophyta, 10taxa belonging to Charophyta, 27 belonging to Cyanobacteria, two taxa belonging to Miozoa, and four taxa belonging to Euglenozoa were identified. None of these species is endemic, and none of them is protected. A table of determined algae species is given in Annex-7.

Zooplanktonic Organisms

Three dominant animal groups represent the zooplanktonic organisms living in the freshwater system. These are the Cladocera, Copepoda and Rotifera groups.

As a result of the sampling and literature studies, a total of 32 taxa were identified belonging to Rotifera, Cladocera and Copepoda from zooplanktonic organisms. The most dominant group of these is Rotifera. Twenty-five taxa belonging to Rotifera, three to Copepoda, and four to Cladocera group were determined. A table of determined zooplanktonic species is given in Annex-7.

An essential part of the species identified in all three basins belongs to Rotifera. Cladocera and Copepoda are very rare in current waters. A significant number of Rotifera species have developed an adaptation to the current velocity. These species are able to protect themselves from the sweeping effect of water by clinging to the bottom of the stones in flowing environments. The fact that more species than other groups represent Rotifera is due to these adaptive features.

Zooplanktonic organisms must be fed with phytoplanktonic organisms to continue their development. Therefore, they prefer areas where this nutrient is abundant, and other physical and chemical factors are optimum for them. Rivers and streams are not suitable habitats for these organisms. The phytoplanktonic organisms they use as food in these areas are low, and the river current is an important limiting factor. Due to their very small size, they can easily be dragged to death. The abundance values of zooplanktonic organisms in all sampling areas were found at very low levels.

The reasons for the low-density values of zooplanktonic organisms have been discussed above. The decrease in the flow rate at the sampling point in Büyük Menderes River stations and the formation of a stagnant water system in a large area have created a suitable environment for zooplankton and other living groups.

Rotifera is the most dominant group in terms of population density, which is better adapted to flowing environments than other zooplankton groups. It has been observed that zooplanktonic organisms have come to the forefront due to the decrease in the current speed of the workstations.

There are no endemic, rare or need-to-be-protected zooplanktonic organisms in the study areas and it has been determined that they are cosmopolitan species.

Benthic Invertebrates

The more heterogeneous the bottom structure of an environment, the more species is represented by benthic. The presence of muddy, sandy and gravelly areas at the study points means an increase in the species diversity of benthic organisms. Because benthic organisms determine their habitats according to the bottom structure. One species does not spread in both muddy and gravelly areas. They are specific to each environment. For example, members of the family Chrinomidae, belonging to the class Diptera, are found only in muddy, low-oxygen environments.

In contrast, members of orders such as Trichoptera, Odonato and Ephemeoroptera live in gravelly and oxygen-rich environments. Therefore, the diversity of the bottom structure is an essential factor that increases the number of species. Other physical and chemical factors affect the existence and distribution of benthic species. Some species may like polluted environments, while others can only live in clean water. In the Diptera order, members of the family Chrinomidae are found in dirty environments, while members of the family Simuliidae prefer clean water environments. Therefore, flow rate and pollution factors are suppressive factors on the species. This situation is also reflected in the sampling results in the study areas. Almost all of the family members of Chrinomidae were found in stations with muddy, stagnant and muddy bottoms. Members of the Simuliidae family were also found in environments with fast-flowing, abundant oxygen and gravelly ground structures.

Quite successful findings have been reached in terms of species abundance. Chironomidae was highly detected, as expected from almost all sampling sites. Twenty-eight taxa belonging to the Chironomidae family have been identified mainly at the genus level. The Chironomidae family is known to be a group known for its tolerance to pollution and might exist in various physicochemical conditions due to its presence in the river. This family has physiological adaptations and the ability to survive low-oxygen conditions. Because of these characteristics, it was observed as the densest and most widespread in every basin region. It is known that the Chironomidae family is one of the significant groups of freshwater macroinvertebrates due to its wide abundance and high diversity. Following the Chironomidae family, the most abundant groups were Baetidae and Hydropsychidae. Baetidae has been reported as one of the families of macro-invertebrates that are acid-sensitive and depend on the dissolved oxygen concentrations in water. The dominance of the Baetidae family in Aydin may be due to the high oxygen concentrations of the two clean/moderate streams. The species belonging to the Baetis genus were mainly found in stations. Members of the Hydropsychidae family are highly tolerant to anthropogenic effects and have the ability to form water-resistant micro-habitats. There are several potential explanations, such as the decrease in species diversity with increasing pollutant loads, river reclamation, and management of reservoirs and dams over the years that have passed (Akyıldız ve Duran, 2021)

In general, benthic species identified from the region are cosmopolitan, and no rare and endangered species are specific to the area.

Fish

A total of 30 fish species were detected due to sampling studies and literature in the Büyük Menderes River basin. 2 of them were sampled during the field studies in the AQ3, and the remaining species were taken from the literature records.

Cobitis simplicispina and *Gambusia holbrooki* species were sampled at the AQ3 station. These species are not endemic or protected. Fish species table and photographs of the sampled species are given in Annex-7.

9.6 Impact Assessment of Ecology and Biodiversity

9.6.1 Significance Criteria

The significance criteria for the impacts on ecology and biodiversity were determined as high, moderate, or low based on evaluating the magnitude of impact and sensitivity/value of the receptors/resources. The sensitivity/value criteria used in the ecological impact assessment are summarized in Table 9.8.

The IFC Performance Standard 6 (IFC, 2012), Biodiversity Conservation and Sustainable Living Revenue Natural Resource Management rules were used to identify Critical Living Areas in the Study Area. IFC criteria for identifying Critical Habitats include:

- Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species
- Criterion 2: Endemic and/or restricted-range species
- Criterion 3: Migratory and/or congregation species
- Criterion 4: Highly threatened and/or unique ecosystems
- Criterion 5: Key evolutionary processes

The level of sensitivity of critical species and habitats was determined according to Table 9.8, and for the evaluation of the significance of the impacts on biodiversity of construction and operation phases of the South Alternative, the categorization matrix (3 x 3) given in Chapter 4 is used.

Determining the ecological sensitivity criteria, the criteria used in defining critical habitat in IFC GN6 Biodiversity Conservation and Sustainable Management of Living Natural Resources (June 27, 2019) were considered. Accordingly, if a biodiversity component meets the critical habitat criteria; its sensitivity is evaluated as "High". Habitats and species that are globally widespread but locally or nationally protected species are assessed as "Medium" sensitivity. Natural habitats that do not meet the criteria for either medium or high sensitivity are assessed as low sensitivity. The criteria are also explained in Table 9.8.

Table 9.8 Criteria for Sensitivity/Value of Resource/Receptor (Ecology and Biodiversity)

Ecosystem Component	**Sensitivity/Value Level**		
	High (3)	**Medium (2)**	**Low (1)**
Designated Areas	Areas that meet the criteria of the IUCN's Protected Area Categories Ia, Ib and II. Key Biodiversity Areas (KBAs), which encompass Important Bird and Biodiversity Areas (IBAs). UNESCO Natural and Mixed World Heritage Sites Sites that fit the designation criteria of the Alliance for Zero Extinction (AZE)	Nationally designated areas	N/A
Habitats	Habitats that trigger critical habitat under the following IFC PS6 Criteria: • Criterion 4: Highly threatened and/or unique; and/or ecosystems • Criterion 5: Key evolutionary processes Habitats that support species of High sensitivity	Areas of habitat that represent >1% distribution within Türkiye or are threatened at a national level. Habitats that support species of Medium sensitivity.	Natural habitats that do not meet the criteria for either medium or high sensitivity. Habitats that support species of Low sensitivity.
Species	Species populations that trigger critical habitat under the following IFC PS6 Criteria: • Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species; • Criterion 2: Endemic and/or restricted-range species;and/or • Criterion 3: Migratory and/or congregatory species.	Nationally/ regionally important concentrations of a Vulnerable (VU) species, or locally important concentrations of Critically Endangered (CR) and/or Endangered (EN) species. Locally important populations of endemic / rangerestricted species. Populations of migratory species that represent >1 % of the national population.	Locally important populations of Near Threatened (NT) or Vulnerable (VU) species, or locally important populations of species listed on Annexes to the Bern Convention.

9.6.2 Impact Assessment

The construction and operation of the South Alternative project will involve a wide range of activities that can potentially affect the ecology. Impacts of project activities can be further divided into the target group of biological elements as terrestrial and aquatic. Significant impacts of motorway construction and operation activities on the biological environment are mainly habitat fragmentation. Habitat fragmentation can be described as splitting natural habitats and ecosystems into smaller, more isolated patches. The fragmentation process is connected to many factors, of which the direct loss and isolation of natural habitat are the most important. (cost 341).

The ecological effects of transportation include disturbance in terms of noise, visual nuisance and pollution, which reduce the suitability of adjacent areas for wildlife. The infrastructure contributes significantly towards habitat fragmentation by creating barriers to animal movement. This may result in the isolation and extinction of vulnerable species. The steady increase in the number of animal casualties associated with roads further indicates the fragmentation effect. Fauna mortality, in particular, has helped raise the public perception of the problem due to the inherent link to traffic safety (cost 341).

During the planning, construction, or upgrading of transportation infrastructure, all possible efforts must be made to maintain or restore ecological structures and connect habitats and populations. Particular attention will be paid to rivers, streams, riparian forests, wooded corridors, networks of hedges and dikes, etc., which provide ecological corridors for growth, expansion of the range, and/or migration of wildlife populations and can often be the last refuge for many species in an intensively man-used landscape (cost 341).

Best practice dictates that project planning and design aim to avoid ecological damage, especially to protect sensitive habitats and/or species. The avoidance of fragmentation will be considered before resorting to mitigation measures. The following articles are general principles to consider against habitat fragmentation:

- The fragmentation of natural habitats by transportation infrastructure is a problem that can only be solved by accepting the issue at a policy level. Only an interdisciplinary approach involving planners, economists, engineers, ecologists, landscape architects, etc., can provide the necessary tools for successfully addressing fragmentation. Public involvement is also essential to ensure the success of the chosen solutions.
- Habitat connectivity is a vital property of landscapes and is especially important for sustaining animal movement across the landscape. The preservation of habitat connectivity will be a strategic goal in the environmental policy of the transport sector.
- Avoiding and mitigation will be applied from the start of the planning process.

The construction and operation of the project will involve a wide range of activities that have the potential to affect the ecology. The relevant activities of the project likely to give rise to impacts on receptors are summarized in Table 9.9, along with the possible pathway of the effects.

Table 9.9 Potential Impacts of the Project on Biodiversity

Phase of the Project Activities	Activity	Potential Impact
Construction	Vegetation clearance	Damage or loss of habitats Loss of important plant species Direct incidental killing of fauna Loss of habitat for faunal species Increase in noise, visual and vibration which may cause disturbance or displacement of fauna Invasive species Loss of ecosystem services
	Camp sites, storage areas and quarries	Damage or loss of habitat Increase in noise, visual and vibration which may cause disturbance or displacement of fauna
	Construction of culverts, bridges and viaducts	Damage or loss of habitat Increase in noise, and vibration and disturbance on fauna Disruption of ecological connectivity Loss of ecosystem services
	Presence of site preparation and construction vehicles	Increase in noise, visual and vibration which may cause disturbance or displacement of fauna Damage or loss of flora and /or fauna
Operation	Operational traffic	Increase in noise, visual and vibration which may cause disturbance or displacement of fauna Damage and/or loss of fauna Barrier effects Ecosystem Services

9.6.3 Receptors

9.6.3.1 Terrestrial Habitats

The sensitivity of terrestrial habitats within the South Alternative is provided in Table 9.10.

Table 9.10 Terrestrial Habitat Sensitivity Evaluation

Habitat	Rationale	Sensitivity
F5.2: Maquis	Habitat of medium sensitive species	Medium
G2.9: *Evergreen Fruit Orchards*	Habitat of medium sensitive species	Medium

9.6.3.2 Terrestrial Flora and Fauna Species

Terrestrial Flora

The sensitivity of terrestrial flora species within the South Alternative is provided in Table 9.11.

Table 9.11 Terrestrial Flora Species Sensitivity Evaluation

Species	Rationale	Sensitivity
Ziziphora taurica subsp. cleonioides	Regional Endemic and VU category in the IUCN Lists	Medium
Peucedanum chryseum	Widespread Endemic	Low
Allium proponticum var. *proponticum*	Widespread Endemic	Low
Stachys cretica subsp. *smyrnaea*	Widespread Endemic	Low

Amphibian – Reptilian

The sensitivity of reptile species within the South Alternative is provided in Table 9.12.

Table 9.12 Amphibian-Reptile Species Sensitivity Evaluation

Species	Rationale	Sensitivity
Testudo graeca	VU category in the IUCN Lists	Medium

Birds

The sensitivity of bird species within the South Alternative is provided in Table 9.13.

Table 9.13 Bird species Sensitivity Evaluation

Species	Rationale	Sensitivity
Falco vespertinus	VU category in the IUCN Lists	Medium
Streptopelia turtur	VU category in the IUCN Lists	Medium

Mammals

The sensitivity of terrestrial mammal species within the South Alternative is provided in Table 9.14.

Table 9.14 Mammal Species Sensitivity Evaluation

Species	Rationale	Sensitivity
Rhinolophus euryale	VU category in the IUCN Lists	Medium

9.6.3.3 Aquatic Environment

At station AQ3, the closest station to the South Alternative, no sensitive aquatic biodiversity elements were sampled.

9.6.4 Impacts on Ecological Components

9.6.4.1 Construction Phase Impacts on Ecology

The project's construction phase will require the removal of the majority of vegetation within the South Alternative, which is a direct, permanent, irreversible adverse impact. The loss of vegetation will also cause fragmentation of the remaining habitats in the South Alternative. Construction activities, including vegetation clearance and topsoil stripping, creation of campsites, storage areas and quarries, design of culverts, bridges and viaducts, presence of site preparation, and construction vehicles have the potential to cause indirect adverse impact on surrounding habitats from runoff and dust.

The effects determined for each section within the context of construction activities are summarized below:

The Impact of Habitat Loss

The assessment of the habitat effect (lifting of the vegetation cover) concerns the value of the structural component as the habitat for the fauna of the vegetation cover, and the species composition of the removed vegetation cover is not considered. Flora specialists have evaluated the species components of the flora cover and the threatening conditions. Regarding the Study Area's total area and similar habitats, the loss of habitats is minimal, representing a small fraction of these habitats available for fauna. Also, as can be understood from fieldwork, lost habitats will not create a barrier that affects species distribution. Although the habitat under new roads will be permanently lost, new viaducts, bridges, ecological bridge, and culverts will return to a situation suitable for use as mammal transition areas.

Aquatic effect

Violation of the vegetation cover and the region's natural environment will cause degradation or destruction of habitats in these regions. The construction of motorways will affect rivers damaged by excavation and blasting, the construction of artificial structures, the smoothing of beds of stream flows, and the activities of flood areas. Construction and excavation work in the coastal regions of waterways affect aquatic organisms, water-supported habitats, and fauna species. Contamination of pollution during activities and increasing water blurring will inevitably occur. If mitigation measures are not taken, this contamination can result in the reduction or destruction of settlement of the basin's gradual and natural biosynthetic reservoirs.

Noise and Dust Influence

The effects of the construction activities will include dust, noise, and vibration. These effects may soon impact indigenous mammalian species, but none of these effects will have a lasting impact on species. After the construction activity, the composition of the fauna species is expected to return to its original state in time.

The effects and the essential criteria for the effects for each section are given below.

Terrestrial Habitats and Species

The magnitude of construction impacts on terrestrial habitat types is evaluated and given in Table 9.15. Habitat loss and habitat fragmentation will occur within the scope of the construction of the project, and the magnitude on the flora and fauna species identified in these habitats has been evaluated as high (see Table 9.16).

Table 9.15 The magnitude of Construction Impacts on Terrestrial Habitats

Habitat	Magnitude
G2.9: Evergreen Fruit Orchards	High
I1.1: Intensive Non-Mixed Agricultural Areas	High
F5.2: Maquis	Medium
G3.F: Highly artificial coniferous plantations	Medium

Table 9.16 The magnitude of Construction Impacts on Terrestrial Flora-Fauna Species

Component	Magnitude
Terrestrial flora-fauna species	High

Aquatic Environment

If the bridge construction piers are built inside the stream bed or on the coastal part, excessive sediment loading and damage to the aquatic ecosystem may occur. The spawning grounds of fish can be destroyed downstream and in working areas. In addition, excess sediment can block the fish's gills, hindering their respiratory function.

Construction activities to be carried out during the breeding season of fish species (April-June) can have adverse effects. Works at the crossing point can destroy benthic organisms. In addition, during the works, destruction will occur in the riparian vegetation in the coastal areas. As a result, deteriorations in coastal stability can be observed.

Within the scope of the South Alternative project, a small part of the Büyük Menderes River will be affected. For this reason, the magnitude of construction activities on the species identified in the Büyük Menderes River and their habitats was evaluated as Medium (see Table 9.17).

Table 9.17 The magnitude of Construction Impacts on Freshwater Habitats

Component	Magnitude
Aquatic Environment	Medium

9.6.4.2 Operation Phase Impacts on Ecology

Since the construction period effects are long-term effects, the duration of the operation period is also included. Therefore, the magnitude of impacts will also be valid for the operating period.

During the operation phase, there will be several potential impacts on ecological components along the route. These impacts include operational traffic and noise and visual disturbance, damage and/or loss of fauna, barrier effect, changes in air quality, and surface and groundwater quality. Relating surface and groundwater quality and air quality are described in Chapter 8 ("Water Resources") and Chapter 10 ("Air Quality and Climate Change"), respectively.

It will be noted that the baseline may have shifted considerably from conditions pre-construction after construction. As such, impacts on species have been predicted, adopting a precautionary approach that assumes species are still present along the motorway.

Barrier effects: The barrier effect of roads is their most significant negative ecological impact. Individual organisms' dispersal ability is a critical factor in species survival. The ability to move around a landscape in search of food, shelter, or mates is negatively impacted by barriers that cause habitat isolation. Impacts on individuals affect population dynamics and often threaten species' survival. The only way to avoid the barrier effect is to make infrastructure more permeable to wildlife through fauna passages, adapt engineering works, or manage traffic flows. Carefully selecting the road route through the landscape can minimize the barrier problem.

Due to habitat fragmentation, the barrier effect is the most significant adverse effect for small and large mammal species. Impacts on individuals affect population dynamics and often threaten species' survival. The barrier effects can be investigated in two points as follows:

Physical barrier: Transport infrastructure becomes a complete barrier for larger mammals only if fenced or if traffic intensity is high. The road surface and verge impose a more substantial barrier for smaller animals, especially invertebrates because the substrate is barren or the disturbance is too great.

Behavioural barrier: Many larger wildlife species avoid areas near roads related to the degree of human disturbance (traffic density, secondary development). Other animals, such as small

mammals and some forest birds, exhibit behavioural avoidance patterns when crossing large open spaces.

Planned motorway traffic flow ranges between 30,000 and 35,000 PCE/day for the Aydın-Denizli Motorway Project. Within the scope of the motorway project, traffic flow can be impenetrable for mammal species (see Table 9.18). However, recommended ecological bridge and culverts will be used as animal passes, preventing mortality due to the traffic flow.

Table 9.18 The relationship between road traffic density and the barrier effect on mammals

Traffic density	Permeability
Road with traffic below 1000 vehicles/day	Permeable to most wildlife species
Roads with 1000 to 4000 vehicles/day	Permeable to some species but avoided by more sensitive species.
Roads with 4000 to 10000 vehicles/day	Strong barriers, noise, and movement will repel many individuals. Many trying to cross the road become road casualties.
Motorways with traffic levels above 10000 vehicles/day	Impermeable to most species.

Traffic mortality will be responsible for just a tiny proportion (1-4%) of the total mortality of common species (rodents, rabbits, foxes, sparrows, blackbirds, etc.). However, without mitigation measures, traffic can cause mortality and significantly affect local population survival for more sensitive species.

If mitigation measures are not taken for noise control, noise impacts would disturb many terrestrial habitats.

Fauna casualties: Mortality is probably the best-known impact of traffic on wildlife. Millions of individuals of a wide range of wildlife species are killed on roads mostly. Large numbers of fauna casualties may not necessarily imply a threat to populations but indicate that the species involved are locally abundant and widespread.

Disturbance and pollution: Road development and operation alter the ecological characteristics of adjacent habitats, which may induce changes in how they are used by wildlife. Many of these changes can affect habitat quality at a significant distance from the infrastructure development. The following are the main types of disturbance associated with transport infrastructure.

Chemical pollution: A wide range of pollutants are derived from road traffic and the road surface. Motor exhausts give rise to, for example, carbon monoxide, nitrogen oxides, sulphur dioxide, and hydrocarbons, including polycyclic aromatic hydrocarbons (PAH), dioxins, and particles. Vehicles are sources of heavy metals such as lead, zinc, copper, and cadmium. Sodium and chloride pollution comes from de-icing salt. The chemicals pollute surface and groundwater, soil and vegetation along roads. Compounds containing nitrogen and sulphur contribute to acidification and eutrophication. Pollutants can cause damage or disturbance to biological functions at several organizational levels, from cells through individuals to populations.

Noise and vibration: The disturbance from noise is mainly influenced by traffic, traffic intensity, road surface properties, topography, rail type, and the structure and type of the adjacent vegetation. Geological and soil characteristics influence the magnitude and spread of vibrations. Some species avoid noise-disturbed areas. For example, in the Netherlands, bird densities declined when the traffic noise exceeded 50 dBA, whereas woodland birds were sensitive to noise levels as low as 40 dBA. Some species breed in average densities in disturbed areas but with lower breeding success.

Lighting and visual disturbances: Artificial lighting can affect growth regulation in plants, disturb breeding and foraging behaviour in birds or influence the behaviour of nocturnal amphibians.

Lights can also attract insects (mercury lamps) and, in turn, increase the local densities of bats along roads, resulting in increased bat mortality.

9.7 Mitigation Measures

The following section details the mitigation measures and areas to avoid, reduce and offset potential impacts on ecology and biodiversity from the project. These measures are described under two headings: the construction and operation phases.

General Mitigations

The general measures to be taken to the effects on the biodiversity from the project activities during the construction phase are given below.

- Study area will be clearly defined before vegetation clearance, where construction activities will occur.
- Access roads will be clearly defined before the onset of construction activities so as not to harm flora elements outside the construction sites.
- Project construction sites and access roads will be separated from other areas with appropriate signboards, signs, and fences. Therefore, staff and vehicle access to the area will be limited to the construction site.
- Vegetation clearance will occur gradually so fauna elements can leave construction sites.
- During vegetation clearance, equipment will be selected to avoid harming plant roots.
- The intrusion of any invasive species into the South Alternative and its surroundings will be prevented. For this purpose, vegetation clearance and/or plant transfer vehicles will be checked beforehand.
- Construction waste generated due to project activities will be stored at designated storage areas, and then disposed of solid waste will not be allowed to be left in natural habitats.
- The construction phase will be carried out with a biologist to take mitigation measures and interfere with some impacts from construction activities taken where necessary.
- Measures to reduce noise are provided in Chapter 11 (“Noise and Vibration”) for details.
- Measures to reduce dust and air pollution are provided in Chapter 10 (“Air Quality and Climate Change”).
- Project workers will not be allowed to bring live animals or plants into the construction site to avoid the risk of pest/invasive species in the South Alternative.

9.7.1 Construction Phase

Terrestrial Vegetation and Flora Species

Ziziphora taurica subsp cleonioides species distributed in the South Alternative and has IUCN Categories “VU”, whose coordinates are shown in Table 9.5, will be monitored. In case of negative impact from the activity, its seeds will be collected and delivered to the Türkiye Seed Gene Bank within the scope of ex-situ conservation.

To minimize the population loss of the regionally distributed *Ziziphora taurica subsp cleonioides* species that will be damaged as a result of the activity, seeds will be collected within the scope of in-situ conservation and planted in suitable habitats that will not be affected by the activity.

After the quarrying activity is completed in the region where the quarries directly affected by the activity are located, restoration plans will be made, considering the natural habitat structure.

The collected seeds will be delivered to the seed bank primarily. Excess collected seeds will be planted in suitable vegetation for in-situ protection in restoration period.

Terrestrial Fauna Habitats

- Before the beginning of site preparation (vegetation clearing and topsoil removal), an expert wildlife ecologist will perform pre-construction surveys in the areas to be cleared (a maximum of seven days before). The survey will focus on target species (terrestrial vertebrates whose locomotion is too limited to escape). If any of these species are observed, they will be collected by the ecologist and translocated to undisturbed but similar habitats out of the South Alternative.
- A specialist zoologist will conduct additional pre-construction inspections of bird and mammal nests.
- The construction activities will be carried out gradually to provide the time and energy for birds to leave the area due to habitat losses, noise, dust formation, and vehicle-human traffics.
- Vehicles will be kept free of food, lubricants, antifreeze, oils and hydrocarbons or else these items will be held in fox/wolf-resistant receptacles within the vehicle.
- Construction areas will be kept as unattractive to large mammals as possible, including adequately managing and storing wastes and raw materials that attract these species (such as food scraps, oils, lubricants and hydrocarbons).
- All employees will promptly collect any materials that could be poisonous or a choking hazard to animals.
- Ground clearance and excavation works will be minimised during the winter months (typically mid-October to mid-March) when suitable hibernation sites for mammals.
- Where possible, ground clearance and excavation in forested areas will not be undertaken in late spring (April - June) to minimise impacts on breeding birds and mammals.
- Before ground clearance works, vegetation in areas of suitable habitat will be trimmed to approximately 10 cm above ground level and cut vegetation removed at least two days before ground works to allow small mammals to disperse. Vegetation will be trimmed and removed using hand-operated cutting tools.
- Reptiles will be caught and moved to a suitable habitat (no smaller than the capture site, containing the same habitat characteristics and prey availability) a minimum of 500 m away from the works.
- Vipers will not be collected by hand; they will be expected to be disturbed by activity and leave the area.
- Hunting and collecting wild animals by employees and contractors will be strictly prohibited within the Project Route.
- Feeding of wildlife or stray cats and dogs will be prohibited on-site, and organic waste will be carefully managed and disposed of to avoid the attraction of wildlife or abandoned cats and dogs.
- The speed of the vehicles on site should be limited, and the use of construction vehicles at night should be avoided to minimize the risk of traffic collisions with fauna.
- The construction sites will be fenced to prevent the entry of fauna species. In addition, traffic will be restricted in the construction area, except for pre-designed roads, to avoid animal destruction.
- If fauna species are encountered, employees and contractors will wait until it moves on by them, or they will ask the assistance of the Environmental Technician for its safe removal and relocation in a suitable environment.
- Blasting activities will be performed during the daytime and at regular times to enhance local fauna habituation to noise and to avoid disturbance during critical hours for many species (dusk and dawn).
- Awareness among on-site employees and contractors about the protected species/habitats potentially present in the area will be developed to ensure constant monitoring and promote actions to be taken if wildlife is encountered. Training will be given to personnel.

Aquatic Environment

- Excavation materials will not be dumped onto a riverbed.
- Mixing any chemical substances used in the construction area, waterbed, and/or aquatic ecosystems will be prevented.
- The natural structure of the riparian vegetation will be preserved, which forms the spawning and sheltering area for many aquatic organisms.
- Especially during the breeding season of fish species (April, May, and June), any intervention on riverbeds will be prevented.
- Sediment traps will be used to prevent the negative impact of the sediment that construction activities will generate.
- Strengthening works will be done with certain rock blocks to ensure the stability of the coast.
- Project activities will be limited to designated areas to avoid direct impacts.
- Monitoring will be done during the construction and operation.
- Project personnel will be informed and trained in the aquatic environment.

9.7.2 Operation Phase

The main impact of the motorway projects during the operation phase is barrier effects and collisions. Various measures are designed to reduce the number of animals killed on or around transport infrastructure and eliminate the barrier effect. Measures to be taken for impacts on ecology and biodiversity during the operation phase are presented below.

Ecological Bridge

Forest and maquis habitats are essential breeding, sheltering, and feeding areas for large mammals (especially roe deer: *Capreolus capreolus*), forest bird species, and the tortoise (*Testudo graeca*- IUCN: VU). Therefore, these sections of the ADMP have been evaluated as to whether it would be appropriate and beneficial to construct culverts and Ecological Bridge in areas where the topography is suitable for the passage of large mammals and other species.

As a result of field and desk studies and monitoring carried out within the scope of ADMP, the Ecological Bridge point has been suggested in the South Alternative Route. The point where the Ecological Bridge is recommended is mapped in Figure 9.6.

The Ecological Bridge point has been determined by considering the movement points used by fauna species for reproduction, nutrition and shelter.

The Ecological Bridge will be wide enough to allow the passage of species (L=56.30 m). The bridge will be planted with flora species compatible with the around the South Alternative. Foreign species will not be used in planting. Seeds of endemic species collected from the area can also be used in planting. In addition, the functionality and effectiveness of the bridge will be monitored regularly, and maintenance will be carried out when necessary for the sustainability of the vegetation. Photographs showing the location of the Ecological Bridge are presented in Chapter 3.

In addition to the ecological bridge, it has been determined that the culverts to be built within the scope of the motorway project are suitable for the passage of mammals and other species. Constructing an Ecological Bridge at determined points in line with the requirements of the related forestry directorates after the KGM approval is recommended.

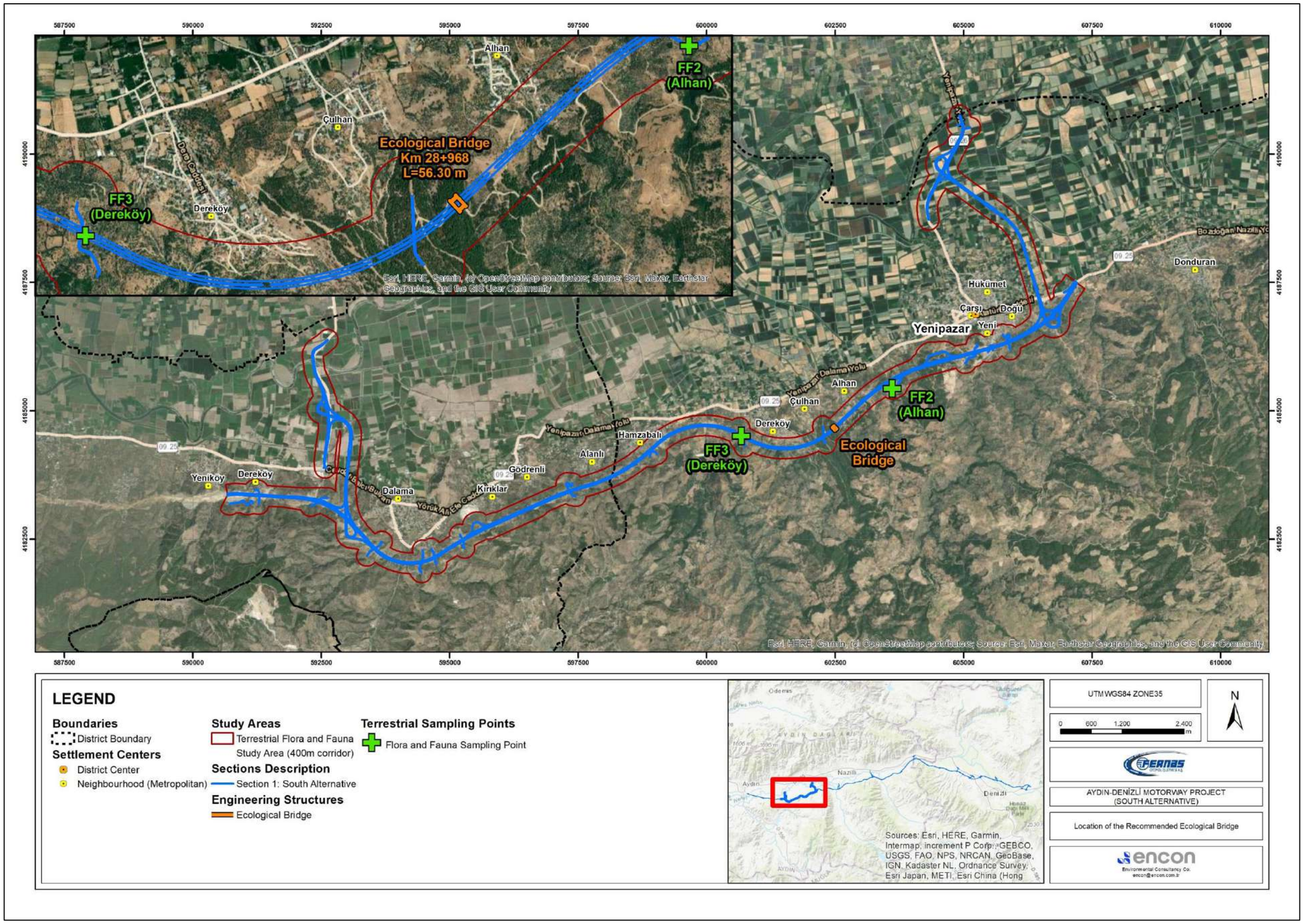


Figure 9.6 Location of the Recommended Ecological Bridge

Viaducts

Viaducts are used to overcome road or infrastructure obstacles between natural habitats or ecosystems. When designed correctly, viaducts can connect habitats, facilitating wildlife passage. Viaducts can prevent traffic accidents by limiting interactions between wildlife and humans.

Culverts

Culverts for animals are primarily constructed as safe crossing points for mammals. They are a suitable solution, particularly in hilly areas or where the infrastructure is built on an embankment. Target species are usually mammals; smaller mammals may also readily use these culverts. It has been determined that the culverts to be built within the project's scope are suitable for mammal passages.

Fences

Fences will be built to prevent moving fauna species from entering the roads. They will mainly be constructed to reduce accidents due to collisions between large mammals and cars and reduce the number of smaller animals killed on the roads. The disadvantage of fences is that they increase the barrier effect. Therefore, where fences or other barriers are erected, it has to be ensured that the species concerned have enough opportunities to cross the road. In most cases, fences must be combined with wildlife passages. They are essential in guiding animals to the crossing points in these cases. When traffic safety is not an issue, fences will only be erected where animal mortality might threaten a population; otherwise, the barrier effect might have worse effects on the survival of the populations in the long term than the mortality due to traffic.

In general, wildlife fences will be only in places where the number of animals killed is high, or there is an increased risk of accidents involving wildlife. This is primarily the case along high-speed roads. Density fences will only be erected at high-risk spots on low-traffic roads.

Fences will always be built on both sides of a road. This is because the ends of the fences are danger points: animals may go around the end of the fence and get trapped on the road. Fences will, therefore, end at structures like bridges. Although only a stretch of the road is fenced in, they will be extended 500 m beyond the danger area. On roads with relatively little traffic, openings in fences can be provided at locations where animals can easily cross and where crossing animals are visible to drivers.

A smaller mesh size in the bottom half or third of the fence is recommended for conventional wildlife fences. Distance between horizontal wires: bottom: 50-150 mm, top: 150-200 mm. Distance between vertical wires: 150 mm. Wires will have a diameter of at least 2.5 mm and contain rust-free material. The bottom wire will lie directly on the ground and be fixed to prevent animals from crawling under the fence. Where the ground is uneven, it must be levelled out to avoid gaps, e.g., due to holes in the background. Special care will be given to places where fences cross ditches. Fences will be made with the approval of KGM.

Within the scope of the South Alternative Project, fences will be used under the practices mentioned above to prevent animals from colliding with other vehicles on the road, especially in areas where traffic will be heavy.

Warning signs

Warning signs aim at influencing drivers' behaviour to reduce the number and severity of collisions between large mammals and cars. In addition, standard traffic signals will be placed in areas where collisions often occur. Warning signs will be made with the approval of KGM.

Lights

Road lights often attract insects and, consequently, bats or nocturnal birds that hunt them. This results in high mortality for the insects and their predators. In insensitive areas, the need to establish road lights will be balanced against the consequences for nature. To prevent collisions with insects, sodium lights will be used.

9.7.3 Monitoring

The effects of the activity on biodiversity and the mitigations taken are defined in this report. However, monitoring species and habitats' presence and population status is also essential. In this context, the biodiversity monitoring plan for the route is given in this Section.

Monitoring will be carried out at least once a year in the construction period and for two years in the operation period in order to control the presence of the identified endemic flora species in the South Alternative and their impact on the project and to take emergency measures if necessary. Monitoring will be carried out in the spring and/or autumn vegetation periods. Terrestrial flora monitoring will be carried out by an expert biologist.

Ziziphora taurica subsp cleonioides species distributed in the South Alternative will be monitored. In case of negative impact from the activity, its seeds will be collected and delivered to the Türkiye Seed Gene Bank within the scope of ex-situ conservation.

All identified sensitive fauna species will be monitored during the construction and operation phases, autumn and spring periods.

After the Ecological Bridge planting works, vegetation conditions will be monitored. In the first year of operation, the Ecological Bridge will be monitored in the spring and autumn to determine whether fauna species are using it. Animal tracks and signs will be monitored, and a camera trap will be set up.

Alternative habitats identified shall be monitored periodically for any sign of stress or disturbance.

Accidents involving wildlife or observing live animals or carcasses along the access road or on the construction site will be recorded. Additional mitigation measures will be taken to discourage wildlife presence on site and avoid roadkill if needed.

The presence of *Streptopelia turtur and Falco vespertinus* nests in and around the South Alternative will be monitored before construction works. *Streptopelia turtur* and *Falco vespertinus* nest monitoring study must be performed in April and May 2024. The data regarding date, location, population extension and number of individuals will be recorded.

After one year of monitoring fauna species and habitats in the operation period, the monitoring program will be reassessed considering the results. An expert biologist will carry out terrestrial fauna monitoring.

An expert hydrobiologist will monitor all critical fish species detected in and around the South Alternative and AQ3 sampling points, twice a year (in spring and autumn) during the construction. In the operation phase, monitoring will be carried out twice in the first year; then, the monitoring period will be re-evaluated by considering the monitoring results.

9.7.4 Summary of Assessment and Residual Impacts

Table 9.19 provides a summary of the ecology and biodiversity assessments. The significance of the identified impacts before and after mitigation measures are summarized in this table.

Table 9.19 Summary of the Ecology and Biodiversity Assessments

Impacted Ecosystem Component		Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
					Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Habitat Types	G2.9:	Land preparation, construction	Damage or loss of vegetation and habitat Loss of ecosystem services	Adverse	Widespread	Long	High	Irreversible	One-off	Major (A)	Medium	High (A2)	• The intrusion of any invasive flora species into the South Alternative and its surroundings will be prevented. For this purpose, vegetation clearance and/or plant transfer vehicles will be checked beforehand. • Project workers will not be allowed to bring live animals or plants into the construction site to avoid the risk of pest/invasive species in the South Alternative. • Measures to reduce noise, dust, and air quality will be taken. • Project construction sites and access roads will be separated from other areas with appropriate KGM-approved signboards, signs, and fences. Therefore, staff and vehicle access to the area will be limited to the construction site.	Medium (B2)
	I1.1						High			Major (A)	Low	Medium (A1)		Low (B1)
	F5.2						High			Major (A)	Medium	High (A2)		Medium (B2)
	G3.F						High			Major (A)	Low	Medium (A1)		Low (B1)
Flora	*Ziziphora taurica subsp. cleonioides*	Land preparation, construction	Destroying/ disappearing	Adverse	Regional	Long	High	Irreversible	One-off	Major (A)	Medium	High (A2)	• Seeds will be collected and delivered to the Türkiye Seed Gene Bank within the scope of ex-situ conservation. • Seeds will be collected within the scope of in-situ conservation and planted in suitable habitats that will not be affected by the project.	Medium (B2)
	Peucedanum chryseum				Widespread		High			Major (A)	Low	Medium (A1)	• The intrusion of any invasive flora species into the South Alternative and its surroundings will be prevented. For this purpose, vegetation clearance and/or plant transfer vehicles will be checked beforehand. • Project workers will not be allowed to bring live animals or plants into the construction site to avoid the risk of pest/invasive species in the South Alternative. • Measures to reduce noise, dust, and air quality will be taken. • Project construction sites and access roads will be separated from other areas with appropriate KGM-approved signboards, signs, and fences. Therefore, staff and vehicle access to the area will be limited to the construction site. • Restoration plans will be made, considering the natural habitat. • Measures to reduce dust and air pollution are provided in Chapter 10 (“Air Quality and Climate Change”).	Low (B1)
	Allium proponticum var. *proponticum*						High			Major (A)	Low	Medium (A1)		Low (B1)
	Stachys cretica subsp. *smyrnaea*						High			Major (A)	Low	Medium (A1)		Low (B1)
	All flora species identified						High			Major (A)	Low	Medium (A1)		Low (B1)
Amphibian-Reptilian	*Testudo graeca*	Land preparation, construction and operation	Destroying/ disappearing	Adverse	Widespread	Long	High	Irreversible	One-off	Major (A)	Medium	High (A2)	• Before beginning site preparation, an expert wildlife ecologist will perform pre-construction surveys in the areas to be cleared (a maximum of seven days before). The survey will focus on target species (terrestrial vertebrates whose locomotion is too limited to escape). If any of these species are observed, they will be collected by the ecologist and translocated to undisturbed but similar habitats out of the South Alternative. • A specialist zoologist will conduct additional pre-construction inspections of bird and mammal nests. • The construction activities will be carried out gradually to provide the time and energy for birds to leave the area due to habitat losses, noise, dust formation, and vehicle-human traffic. • Vehicles will be kept free of food, lubricants, antifreeze, oils and hydrocarbons or else these items will be held in fox/wolf-resistant receptacles within the vehicle. • Construction areas will be kept as unattractive to large mammals as possible, including adequately managing and storing wastes and raw materials that attract these species.	Medium (B2)
	All amphibian and reptile species identified						High			Major (A)	Low	Medium (A1)		Low (B1)
Birds	*Falco vespertinus*						High			Major (A)	Medium	High (A2)		Medium (B2)
	Streptopelia turtur	Land preparation, construction and operation	Destroying/ disappearing	Adverse	Widespread	Long	High	Irreversible	One-off	Major (A)	Medium	High (A2)		Medium (B2)
	All bird species identified					Long	High			Major (A)	Low	Medium (A1)		Low (B1)
Mammals	*Rhinolophus euryale*					Long	High			Major (A)	Medium	High (A2)		Medium (B2)
	All mammal species identified					Long	High			Major (A)	Low	Medium (A1)		Low (B1)

													• All employees will promptly collect any materials that could be poisonous or a choking hazard to animals. • Vegetation clearing and excavation works will be minimized during the winter months (typically mid-October to mid-March) when suitable hibernation sites for mammals. • Where possible, ground clearance and excavation in forested areas will not be undertaken in late spring (April - June) to minimize impacts on breeding birds and mammals. • Before vegetation clearing, vegetation in areas of suitable habitat will be trimmed to approximately 10 cm above ground level and cut vegetation removed at least two days before ground works to allow small mammals to disperse. Vegetation will be trimmed and removed using hand-operated cutting tools. • Reptiles will be caught and moved to a suitable habitat a minimum of 500 m away from the works. • Vipers will not be collected by hand; they will be expected to be disturbed by activity and leave the area. • Hunting and collecting wild animals by employees and contractors will be strictly prohibited within the South Alternative. • Feeding of wildlife or stray cats and dogs will be prohibited on-site, and organic waste will be carefully managed and disposed of to avoid the attraction of wildlife or abandoned cats and dogs. • The speed of the vehicles on site will be limited, and the use of construction vehicles at night will be avoided to minimize the risk of traffic collisions with fauna. • The construction sites will be fenced to prevent the entry of fauna species. In addition, traffic will be restricted in the South Alternative, except for pre-designed roads, to avoid animal destruction. • Blasting activities will be performed during the daytime and at regular times to enhance local fauna habituation to noise and to avoid disturbance during critical hours for many species (dusk and dawn). • Biodiversity awareness training will be given to personnel. • The Ecological Bridge point has been recommended in the South Alternative South Alternative. • Monitoring will be done during the construction and operation.	
Aquatic Habitat	Büyük Menderes River	Land preparation, construction and operation	Destroying/ disappearing Loss of important aquatic flora-fauna species	Adverse	Regional	Long	Medium	Irreversible	One-off	Moderate (B)	Low	Low (B1)	• Excavation materials will not be dumped onto a riverbed. • Mixing any chemical substances used in the construction area, waterbed, and/or aquatic ecosystems will be prevented. • The natural structure of the riparian vegetation will be preserved, which forms the spawning and sheltering area for many aquatic organisms. • Especially during the breeding season of fish species (April, May, and June), any intervention on riverbeds will be prevented. • Sediment traps will be used to prevent the negative impact of the sediment that construction activities will generate. • Strengthening works will be done with certain rock blocks to ensure the stability of the coast. • Project activities will be limited to designated areas to avoid direct impacts. • Monitoring will be done during the construction and operation. • Project personnel will be informed and trained in the aquatic environment.	Low (C1)
	All aquatic species identified									Moderate (B)	Low	Low (B1)		Low (C1)

9.8 Ecosystem Services

IFC Performance Standard 6 defines ecosystem services as “the benefits that people, including businesses, obtain from ecosystems” (paragraph 2), which aligns with the definition provided by the Millennium Ecosystem Assessment. Ecosystem services are organized into four major categories:

Provisioning ecosystem services include, among others:

1. Agricultural products, seafood and game, wild foods, and ethnobotanical plants.
2. Water for drinking, irrigation, and industrial purposes.
3. Forest areas provide the basis for many biopharmaceuticals, construction materials, and biomass for renewable energy.

Regulating ecosystem services includes, among others:

1. Climate regulation and carbon storage and sequestration
2. Waste decomposition and detoxification
3. Purification of water and air
4. Control of pests, disease, and pollination
5. Natural hazard mitigation

Cultural services include, among others:

1. Spiritual and sacred sites
2. Recreational purposes such as sport, hunting, fishing, and ecotourism
3. Scientific exploration and education

Supporting services are the natural processes that maintain the other services, such as (i) nutrient capture and recycling, (ii) primary production, and (iii) pathways for genetic exchange.

The ecosystem services impact assessment identified in South Alternative is given in Table 9.21. Criteria used to define the value of ecosystem services are shown in Table 9.20.

Detailed information about agriculture and pasture areas and the measures to be taken are given in Chapters 14 and 19, and detailed information about cultural heritage and the measures to be taken are given in Chapter 13.

Table 9.20 Criteria used to define the value of ecosystem services

		Replicability of the service		
		High (lots of Geographic locations possible)	**Moderate (a few geographic locations possible)**	**Low (a few to no other possible geographic location)**
Importance to beneficiaries of the ecosystem service	Minor	Low	Low	Medium
	Moderate	Low	Medium	High
	High	Medium	High	Critical
	Essential	High	Critical	Critical

Table 9.21 Summary of the Ecosystem Services

Provisioning Services :	**Importance to Beneficiaries**	**Replicability**	**Value**	**Significance of residual impact**
Agricultural lands and fruit gardens provide services for people to feed	Moderate	Moderate	Medium	Low
Flowing and stagnant water supplies provide water for both natural animals, and these waters are used to irrigate agricultural areas. In addition, these water resources regulate the water regime in the region.	High	High	Medium	Medium
Natural and plantation forests constitute both feeding, nesting and breeding areas for many birds, mammals, reptiles and insect species.	High	Moderate	High	Medium
Regulating Services:				
Using carbon dioxide through plant cover and trees, the oxygen needed for mankind is produced.	High	Moderate	High	Medium
Vegetation cover contributes to the prevention of floods by controlling erosion.	Moderate	Moderate	Medium	Low
Vegetation covers reducing sediment transport to the lake and the seas.	Moderate	Moderate	Medium	Low
Cultural Spiritual, and Recreational Services				
Natural wooded areas are suitable for people to rest.	Moderate	Low	High	Medium
Natural forests provide lovely landscaping views.	Moderate	Low	High	Medium
Meadow-pasture areas provide grazing for livestock.	Moderate	Low	High	Medium

CHAPTER 10

AIR QUALITY AND CLIMATE CHANGE

10. CHAPTER – AIR QUALITY AND CLIMATE CHANGE

In this section, the potential impacts of the motorway project on air quality and climate of the region is assessed. Within this scope, the construction and operation phases of the motorway are taken into consideration and impacts are evaluated separately. For the assessment of impacts on air quality, air quality modeling studies were performed. This chapter includes the followings:

- Turkish and IFC air quality legislation and standards
- Baseline air quality
- Assessment and quantification of potential project emissions
- Air quality modeling with AERMOD software for the construction and operation phases of the Project taking into account local meteorological data and topography of the region
- Assessment of potential impacts on air quality
- Mitigation measures regarding air quality
- Residual impacts on air quality
- Meteorological and climatic conditions of the project area
- Assessment of potential impacts regarding climate change and relevant mitigation measures

10.1 Air Quality

Air pollution can be defined as pollutants emitted from various sources reaching the level that affects human health and the environment negatively. Main sources that result in air pollution are anthropogenic sources such as traffic (motor vehicles), industrial activities, domestic heating and overuse of natural resources.

Main pollutants emitted from motorway projects are nitrogen oxides (NO_x (NO_2 and NO)), particulate matter (PM_{10}), carbon monoxide (CO), hydrocarbons (HC) and carbon dioxide (CO_2). PM_{10} is expected to be emitted mainly during construction phase of the Project as a result of material extraction and supply, motorway construction cut and fill operations and storage of excavated material. Particles can vary according to size and composition. PM_{10} (particulate matter with aerodynamic diameter smaller than 10 µm) standard is set to define the particles that people are likely to inhale, and PM_{10} has become the general measure of particulate matter. In this sense, generally limit values are defined for PM_{10}.

Other potential pollutants are expected to arise from the operation of construction machinery and equipment during construction phase and traffic flow during operation phase of the motorway.

10.1.1 Assessment Methodology and Data Sources

10.1.1.1 Regulatory Framework

Regulation on Assessment and Management of Air Quality

Regulation on Assessment and Management of Air Quality was published on 06.06.2008 in Official Gazette No 26898. The purpose of this regulation is to define and set air quality targets in order to prevent or mitigate the negative impacts of air pollution on human health and environment, to assess air quality with defined methods and criteria, to sustain existing conditions in areas where air quality is good, to gather information about air quality and to inform the public about warning threshold levels.

In this regulation, short and long term limit values of various pollutants are defined for the harmonization to European Union (EU) environmental legislation. However, a transition period is proposed for the application of these limit values. In addition to the limit values, warning threshold levels for air pollutants are identified.

Industrial Air Pollution Control Regulation (IAPCR)

The Industrial Air Pollution Control Regulation, published on 03.07.2009 in Official Gazette No 27277, aims to control emissions in form of smoke, dust, gas, vapor and aerosol generated as a result of industrial activities and energy generation, protect human and environment from pollution in receiving environment, prevent negative impacts of air pollution on public and ensure that these effects do not arise.

According to the regulation, the limit values from stack and non-stack sources that require the calculation of the contribution values to air pollution in case of exceeding are provided. According to IAPCR Appendix 2 Table 2.1 for dust emissions the limit value from stack sources is 10 kg/hr, from non-stack sources 1 kg/hr. If the dust emissions exceed this limit value, the air quality contribution value should be calculated.

Emissions generated from the Project activities will be calculated and compared with the regulatory limits. If the calculated emission amount exceeds the regulatory limit value, modeling study will be conducted and the air quality contribution value will be estimated.

Regulation on Monitoring of Greenhouse Gas Emissions

The Regulation on Monitoring of Greenhouse Gas Emissions was published on 17.05.2014 in Official Gazette No 29003. The purpose of the regulation is to define procedures and principles for monitoring, reporting and verification of greenhouse gas emissions for a list of activities considered within the scope of the regulation.

10.1.1.2 Air Quality Standards

This section provides an overview of the national and international ambient air quality standards applicable to the assessment of air quality.

Turkish Legal Requirements

Ambient air quality is regulated in Turkey by the Regulation on Assessment and Management of Air Quality. Appendices I and I-A of this regulation provide limit values for various pollutant. The transition intervals to reach the target values are also defined in these appendices.

Air quality standards are defined in the Regulation on Assessment and Management of Air Quality published on 06.06.2008 in Official Gazette No 26898 and Industrial Air Pollution Control Regulation published on 03.07.2009 in Official Gazette No 27277 (Amendment: Date, 06.10.2020; Official Gazette No, 31296) . Ambient air quality limit values for various pollutants defined in Turkish regulations are presented in Table 10.1. The standards in Table 10.1 are the target values for 2024 and further years.

Table 10.1 Ambient Air Quality Limit Values – Turkish Regulations

Parameter	Duration	Limit Value* ($\mu g/m^3$)
SO_2	Hourly (cannot be exceeded more than 24 times in a year)	350
	24 hour (cannot be exceeded more than 3 times in a year)	125
	Long term limit	60
	Annual and winter season (from 1 October to 31 March)	20
NO_2	Hourly (cannot be exceeded more than 18 times a year)	200
	Annual	40
Particulate Matter (PM_{10})	24 hour (cannot be exceeded more than 35 times a year)	50
	Annual	40
CO	8 hour daily maximum	10,000
O_3	8 hour daily maximum in a year	120
VOC**	Hourly	280
	24-hour	70

**Regulation on Assessment and Management of Air Quality*
*** Management and the Regulation on Control of Industrial Air Pollution*

IFC Standards

IFC standards and requirements will apply to the project. The IFC General EHS Guidelines – Environmental Air Emissions and Ambient Air Quality (2007) refer to the World Health Organization (WHO) Ambient Air Quality Guidelines for recommended limit values. These limit values are presented in Table 10.2.

Table10.2 Ambient Air Quality Limit Values – IFC Standards

Parameter	Duration	Guideline Value ($\mu g/m^3$)*
SO_2	10 minute	500
	24 hour	20
NO_2	Hourly	200
	Annual	40
Particulate Matter (PM_{10})	24 hour	50
	Annual	20
Particulate Matter ($PM_{2.5}$)	24 hour	25
	Annual	10
Ozone	8 hour daily maximum	100

**Environmental, Health and Safety Guidelines, General EHS Guidelines: Environmental, Air Emissions and Ambient Air Quality*

10.1.1.3 Significance Criteria

The significance criteria for the impacts on air quality will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impact on the air quality, while sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 10.3.

Table 10.3 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	Medium (2)	Low (1)
Human Receptors	Areas densely populated with residences and have poor air quality*	Areas densely populated with residences and have good air quality*	Areas with dense work places/ industrial areas and/or non densely populated with residences
Ecological Receptors	-	Forests with ecological function Dams for drinking water purpose	Forests with social and cultural and economic function Dams for irrigation and energy production purpose

**Good and poor air quality of receptors is determined according to baseline air quality measurements.*

Evaluation of magnitude of impacts was based on percentage of exceedance of air quality standards defined in the Regulation on Assessment and Management of Air Quality. Magnitude of impact is defined as low, medium and high when the result of modeling study exceeds the Turkish air quality limit values of a specified location 0-25%, 25-50 % and more than 50 %, respectively (see Table 10.4).

Table 10.4 Impact Magnitude Criteria

Magnitude of Impact	Exceedance of Air Quality Standard
Low	0-25 %
Medium	25-50 %
High	>50 %

10.1.1.4 Air Quality Modeling

Air quality modeling was performed with AERMOD Gaussian Plume Air Dispersion Model (Version 19191) which is a complete and powerful air dispersion modeling. AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The software generates daily, monthly as well as annual concentrations of pollutants in ambient air. The model handles a variety of pollutant sources in a wide variety of settings such as rural and urban as well as flat and complex terrain.

There are two input data processors of the AERMOD modeling system: AERMET, a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP, a terrain data preprocessor that incorporates complex terrain using USGS Digital Elevation Data. The report of the air quality modeling study for the construction and operation phase is presented in Annex-11.

Meteorological Parameters

AERMOD utilizes a meteorological data preprocessor AERMET. Hourly surface station data is measured at air conditioning, synoptic or automatic type stations, and sounding meteorological information is calculated at rawinsonde stations where the vertical profile of the atmosphere is determined for AERMOD.

In modeling study, hourly meteorological data sets required according to the project region were obtained from the closest synoptic ground observation station Aydın (Station Number: 17234) and rawinsonde station Izmir (Station Number: 17220) for the first part of the planned project. While selecting the meteorological data set, the wind speed and wind direction data of the Aydın (Station

Number: 17234) Meteorology Stations measured data between 1960-2019 were used to extract the wind profile of the region.

The wind profile for the years 1960-2019 is shown in Figure 10.1 for Aydın Meteorological Station. Since there is no exact year matching with the years 1960-2019 from the data of the last ten years, the total estimation of the previous ten years was taken into account, and it was seen that the 2019 data matched precisely. And, the total wind blow numbers for 2019 are shown in Figure 10.1. For this reason, 2019 was deemed appropriate to represent Aydın Meteorological Station.

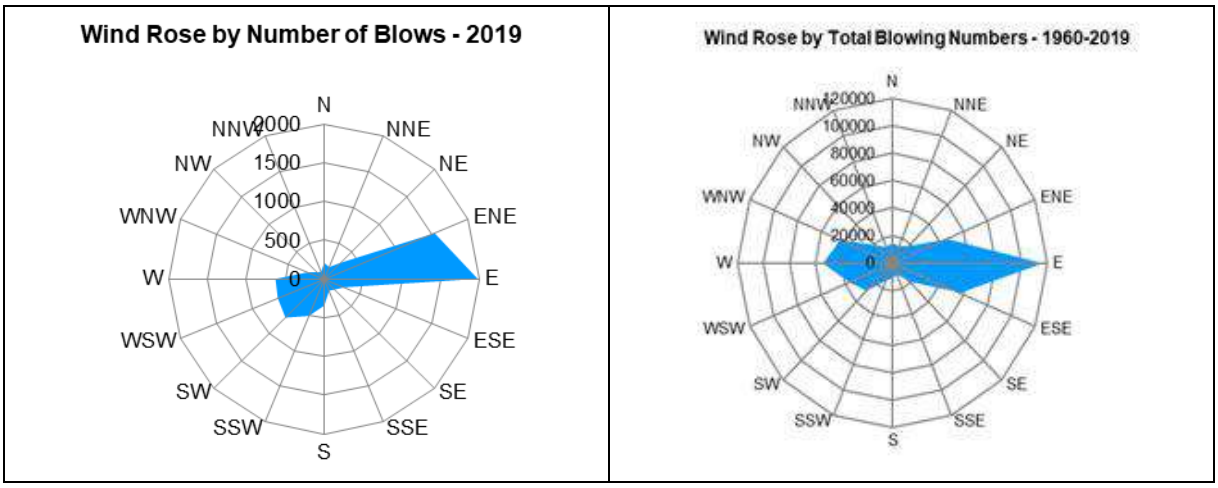


Figure 10.1 Wind Rose Numbers Recorded in Aydın Meteorological Station

After determination of the representative meteorological years, hourly meteorological data and upper air observations were obtained from the meteorological stations which best represents the Project area.

10.1.2 Baseline Conditions

Air quality measurements in Aydın Province are performed regularly in air quality measurement station located in various point throughout the city. This station works under automatic data recording system, and the records are transferred to the National Air Quality Monitoring Network of Republic of Turkey Ministry of Environment, Urbanization and Climate Change (MoEUCC). Air Quality Measurement Station representative for the Project in Aydın Province was selected and the measurement results for 2021 are presented in Table 10.5.

Table 10.5 Results of Air Quality Measurements in Aydın Province (2022)

Station Location	Parameters and Annual Measurement Results (µg/m^3)					
	PM_{10}	SO_2	CO	NO_2	NO_x	O_3
Aydın						
Efeler	38.60	4.17	901.59	45.1	10.36	113.23

Source: Republic of Turkey, Ministry of Environment, Urbanization and Climate Change http://www.havaizleme.gov.tr/ 2022

According to the limit values defined in the Regulation on Assessment and Management of Air Quality and Industrial Air Pollution Control Regulation, only the annual NO_2 measurement results for 2022 are exceed the limit values at the station. This can be associated with urban pollution sources such as heating and traffic.

In order to determine the air quality along the South Alternative route and its surrounding environment, comprehensive air quality measurement studies were performed in the scope of the Project. Parameters measured in this context are PM_{10}, heavy metals in PM_{10}, $PM_{2.5}$, settled dust, NO_2, SO_2, VOC and Benzene. Sensitive areas such as settlements, quarries and areas where urban traffic is intense were taken into consideration in the selection of air quality measurement points. Maps showing the air quality measurement locations are provided in Figure 10.2 for Section 1. Laboratory reports are presented in Annex-5.

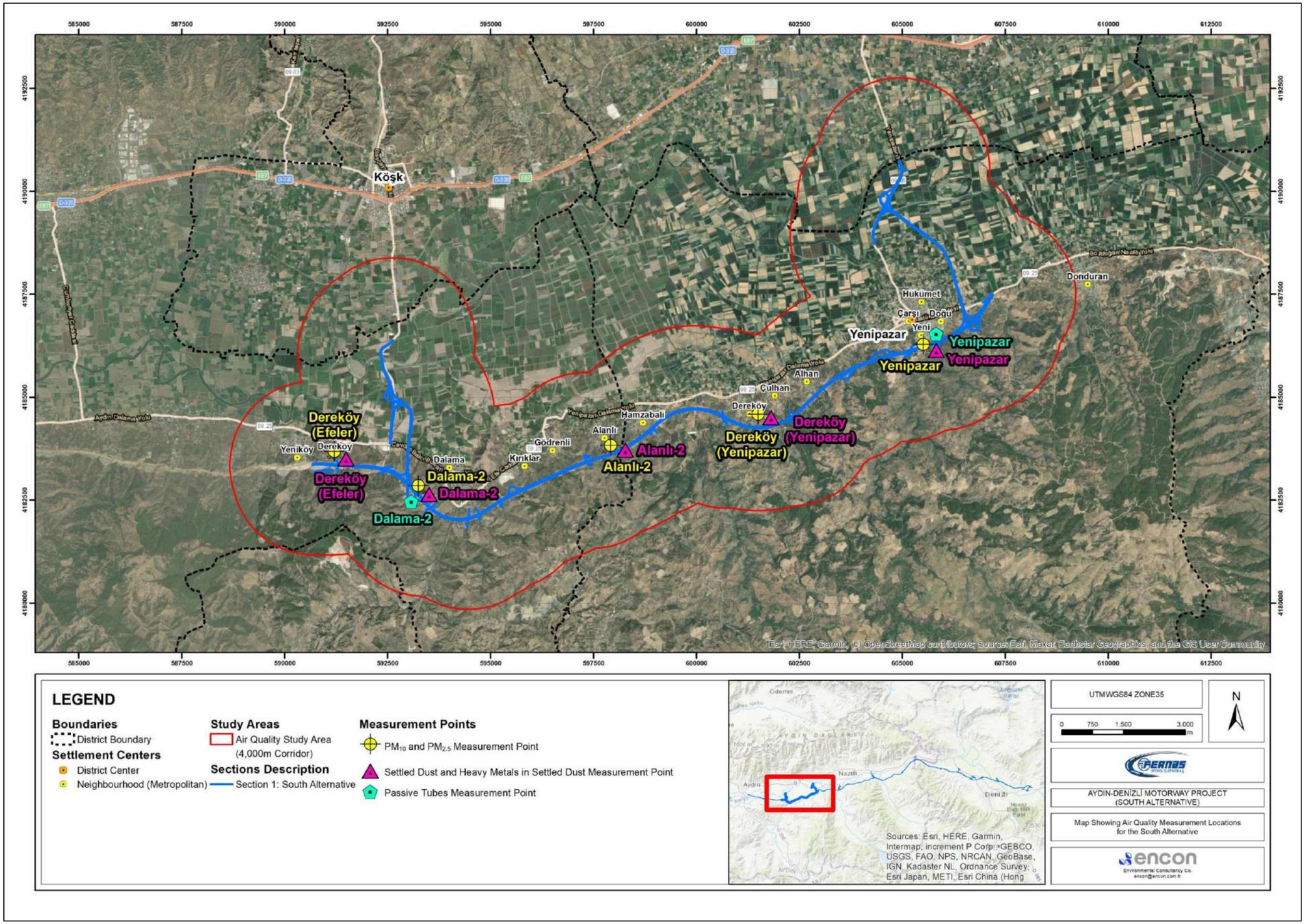


Figure 10.2 Map Showing Air Quality Measurement Locations for South Alternative

In August 2023, 24-hour measurements of PM_{10} and heavy metals in PM_{10} conducted at 5 measurement points. The results of PM_{10} and heavy metal in PM_{10} measurements are presented in Table 10.6 and Table 10.7, respectively. In the measurement results, it is observed that PM_{10} concentration exceeded the limit values defined in the Air Quality Assessment and Management Regulation at all points. Exceedances in these measurements were detected during the short-term peak period when construction works were ongoing together with Aydın Denizli Motorway and South Alternative.

Table 10.6 Results of PM_{10} Measurements (August 2023)

District	Coordinates	PM_{10} Results (µg/m³)
Alanlı-2	597914/4183834	457.43
Dereköy	591203/4183693	134.02
Dereköy (Yenipazar)	601492/4184590	77.77
Yenipazar	605505/4186287	186.54
Dalama-2	593238/4182857	348.13

Table 10.7 Results of Heavy Metals in PM_{10} Measurements (August 2023)

District	Heavy Metals in PM_{10}		
	Cadmium (mg/kg)	Lead (mg/kg)	Thallium (mg/kg)
Alanlı-2	<0.02	0.110	<0.02
Dereköy	<0.02	0.094	<0.02
Dereköy (Yenipazar)	<0.02	0.102	<0.02
Yenipazar	<0.02	0.094	<0.02
Dalama-2	<0.02	0.126	<0.02

Results of settled dust measurements conducted at 5 measurement points in August 2023 are presented in Table 10.8.

Table 10.8 Results of Settled Dust Measurements (September 2023)

District	Coordinates	Settled Dust Measurement Results ($mg/m^2.day$)
Alanlı-2	597914/4183834	181.25
Dereköy	591203/4183693	321.32
Yenipazar	605505/4186287	1,097.79
Dereköy (Yenipazar)	601492/4184590	139.15
Dalama-2	593238/4182857	721.51

Results of PM2.5 measurements conducted at 5 measurement points in August 2023 are presented in Table 10.9. It is observed that all of the values are over the limit values stated in the IFC General EHS Guidelines: Air Emissions and Ambient Air Quality.

Table 10.9 Results of $PM_{2.5}$ Measurements (August 2023)

District	Coordinates	$PM_{2.5}$ Results (µg/m³)
Alanlı-2	0597914/4183834	186.82
Dereköy	0591203/4183693	86.21
Yenipazar	605505/4186287	85.19
Dereköy (Yenipazar)	601492/4184590	48.21
Dalama-2	593238/4182857	235.55

In addition to PM_{10}, $PM_{2.5}$ and settled dust measurements, other parameters measured within the scope of baseline studies were SO_2, NO_2, VOC and Benzene. Passive sampling for these parameters was conducted for one month period between 07.08.2023 and 07.09.2023 at 2 measurement points. Results of these measurements are provided in Table 10.10

Table 10.10 Results of Passive Measurements (Aug 07 – Sep 07)

Parameters	1.Location/Türkiye (Yenipazar)	2.Location/Türkiye (Dalama-2)
Nitrogen Dioxide (µg/m³)	18.61	25.17
Sulphur Dioxide (µg/m³)	98.05	179.0
VOC (µg/m³)	<0.16	<0.16
Benzene (µg/m³)	<0.16	<0.16

10.1.3 Potential Impacts

Emissions during motorway construction will consist of dust emissions and emissions from construction machinery and equipment which will include mostly the same pollutants of concern. During the operation of the motorway, similar to the other combustion processes, emissions from vehicles include CO, NOx, SO2, PM and VOCs (IFC General Health and Safety Guidelines on Air Emissions and Ambient Air Quality). Within this context, main air pollutants of concern regarding the motorway project are described below:

Particulate Matter (PM)

PM stands for particulate matter (also called particle pollution): the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be seen. Others can only be detected using an electron microscope. Particulate matter includes PM_{10} inhalable particles, with diameters that are generally 10 micrometers and smaller; and $PM_{2.5}$; fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller *(https://www.epa.gov/pm-pollution).*

Particulate matter come in many sizes and shapes and can be made up of hundreds of different chemicals. Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires. Most particles form in the atmosphere as a result of complex reactions of other pollutants such as sulfur dioxide and nitrogen oxides.

Once inhaled, these particles can affect the heart and lungs and cause serious health effects. Particles less than 10 micrometers in diameter pose the greatest problems, because they can get deep into lungs, and some may even get into the bloodstream.

Particles can vary according to size and composition. PM_{10} (particulate matter with aerodynamic diameter smaller than 10 µm) standard is set to define the particles that people are likely to inhale and PM_{10} has become the general measure of particulate matter.

Carbon monoxide (CO)

Carbon monoxide (CO) is a colorless, odorless gas that can be harmful when inhaled in large amounts. It is formed both naturally and human activities such as in complete burning of fossil fuels, and it is important to note that natural processes produce relatively small amounts of CO when compared to anthropogenic sources. Main sources of CO in outdoor air can be accepted as cars, trucks and other vehicles and machinery that burn fossil fuels. Therefore, it can be said that CO levels in urban areas is closely related with traffic density. Other anthropogenic sources of the pollutant are power stations and waste incinerators.

Human inhalation of air with high CO concentration is known to reduce the amount of oxygen carrying capacity of blood stream as CO is rapidly absorbed by blood. Very high levels are generally associated with indoor pollution however; significant health problems for vulnerable individuals can be observed when CO levels are elevated outdoors.

CO is considered as a relatively stable compound and takes part slowly in atmospheric chemical reactions. CO reacts with other pollutants in air to form ozone. This forms ground level ozone which does not have significant environmental impacts at a global level. On the other hand, CO contributes indirectly to greenhouse effect by depleting hydroxyl radicals and slowing destruction of methane.

Sulfur Dioxide (SO_2)

Sulfur Dioxide (SO_2) is one of a group of gases called sulfur oxides (SO_x). While all of these gases are harmful to human health and the environment, (SO_2) is of greater concern. Other gaseous SO_x (such as SO_3) are found in the atmosphere at concentrations much lower than (SO_2). The largest sources of (SO_2) emissions are from fossil fuel combustion at power plants and other industrial facilities. Smaller sources of (SO_2) emissions include: industrial processes such as extracting metal from ore; natural sources such as volcanoes; and transportation via locomotives, ships and other vehicles and heavy equipment that burn fuel with high sulfur content.

SO_2 can affect both health and the environment. Short-term exposures to SO_2 can harm the human respiratory system and make breathing difficult. Children, the elderly, and those who suffer from asthma are particularly sensitive to effects of SO_2.

SO_2 emissions that lead to high concentrations of pollutants in the air generally also lead to the formation of other sulfur oxides (SOx). SOx can react with other compounds in the atmosphere to form small particles. These particles contribute to particulate matter (PM) pollution: and cause additional health problems and reduce visibility (haze). Deposition of particles can also damage stone and other materials, including culturally important objects. In addition, at high concentrations, gaseous SO_x can harm trees and plants by damaging foliage and decreasing growth. SO_2 and other sulfur oxides can contribute to acid rain which can harm sensitive ecosystems *(https://www.epa.gov/so2-pollution).*

Nitrogen Dioxide (NO_2)

Nitrogen Dioxide (NO_2) is one of a group of highly reactive gases called nitrogen oxides (NO_x). While all of these gases are harmful to human health and the environment, NO_2 is of greater concern. Other nitrogen oxides include nitrous acid and nitric acid. NO_2 primarily gets in the air from the burning of fuel. NO_2 forms from emissions from cars, trucks and buses, power plants, and off-road equipment.

Breathing air with a high concentration of NO_2 can irritate airways in respiratory system. Such exposures over short periods can cause respiratory diseases such as asthma, leading to respiratory symptoms such as coughing, or difficulty in breathing. Longer exposures to elevated concentrations of NO_2 may contribute to the development of serious health problems. NO_2 reacts with other chemicals in

the air to form both particulate matter and ozone. Both of these are also harmful when inhaled due to effects on the respiratory system *(https://www.epa.gov/no2-pollution).*

NO_2 and other NO_x interact with water, oxygen and other chemicals in the atmosphere to form acid rain. Acid rain harms sensitive ecosystems such as lakes and forests. The nitrate particles that result from NO_x make the air hazy and decrease visibility. In addition, NO_x in the atmosphere contributes to nutrient pollution in coastal waters.

Volatile Organic Compounds (VOCs)

VOCs are organic compounds containing one or more carbon atoms that have high vapor pressures and therefore evaporate readily to the atmosphere. There are thousands of compounds that meet this definition. VOCs play a significant role in the formation of ozone and fine particulates in the atmosphere. Under sunlight, VOCs react with nitrogen oxides emitted mainly from vehicles, power plants and industrial activities to form ozone, which in turn helps the formation of fine particulates. The accumulation of ozone, fine particulates and other gaseous pollutants results in smog that reduces visibility. Smog is particularly severe under stagnant weather conditions.

Smog can irritate eyes, nose and throat, or can worsen existing heart and respiratory problems such as asthma. People with heart and lung problems, the elderly and children whose respiratory systems are still developing are most at risk. Prolonged exposure to severe smog condition may cause permanent damage to lung tissue and affects the human immune system. In addition, smog impairs visibility
(http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/vocs_smog.html).

Abovementioned pollutants are expected to be emitted during land preparation, construction and operation phases of the motorway project. In order to determine the potential impacts of project emissions on air quality, the sources of pollutants are clearly defined and amounts of pollutants emitted from each source are quantified. Sources and amounts of project emissions are described in detail for land preparation and construction and operation phases of the Project separately in the following parts. Air quality modeling results are presented accordingly.

10.1.3.1 Land Preparation and Construction Phase

Project construction activities are expected to result in dust emissions during land preparation, cut-fill operations and activities of quarries operated in the scope of the Project. In addition, exhaust emissions such as PM_{10}, NO_x, CO, SO_2, VOC, benzene, NH_3 and N_2O are also expected. Asphalt plants and concrete plants are considered as other emission sources of construction activities. Camp sites, concrete plants, asphalt plants, mechanical plants and quarries/material borrow sites to be operated during the construction phase are presented in Figure 10.3.

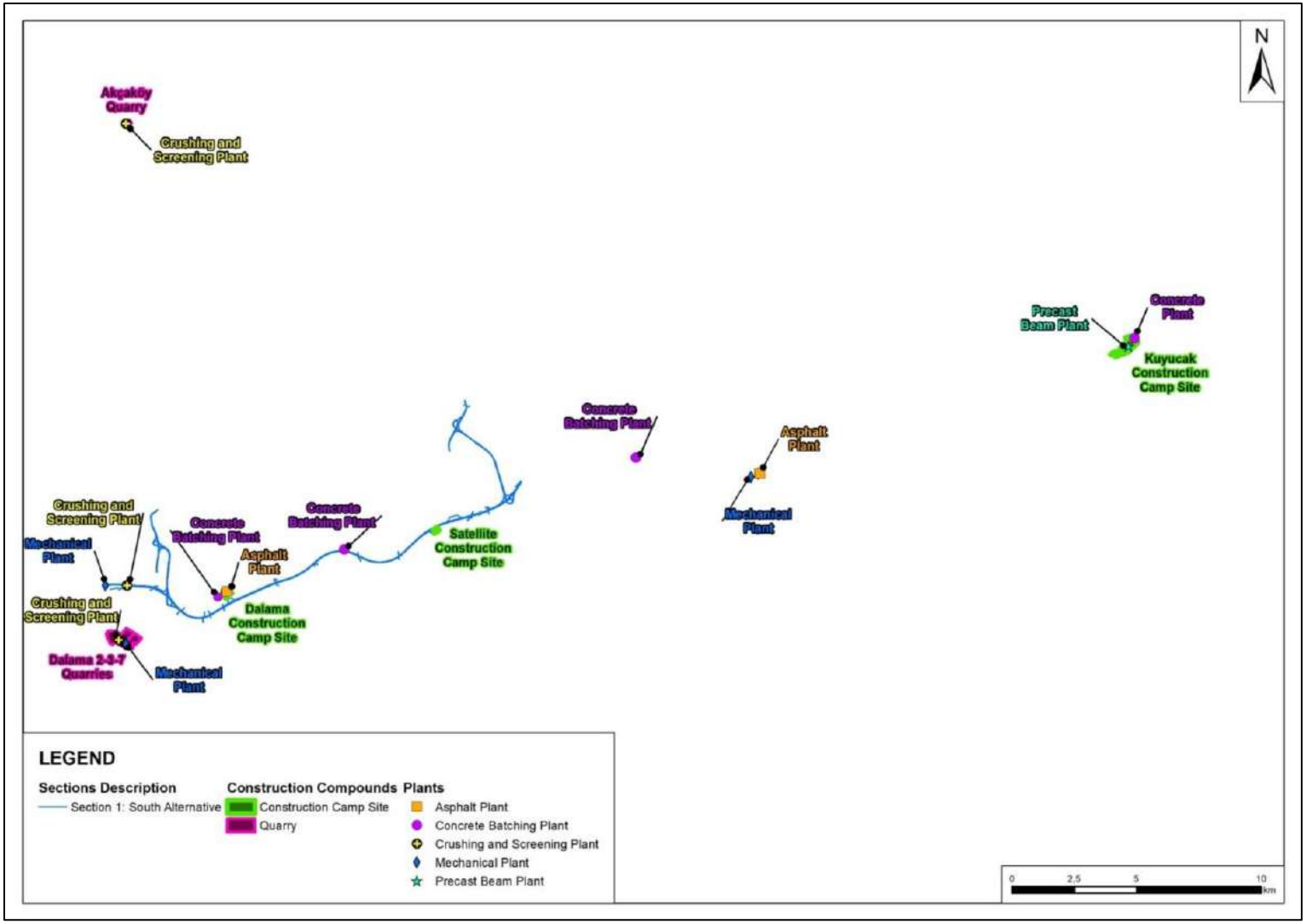


Figure 10.3 Locations of Camp Sites, Asphalt, Concrete and Mechanical Plants, Quarries

According to the project schedule, it is planned that the construction of the ADMP so that, South Alternative will take at most three years. Within this scope, top-soil stripping will be followed by excavation, fill and leveling. Next, bridges, underpass and overpass bridges, culverts and viaducts, will be established accordingly.

In the scope of road construction works, excavated materials are planned to be used in the fill operations wherever the properties and the quality of the materials are suitable. When there is a surplus of excavated materials, excess material will need to be stored at designated storage areas. If there is a need for supply of construction material, it will be supplied from nearby licensed quarries.

Materials will be supplied from four different quarries. Detailed information about these quarries is given in Table 10.11. Material requirement will be fulfilled from quarries currently in operation.

Table 10.11 Details about the Quarries

Location	Location			Description of the Site/Plant	Area (ha)	Capacity Information (tonnes/year)
	Province	District	Nearest Neighborhood			
Km 20+000	Aydın	Efeler	Dalama	Dalama 2 Quarry	24.68	1,560,000
Km 20+000	Aydın	Efeler	Dalama	Dalama 3 Quarry	20.79	1,593,800
Km 20+000	Aydın	Efeler	Dalama	Dalama 7 Quarry	24.88	1,560,000
Km 21+000	Aydın	Akçaköy	Akçaköy	Akçaköy Quarry	4.20	332,800

Emission factors defined in Industrial Air Pollution Control Regulation will be used to calculate the dust emissions from excavation and fill operations. These emission factors are presented in Table 10.12. Uncontrolled emission factors represent the case in which the activities are performed without any measures taken, while controlled emission factors represent the case when measures such as watering, usage of closed transportation systems, keeping the material moisturized and performing loading and unloading of materials without scattering are taken. For detailed calculations of the the dust emissions, please refer to the Annex-11 Air Quality Modeling Report.

Table 10.12 Emission Factors Used to Calculate Dust Emissions

Sources	Emission Factors		Unit
	Uncontrolled	Controlled	
Excavation	0.025	0.0125	kg/ton
Loading	0.010	0.005	
Unloading	0.010	0.005	
Primary Crusher	0.243	0.0243	
Secondary Crusher	0.585	0.0585	
Tertiary Crusher	0.585	0.0585	
Transportation (round-trip total distance)	0.7	0.35	kg/km-vehicle
Storage	5.8	2.9	kg dust/ha.day

Source: Industrial Air Pollution Control Regulation, Annex-12

Material extracted from quarries will be transferred to crushers located near quarries. According to the Technical Specifications of KGM, crushers should be operated in closed environments and equipped with dust suppression systems. As stated above, excess material from excavation will be stored at designated storage areas. Location and capacities of storage areas are presented in Table 10.13.

Table 10.13 Storage Areas

Location	Location			Description of the Site	Area (ha)	Storage Capacity (m^3)
	Province	District	Nearest Neighborhood			
Km: 20+000	Aydın	Efeler	Kırıklar	Kırıklar Storage Site	37	1,500,000
Km: 37+500	Aydın	Yenipazar	Direcik	Direcik Storage Site	21	3,000,000
TOTAL					**58**	**4,500,000**

Asphalt plants and concrete plants are other sources of emissions during construction phase of the motorway. Location of these facilities can be seen in Figure 10.3. There will be two asphalt plants operated in construction of the motorway, both of them having a capacity of 340 tonnes/hour. Number of concrete plants to be established is three with each having 90 m3/hour production capacities. In addition, one precast beam plant will be continued to be used. The capacity of the precast beam plant is 90 m3/hour.

In addition to dust emissions, exhaust gases will be emitted from operation of construction equipment and machinery.

Air Quality Modeling for Land Preparation and Construction Phase

In order to evaluate the potential impacts of Project's construction activities, air quality modeling was carried out for PM_{10} and settled dust parameters. The Air Quality Modeling Report is presented in Annex-11. Within this scope, daily and annually PM_{10} concentrations and settled dust amounts are determined and compared with air quality limit values defined in Regulation on Assessment and Management of Air Quality and IFC standards (see Table 10.1 and Table 10.2).

For each pollutant, modeling studies were carried out under 1 scenario and the possible effects of pollutant sources on local air quality were examined in accordance with each scenario.

According to the determined scenarios for construction phase, the ground level concentration (GLC) values of the settled dust and PM_{10} that will form near the existing facilities are shown in Table 10.14. Also, maximum annually emission distribution maps of PM_{10} and settled dust originated from cumulative activities are presented in Figure 10.4, and Figure 10.5.

Table 10.14 Results of ground-level PM_{10} and settled dust concentrations observed in different scenarios

Scenarios	Highest Pollutant Results				
	PM_{10}			Settled Dust	
	Daily Concentration Value (36th value) ($\mu g/m^3$)	Number of Overruns	Highest Annually Concentration Value ($\mu g/m^3$)	Maximum Daily Settled Dust ($mg/m^2/day$)	Maximum Annually Settled Dust ($mg/m^2/day$)
Scenario 1	10.53 (594672, 4182904)	2	6.67 (605494, 4186306)	27.02 (595672, 4182904)	4.51 (595672, 4183404)
IAPCR Limit Values	50	not exceeded more than 35 times in a year	40	390	210

According to Table 10.15, the cumulative daily 36th value and the annual highest value for PM_{10} covering the South Alternative are 10.53 µg/m^3 and 6.67 µg/m^3, respectively, which is considerably smaller than the limit values in IAPCR.

In the cumulative scenario covering the South Alternative the daily and annual settled dust amount is 27.02 mg/m^2.day and 4.51 mg/m^2.day, respectively, which is considerably smaller than the limit values found in IAPCR. This scenario complies with the regulation, with 2 exceedances occurring per year at the maximum daily concentration of 102.87 µg/m^3.

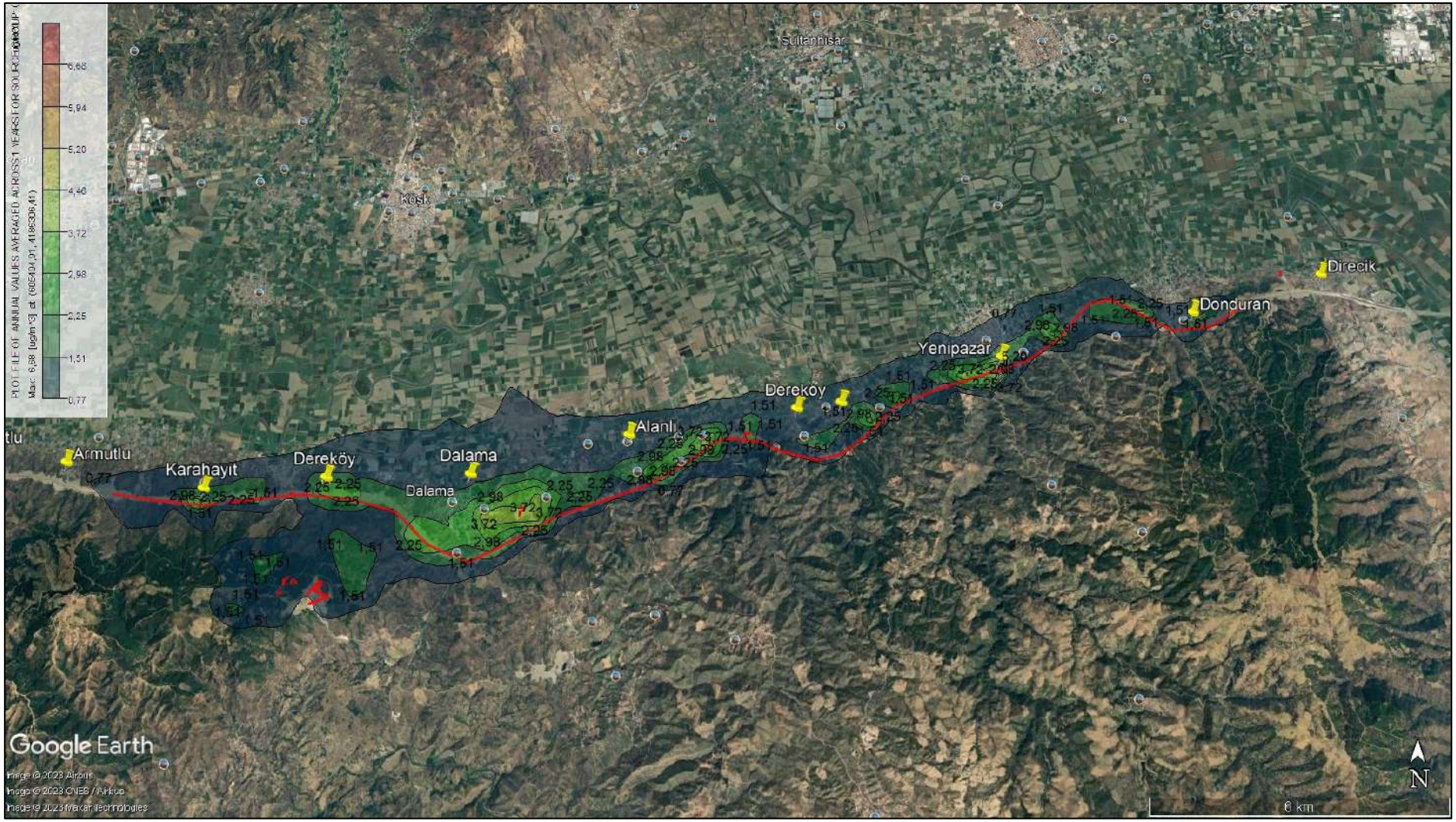


Figure 10.4 Maximum annual PM_{10} emission distribution ($\mu g/m^3$)

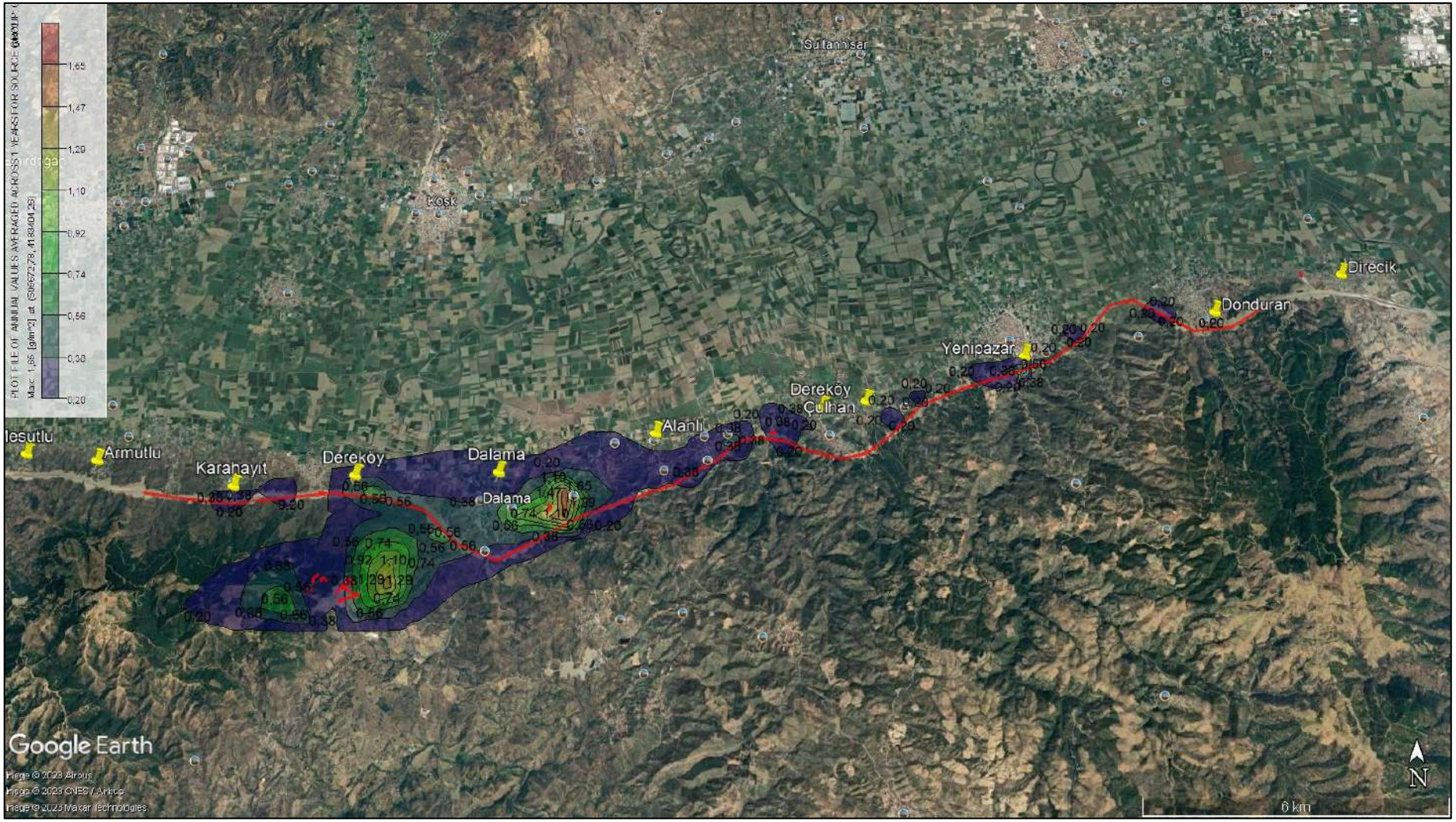


Figure 10.5 Maximum annual settled dust emission distribution (µg/m^3)

As a result, since the PM10 concentration values and the settled dust amounts to be formed around the project are lower than the limit values specified in the regulation, the settled dust and PM10 emissions from the project are not expected to have any adverse impact on the air quality of the region.

In addition, as mentioned before, background measurements representing the air quality in various areas in the region were carried out, and the total air quality contribution values of the project with these measurements were calculated in Table 10.15, Table 10.16. The model results calculated at the measurement points are below the limit values, as seen in Table 10.15 and Table 10.16. The effect of cumulative emissions of the project for the identified sensitive receptors is insignificant.

As seen in Table 10.15, the highest contribution of the project to air pollution for PM_{10} in these areas was calculated for Karahayıt with 50.4%. The contribution margin does not exceed 15% when all measurement points are considered, except for a few points. Since the project's construction phase will be completed in the short term, it is not expected that the air quality at these points will deteriorate in the long term. As seen in Table 10.16, the highest contribution of the project to air pollution for settled dust in these areas was calculated for Yenipazar with 5.15%. When all measurement points are considered, the contribution is low. Therefore, it is not expected that the air quality at these points will deteriorate in the long term.

Table 10.15 Cumulative Impact Assessment with Maximum PM_{10} GLC Values Measurement Points

Measurement Points	PM_{10} Background Measurement Results ($\mu g/m^3$)	Scenario 1 Max Daily Result (µg/m3)	The Effect Of The Project On The Air Quality Of The Region (%)
Direcik	34.56	2.40	6.49
Alanlı	38.00	11.29	17.2
Dereköy	43.12	40.91	48.6
Yenipazar	26.98	11.60	50.1
Donduran	39.45	6.08	13.4
Karahayıt	19.79	20.11	50.4
Mesutlu	57.59	3.06	5.01
Armutlu	40.06	7.45	15.7
Dalama	62.15	22.27	26.4

Table 10.16 Cumulative Impact Assessment with Maximum settled dust GLC Values Measurement Points

Measurement Points	Settled Dust Background Measurement Results (mg/m2.day)	Scenario 1 Max Daily Result (mg/m2.day)	The Effect Of The Project On The Air Quality Of The Region (%)
Direcik	54.57	0.88	1.59
Donduran	61.01	1.05	1.69
Yenipazar	64.63	3.51	5.15
Çulhan	59.31	1.10	1.82
Alanlı	64.21	2.08	3.14
Dalama	57.29	2.95	4.90
Dereköy	70.83	1.53	2.11
Karahayıt	68.55	3.28	4.57
Armutlu	64.67	1.00	1.52

The modeling results obtained according to the emission amounts of the existing facilities in the impact area of the project, the emission amounts to be caused by the project, the hourly meteorological data observed, and the topography are summarized below:

- Daily and annual limit values for PM_{10} emissions in IAPCR are 50 µg/m^3 and 40 µg/m^3, respectively. In all the scenarios studies, results comply with limit values. The cumulative daily 36th value and the annual highest value for PM_{10} are 10.53 µg/m^3 and 6.67 µg/m^3, which is considerably smaller than the limit values found in IAPCR. In addition, it is stated in IAPCR that limit values cannot be exceeded more than 35 times a year. This scenario complies with the regulation, with 2 exceedances occurring per year at the maximum daily concentration of 102.87 µg/m3 .
- The daily and annual settling dust limit values in IAPCR were defined as 390 and 210 mg/m^2. day, respectively. In the scenario covering the south alternative of the project, the daily and annual settled dust amount is 27.02 mg/m^2.day and 4.51 mg/m^2.day, respectively, which is considerably smaller than the limit values found in IAPCR.

Consequently, when all scenarios are examined, it is seen that the construction of the project does not make a difference for PM_{10} and settled dust emission in terms of annual air quality in the region.

10.1.3.2 Operation Phase

Main pollutants expected to be generated during the operation of the motorway will include NO_x, PM_{10}, CO, VOCs and SO_2. In order to quantify the amounts of emissions generated during motorway operation, traffic forecast provided in the Feasibility Report prepared for the Aydın-Denizli Motorway Project were used. In order to represent the worst case scenario, traffic projections for 2041 are considered (highest traffic flow data) (see Table 10.17).

Table 10.17 Traffic Projections for 2041

Motorway Section	Description	Number of Vehicles						Heavy Vehicle Percentage (%)
		Car + Motor (LV)	Light Commercial Vehicle (HV)	Bus (HV)	Truck (HV)	Truck + Trailer (HV)	Total	
Section 1	Aydın-Kuyucak	14,023	1,592	265	1,200	1,445	18,525	24.30
Section 2	Kuyucak-Denizli	9,207	1,034	209	978	1,700	13,128	29.87

LV: Light Vehicle, HV: Heavy Vehicle

Emission calculations for different types of vehicles including petroleum fueled car, diesel cars and LPG cars, and various types of heavy vehicles were calculated. For detailed calculations of the emissions caused by each type of vehicle, please refer to the Annex-11 Air Quality Modeling Report.

Limit values above which air quality modeling should be performed are defined in Industrial Air Pollution Control Regulation. Emissions to be calculated for the worst case scenario were compared with the limit values for non-stack sources defined by the Industrial Air Pollution Control Regulation. And, the air quality modeling for operation phase was made.

Air Quality Modeling for Operation Phase

Modeling studies were carried out for NO2, TVOC, CO parameters, and each pollutant under different scenarios and the possible effects of pollutant sources on local air quality were examined in accordance with each scenario.

The GLC values of NO_2 for the determined scenarios are shown in Table 10.19. NO_2 distributions according to the determined scenarios are shown between Figure 10.6 and Figure 10.9.

According to Table 10.18, the hourly 19th value and the annual highest value for NO_2 covering the first section of the project are 190.29 µg/m^3 and 34.93 µg/m^3 respectively, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 15 exceedances occur per year and this scenario complies with the regulation.

The hourly 19th value and the annual highest value for NO_2 covering the second section of the project are 183.29 µg/m^3 and 17.33 µg/m^3 respectively, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 7 exceedances occur per year and this scenario complies with the regulation.

As a result, since the NO_2 concentration values to be formed around the project are lower than the limit values specified in the regulation, NO_2 emissions are not expected to have any adverse impact on the environment.

Table 10.18 Results of ground-level NO_2 concentrations observed in different scenarios

Scenario	**Highest Results NO_2**		
	Maximum Hourly Concentration (19th value) (µg/m^3)	**Number of Overruns**	**Maximum Annually Concentration (µg/m^3)**
Scenario 1	190.29 (580726, 4183808)	15	34.93 (606772, 4186731)
Scenario 4	183.29 (636529, 4191779)	7	17.33 (654800, 4200475)
Limit Value	200	Not exceeded more than 18 times in a year	40

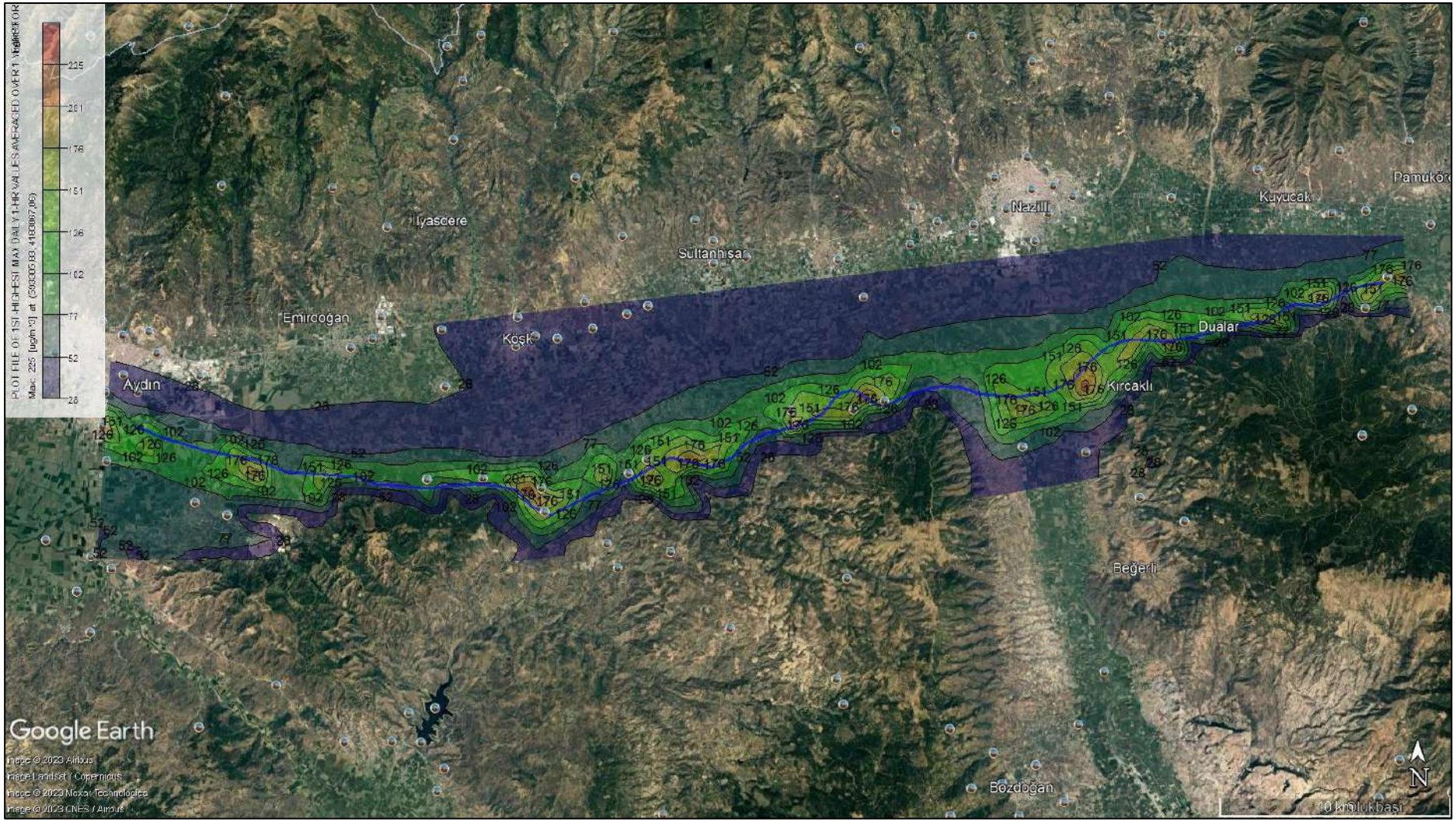


Figure 10.6. Maximum hourly NO_2 emission distribution Section 1 ($\mu g/m^3$)

Figure 10.7 Maximum annual NO_2 emission distribution Section 2 (µg/m^3)

Figure 10.8 Maximum hourly NO_2 emission distributions for Section 1 (µg/m^3)

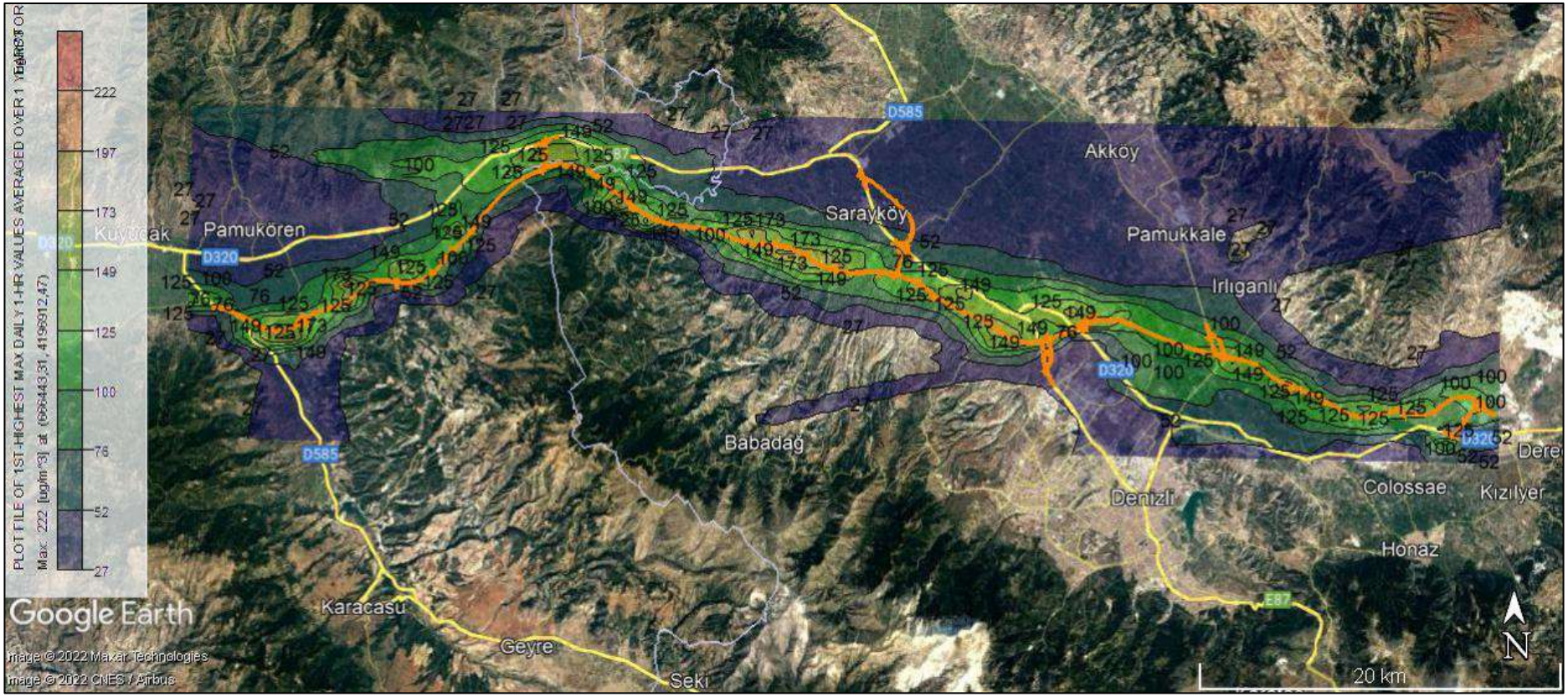


Figure 10.9 Maximum annual NO_2 emission distribution for Section 2 (µg/m^3)

In addition, as mentioned before, background measurements representing the air quality in various areas in the region were carried out, and the total air quality contribution values of the project with these measurements were calculated in Table 10.19. As seen in Table 10.19, the project remains below the limit value at the measurement points and there are no points except Gerali where the hourly limit value is exceeded. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In Dalama-2, 18 exceedances occur per year and this scenario complies with the regulation. Consequently, the effect of the project 's emissions for the identified sensitive receptors is insignificant.

Table 10.19 Impact Assessment with Maximum NO_2 GLC Values-Measurement Points

Measurement Points	NO_2 Background Measurement Results (µg/M^3)	Scenario 4 Max Hourly Result (µg/m^3)	Effect Of The Project On The Air Quality Of The Region Scenario 1 Total Pollution Values(µg/m^3)	Number Of Overruns
Dalama-2	25.17	225.44	250.61	18
Yenipazar	18.61	196.76	215.37	7
Kumkısığı	18.15	122.81	140.96	0
Denizli	19.32	28.78	48.10	0
Beylerbeyi	19.24	100.28	119.25	0
Duacılı	20.13	63.39	83.25	0
Sarayköy	21.05	40.85	61.90	0
Gerali	20.17	214.36	234.53	13
Kabaağaç	19.63	167.14	186.77	0
Savcılı	19.38	90.58	109.96	0
Buharkent	20.10	151.67	171.77	0
Bucakköy	18.88	26.75	45.63	0
Çamdibi	19.42	62.24	81.66	0

The GLC values of CO for the determined scenarios are shown in Table 10.20. CO distributions according to the determined scenarios are shown in Figure 10.10 and Figure 10.11.

According to Table 10.20, the 8-hour average value for CO covering the first section of the project is 175.33 µg/m^3, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded the limit value. In this scenario, there are no exceedances that occur per year and this scenario complies with the regulation.

According to Table 10.20, the 8-hour average value for CO covering the second section of the project is 136.18 µg/m^3, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded the limit value. In this scenario, there are no exceedances per year and this scenario complies with the regulation.

Table 10.20 Results of ground-level CO concentrations observed in different scenarios

Scenario	Coordinates		CO Highest Daily 8-Hour Average (µg/m^3)
	X	Y	
Scenario 2	588608	4183182	175.33
Scenario 5	637966	4193040	136.18
Limit Values			10000

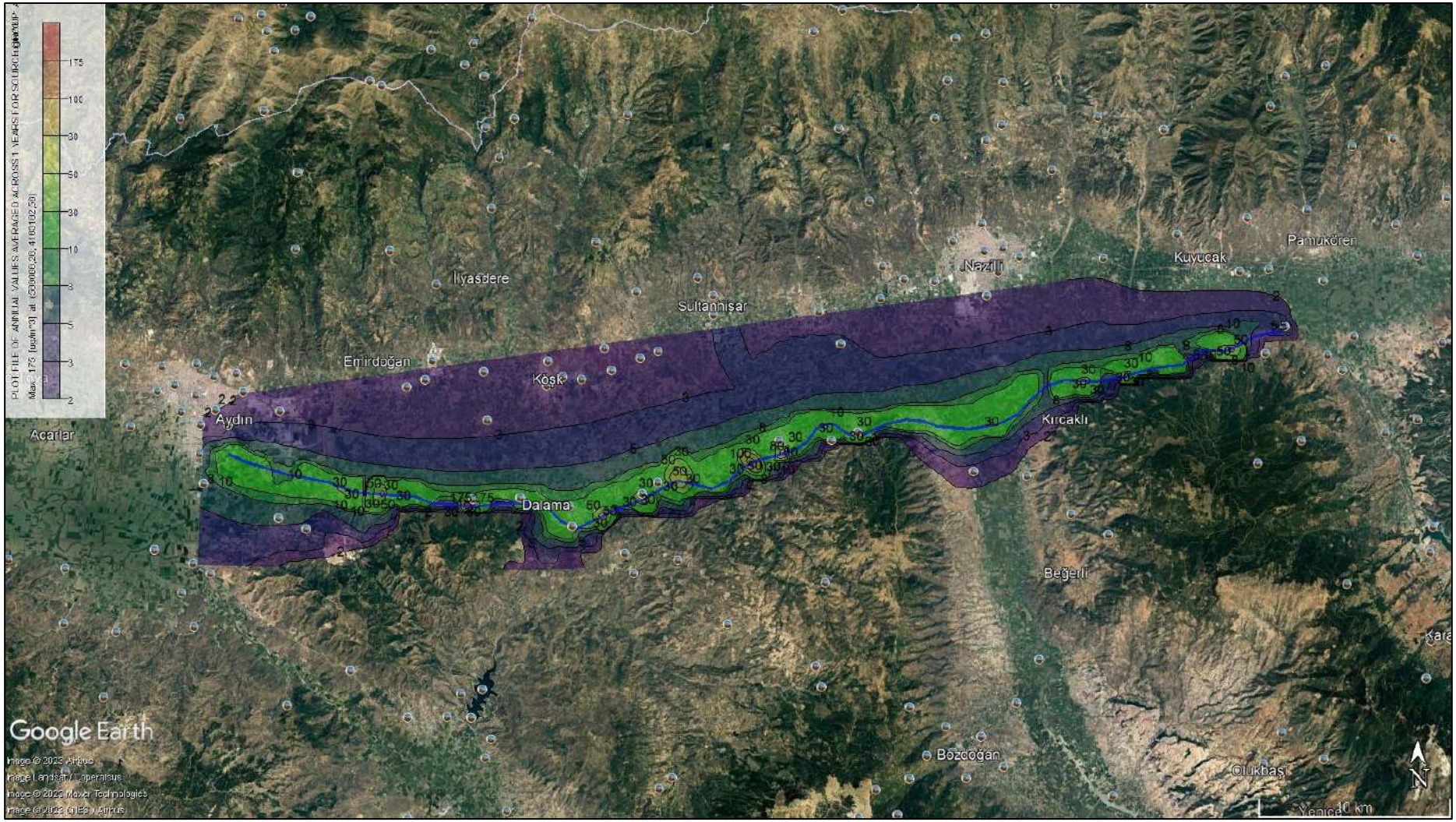


Figure 10.10 Maximum 8-hour CO emission distribution Section 1 (µg/m^3)

Figure 10.11 Maximum 8-hour CO emission distribution Section 2 (µg/m^3)

The GLC values of TVOC for the determined scenarios are shown in Table 10.21. TVOC distributions according to the determined scenarios are shown between Figure 10.12 and Figure 10.15.

According to Table 10.21, the hourly maximum value and the daily highest value for TVOC covering the first section of the project are 68.36 µg/m^3 and 27.27 µg/m^3, respectively, which is considerably smaller than the limit values found in IAPCR.

The hourly maximum value and the daily highest value for TVOC covering the second section of the project are 80.20 µg/m^3 and 16.22 µg/m^3, respectively, which is considerably smaller than the limit values found in IAPCR. As a result, since the TVOC concentration values to be formed around the project are lower than the limit values specified in the regulation, TVOC emissions are not expected to have any adverse impact on the environment.

Table 10.21 Ground-level TVOC concentration results observed in different scenarios

Scenario	Highest Results TVOC	
	Maximum Hourly Concentration (µg/m^3)	Maximum Daily Concentration (µg/m^3)
Scenario 3	68.36 (606772, 4186731)	27.27 (609680, 4187391)
Scenario 6	80.20 (637852, 4192943)	16.22 (683802, 4193520)
Limit Values	280	70

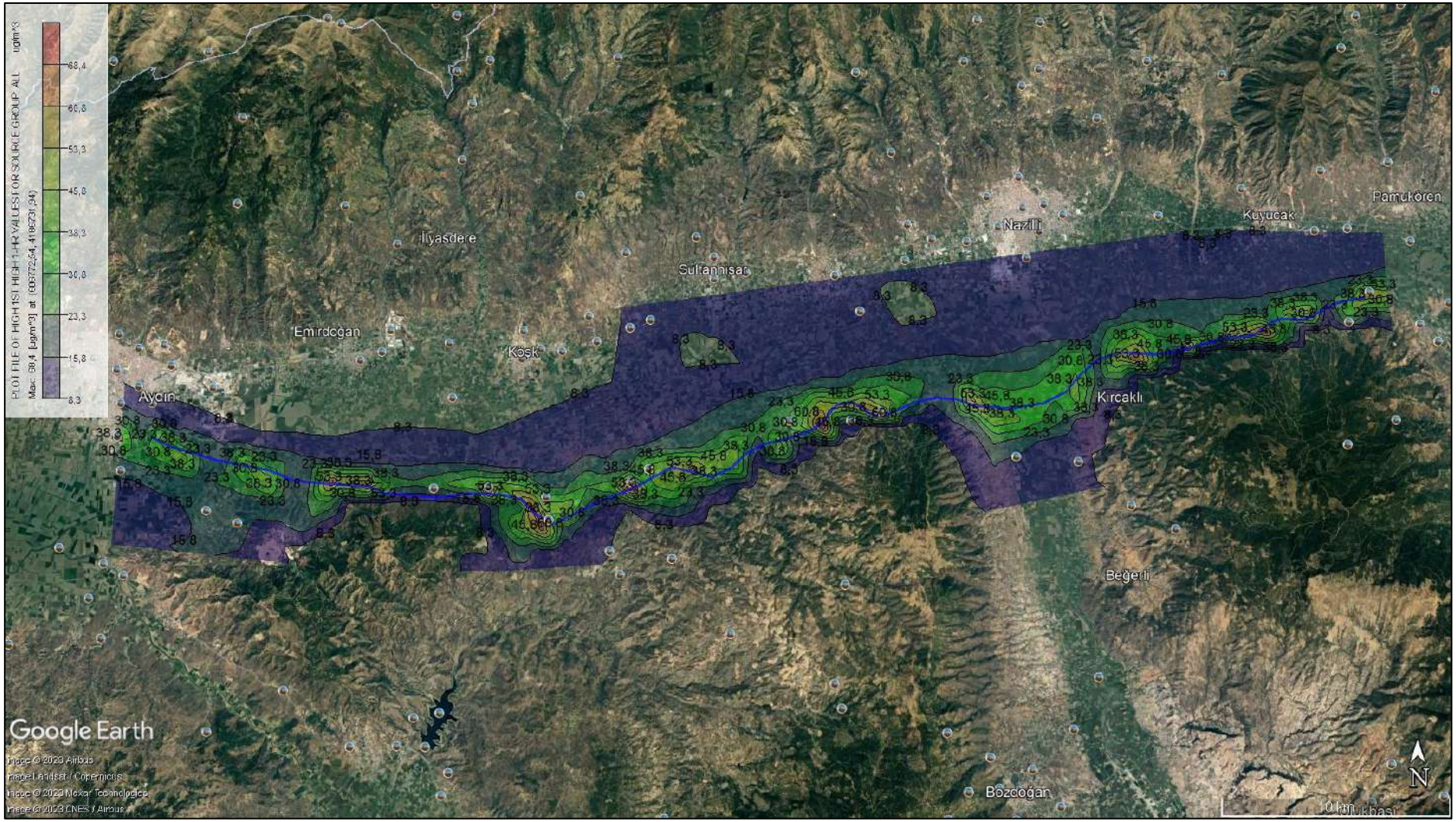


Figure 10.12 Maximum hourly TVOC emission distribution Section 1 (µg/m^3)

Figure 10.13 Maximum daily TVOC emission distribution Section 1(µg/m^3)

Figure 10.14 Maximum hourly TVOC emission distribution Section 2 (µg/m^3)

Figure 10.15 Maximum daily TVOC emission distribution Section 2(µg/m^3)

In addition, as mentioned before, background measurements representing the air quality in various areas in the region were carried out, and the total air quality contribution values of the project with these measurements were calculated in Table 10.22. As seen in Table 10.22, the project remains below the limit value at the measurement points and there are no points where the hourly limit value is exceeded. Consequently, the effect of the project's TVOC emissions for the identified sensitive receptors is insignificant.

Table 10.22 Impact Assessment with Maximum TVOC GLC Values-Measurement Points

Measurement Points	TVOC Background Measurement Results (µg/m3)	Scenario 6 Max Hourly Result (µg/ m3)	Effect Of The Project On The Air Quality Of The Region Scenario 1 Total Pollution Values (µg/ m3)	Number Of Overruns
Yenipazar	0.16	1.64	1.80	0
Dalama2	0.16	38.35	38.51	0
Kumkısığı	0.221	27.27	27.491	0
Denizli	0.17	5.50	5.67	0
Beylerbeyi	0.579	27.66	28.239	0
Duacılı	0.236	13.90	14.136	0
Sarayköy	0.314	8.21	8.524	0
Gerali	0.21	49.74	49.95	0
Kabaağaç	0.213	33.47	33.683	0
Savcılı	0.491	18.15	18.641	0
Buharkent	0.307	30.60	30.907	0
Bucakköy	0.428	4.74	5.168	0
Çamdibi	0.307	10.43	10.737	0

- Hourly and annual limit values for NO_2 emissions in IAPCR are 200 µg/m3 and 40 µg/m3, respectively. In all the scenarios studies, results comply with limit values. The hourly 19h value and the annual highest value for NO_2 covering the first section of the project are 190.29 µg/m3 and 34.93 µg/m3, respectively, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 15 exceedances occur per year and this scenario complies with the regulation. The hourly 19h value and the annual highest value for NO_2 covering the second section of the project are 183.29µg/m3 and 17.33 µg/m3, respectively, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 7 exceedances occur per year and this scenario complies with the regulation.
- The 8-hour average CO limit values in IAPCR are defined as 10000 µg/m3. The 8-hour average value for CO covering the first section of the project is 175.33 µg/m3, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded the limit value. The 8-hour average value for CO covering the second section of the project is 136.18 µg/m3, which is considerably smaller than the limit values found in IAPCR. As stated in the IAPCR Limit Value, the hourly limit value cannot be exceeded the limit value. In both scenarios, there are no exceedances per year and this scenario complies with the regulation.
- Hourly and daily limit values for TVOC emissions in IAPCR are 280 µg/m3 and 70 µg/m3, respectively. In all the scenarios studies, results comply with limit values. The hourly maximum value and the daily highest value for TVOC covering the first section of the project are 68.36 µg/m3 and 27.27 µg/m3, respectively, which is considerably smaller than the limit values found in IAPCR. The hourly maximum value and the daily highest value for TVOC covering the first section of the project are 80.20 µg/m3 and 16.22 µg/m3, respectively, which is considerably smaller than the limit values found in IAPCR. As a result, since the TVOC concentration values to be formed around the project are lower than the limit values specified in the regulation, TVOC emissions are not expected to have any adverse impact on the environment.

Consequently, when all scenarios and measurement points are examined, it is seen that the project does not make a difference for NO_2, CO, and TVOC emissions in terms of air quality in the region.

10.1.4 Mitigation Measures

The following section describes the actions and strategies designed to avoid, minimize or offset the potential adverse air quality impacts of the project, or to enhance potential project benefits.

10.1.4.1 Land Preparation and Construction Phase

As described in the sections above, construction activities may generate emission of dust caused by excavation, fill and materials handling and storage as well as exhaust emissions from diesel fueled construction machinery and equipment. The following techniques for the reduction and control of air emissions will be implemented during the land preparation and construction phase in accordance with relevant Turkish regulations and KGM's Technical Specifications for Motorways:

- Dust should be minimized from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house filters or cyclones).
- Dust should be minimized from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content.
- Speed limitations will be defined and obeyed for construction vehicles.
- Well and adequate maintained vehicles shall be used. Regular maintenance of machinery and equipment will be ensured.
- The drop height of potentially dust generating materials will be kept as low as possible.
- Construction vehicles will not be permitted to keep engines running while waiting to enter the site or waiting on-site.
- Dust suppression methods (i.e. watering with water trucks, applying non-toxic chemicals, speed limits for mobile vehicles, use of well-maintained vehicles/machinery) will be applied at road construction sites, service roads and quarry/material borrow/storage sites to mitigate Project-related dust emissions. In this respect, upper layers of the work sites/materials will be kept at a humidity level of about 10%. Watering will be applied at any time necessary including night time, weekends or off-days by using pressurized distribution or spraying systems that would ensure even distribution of water.
- If there is traffic flow on the existing roads near the work sites, dust suppression measures will be continuously applied to ensure traffic safety. If there is no traffic existing in the local roads, dust suppression measures will be applied only at local residential and business areas.
- All the dust-emitting components of the crushing-screening plants will be put in closed spaces and equipped with dust suppression systems.
- Loading and unloading operations will be performed without throwing/scattering.
- During transportation, excavated materials will be covered with nylon canvas or materials with grain size larger than 10 mm.
- In the supply of construction materials, local licensed quarries (existing or new) will be preferred to reduce transportation distance to minimize associated impacts and costs.
- Wind shields/barriers will be placed at work sites such as material storage areas to prevent dust dispersion where necessary.
- Relevant provisions of the Regulation on Air Pollution Control Sourced from Industry and Regulation on the Assessment and Management of Air Quality will be complied with to minimize air emissions sourced from construction machinery and trucks.
- Blasting operations will be conducted in line with the legislation in force and good industry practices/modern techniques.
- Roads to be used for access to quarry sites will be upgraded by the Project Sponsors to minimize dust emissions during transport. These roads will have sufficient width.

- Driving through settlements will be avoided wherever alternative roads are present.
- Any damage caused by insufficient or lack of dust suppression measures will be compensated.

10.1.4.2 Operation Phase

- At the service areas, a green buffer strip will be formed between the outer lane of the Motorway and the facilities. This strip will be properly planted (e.g. with shrubs that start growing from the base and are resistant to dust and gaseous emissions) to form a barrier against dust to be sourced from the motorway traffic.
- The application of automatic toll systems along the motorway will contribute to an optimization of traffic flows and thus lower emissions.

10.1.5 Summary of Assessment and Residual Impacts

Table 10.68 provides a summary on the air quality assessments. Significance of the identified impacts before and after the implementation of mitigation measures are summarized in this table. As can be seen from the Table, potential impacts on local communities are assessed as low during land preparation and construction phase of the motorway while it is anticipated that these impacts would be lower with mitigation measures to be applied. During operation of the motorway, medium and high level impacts are anticipated to result in residual impacts of medium and low with relevant mitigation measures. Furthermore, already existing traffic load on alternative roads will shift on to Aydın-Denizli Motorway and it is anticipated that emissions from these roads will decrease. It should also be noted that high impact significance (for sensitive receptors) is mainly attributed to the baseline air quality measured at sensitive receptors which reflect exceedance of air quality standards.

10.2 Climate Change

10.2.1 Assessment Methodology And Data Sources

South Alternative Project is considered having the potential to emit one or more of the greenhouse gases (GHGs). GHG assessment for the land preparation and construction phase and operation phase of the motorway is carried out in this section.

10.2.1.1 Greenhouse Gases

Greenhouse gas emissions refer to the release of greenhouse gases (GHG) into the atmosphere. United Nations Framework Convention on Climate Change (UNFCCC) lists GHG as below:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Sulfur hexafluoride (SF_6)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)

Contribution of project activities to climate change is evaluated by estimation of the amount of greenhouse gas emissions. Greenhouse gas emissions will be generated during both construction and operation phases of the project.

Mobile sources and transportation account for a large fraction of fossil fuel combustion in most countries. Internal combustion engines derive energy from burning of hydrocarbon fuel in air, generating carbon dioxide (CO_2) and water vapor (H_2O). During combustion, some amount of the fuel is either not burnt or partially burnt. This results in generation of carbon monoxide (CO), volatile organic compounds (VOCs) and particulate matter (PM).

In addition, at the high temperatures and pressures found in the combustion chamber, some of the nitrogen in the air and fuel is oxidized, forming mainly nitric oxide (NO) with a small amount of nitrogen dioxide (NO_2). By convention, the sum total of oxides of nitrogen (i.e. NO + NO_2) is abbreviated as NO_x. To summarize, CO, VOCs, NO_x and PM, have normally been regarded as the pollutants of most concern, and rates of emission are legally restricted in many countries. CO_2, being a major contributor to global warming, is now also considered to be an atmospheric pollutant.

Besides local air pollution, vehicle emissions also contribute to a regional degradation of air quality such that greenhouse gases such as CO_2, may contribute to environmental problems on a global scale for many years.

10.2.1.2 Regulatory Framework

Turkish Legal Requirements

Turkey became a party of the United Nations Framework Convention on Climate Change in 2004. In the 7th Conferences of the Parties (COP7) meeting held in Marrakech in 2001, the special conditions of Turkey which has a different position than the other countries in the Annex-I list of the Convention, were recognized and it was decided that its name will remain on the Annex-I while it will be removed from the Annex-II list.

The process that is started when Turkey is recognized as an Annex-I country having special conditions different from the other parties of the Convention, has affected and accelerated the country's political decision of being a party of the Kyoto Protocol. Around five years after becoming a part of the Convention, in February 2009, "The law on the convenience of Turkey's entrance to the Kyoto Protocol for the United Nations Framework Convention on Climate Change" came into force, in May 2009, Turkey's entrance to the Kyoto Protocol was documented and sent to the General Secretariat of the United Nations. The whole ratification process of the Protocol was completed in 26 August 2009.

As a country that ratified the UN Convention Framework on Climate Change and the Kyoto Protocol, Turkey has taken the responsibilities described under UNFCCC, that are related to the adaptation to the effects of the climate change which are imposed to the parties. The issues of some of the international UN conventions that Turkey is a party, are also indirectly related with the adaptation to the effects of the climate change. These are; Convention to Combat Desertification, Convention on Biological Diversity, Bern Convention on the Conservation of European Wildlife and Natural Habitats, Conventions for the Protection of Mediterranean Sea and the Black Sea Against Pollution and its additional protocols (Ministry of Environment, Urbanization and Climate Change, 2021).

Within this scope, adaptation to climate change and actions towards mitigation of potential impacts of climate change are regulated through a variety of national legislation including topics such as disaster risk management, conservation of biodiversity, water safety and security, food safety and security.

IFC Standards

IFC has established the Performance Standards on Environmental and Social Sustainability and relevant guidance notes. IFC Performance Standard (PS) 3 on Resource Efficiency and Pollution Prevention states that; for projects that are expected to or currently produce more than 25.000 tons of CO2eq annually, the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary, as well as indirect emissions associated with the off-site production of energy used by the project. It suggests the client to consider alternatives and implement technically and financially feasible and cost-effective options to reduce project related GHG emissions during the design and operation of the project which may include, but not limited to, alternative project locations, adoption of renewable or low carbon energy sources, sustainable agricultural, forestry and livestock management practices, the reduction of fugitive emissions and the reduction of gas flaring. Another requirement of PS 3 is quantification of GHG emissions which will be conducted by the client annually in accordance with internationally recognized methodologies and good practice.

10.2.2 Baseline Conditions

10.2.2.1 Meteorological and Climate Characteristics

In this section, properties of the Project area were evaluated regarding its climatic and meteorological properties.

South Alternative is located in Aydın province of the Aegean region. In Aydın, where the Mediterranean climate is dominant, summers are hot and dry, and winters are warm and rainy. Buyuk Menderes Valley, like other Aegean plains, is in the form of a groove opening towards the sea in the west. Therefore, the warming effect of the sea and the winds that bring precipitation easily penetrate into the interior. *(The Governorship of Aydın, 2021).*

Meteorological conditions of the South Alternative are evaluated with regard to meteorological observations of Aydın Meteorological Stations. The long-term statistical data of this station was evaluated within the scope of this ESIA Report, using the data to be shared in line with the data request made to the General Directorate of Meteorology.

Pressure Distribution

Annual mean local pressure measured in Aydın Meteorology Station is 1007.0 hPa. During the whole observation period, minimum pressure is recorded as 979.9 hPa in March and maximum pressure is recorded as 1030.0 hPa in January. Monthly average, maximum and minimum pressure values recorded in the station are provided in Figure 10.16 and Table 10.23.

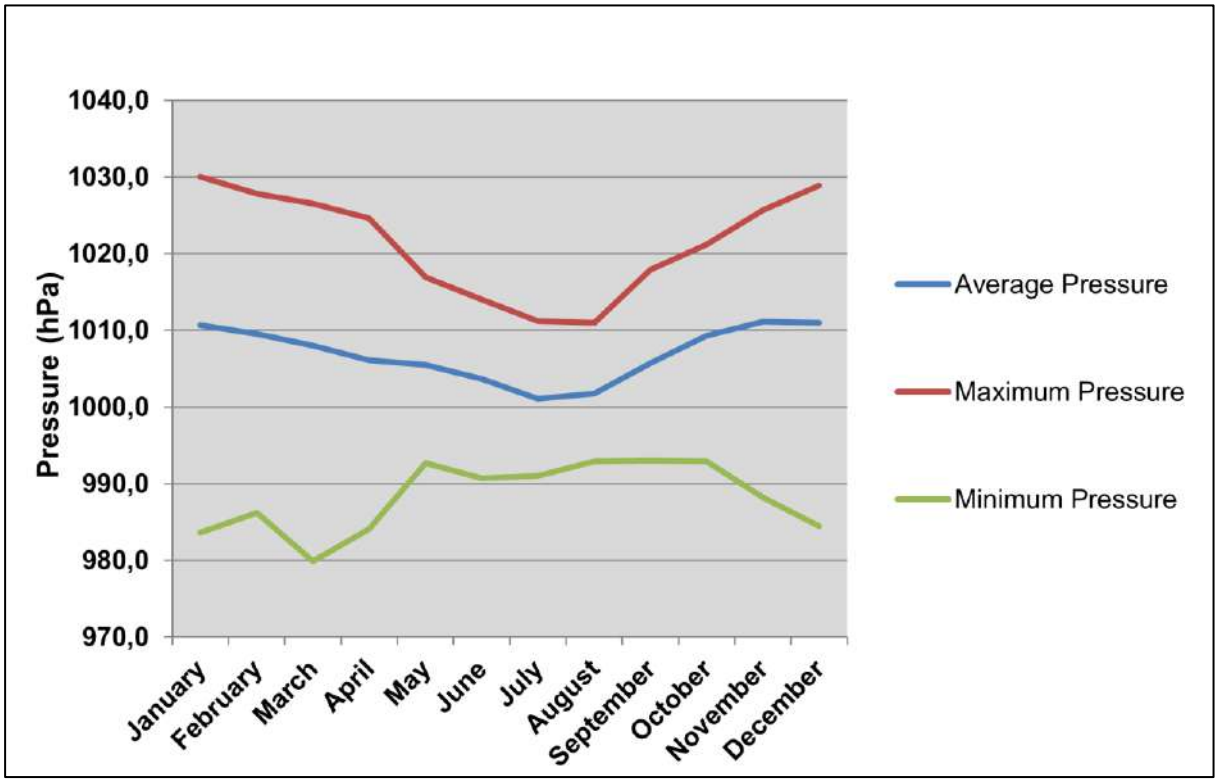


Figure 10.16 Aydın Meteorology Station Monthly Average, Maximum and Minimum Pressure Values

Table 10.23 Aydın Meteorology Station Monthly Average, Maximum and Minimum Pressure Values

Months	Average Pressure (hPa)	Maximum Pressure (hPa)	Minimum Pressure (hPa)
January	1010.7	1030.0	983.6
February	1009.5	1027.8	986.2
March	1008.0	1026.5	979.9
April	1006.1	1024.6	984.1
May	1005.5	1016.9	992.7
June	1003.7	1014.0	990.7
July	1001.1	1011.2	991.0
August	1001.8	1011.0	992.9
September	1005.7	1017.9	993.0
October	1009.3	1021.2	992.9
November	1011.1	1025.7	988.2
December	1011.0	1028.9	984.5
Annual	**1007.0**	**1030.0**	**979.9**

Temperature Distribution

According to Aydın Meteorology Station records, annual mean temperature is 17.7 °C. The highest temperature is recorded as 44.8ºC in July. The lowest temperature is recorded as –7.6ºC in January. The graphical and tabular representation of the average, maximum, minimum temperature records and maximum average and minimum average temperature records measured in this station are given in Figure 10.17 and Table 10.24, respectively.

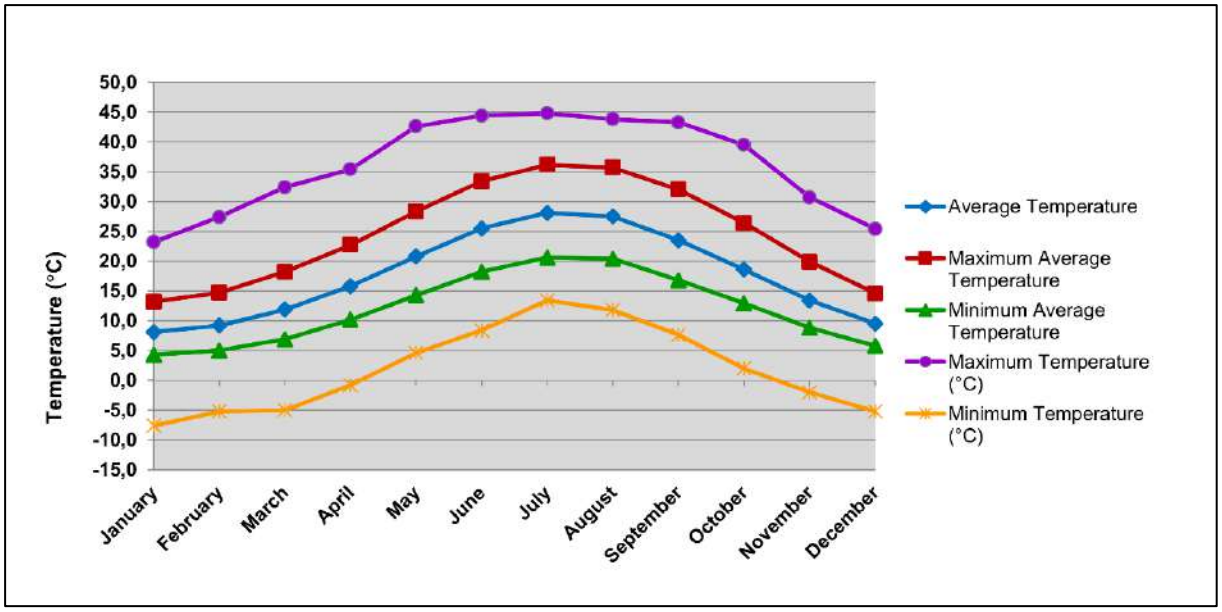


Figure 10.17 Aydın Meteorology Station Average Temperature, Maximum Average Temperature, Minimum Average Temperature

Table 10.24 Aydın Meteorology Station Temperature Values

Months	Average Temperature (°C)	Maximum Average Temperatures (°C)	Minimum Average Temperatures (°C)	Maximum Temperature (°C)	Minimum Temperature (°C)
January	8.1	13.2	4.3	23.2	-7.6
February	9.2	14.7	5.0	27.4	-5.2
March	11.9	18.2	6.9	32.4	-5.0
April	15.8	22.7	10.2	35.4	-0.8
May	20.8	28.3	14.3	42.6	4.6
June	25.5	33.4	18.2	44.4	8.4
July	28.1	36.2	20.6	44.8	13.4
August	27.5	35.7	20.4	43.8	11.8
September	23.5	32.0	16.8	43.3	7.6
October	18.6	26.4	12.9	39.5	2.0
November	13.4	19.9	8.8	30.7	-2.0
December	9.5	14.6	5.8	25.4	-5.2
Annual	**17.7**	**24.6**	**12.0**	**44.8**	**-7.6**

Precipitation Distribution

According to Aydın Meteorology Station records, annual average total precipitation is 648.7 mm. Average total precipitation is maximum in December with 122.8 mm and minimum in August with 5.5 mm. During long time records, monthly maximum precipitation is recorded as 93.8 mm in January. Average monthly precipitation and daily maximum precipitation amounts are given graphically in Figure 10.18 and tabulated in Table 10.25.

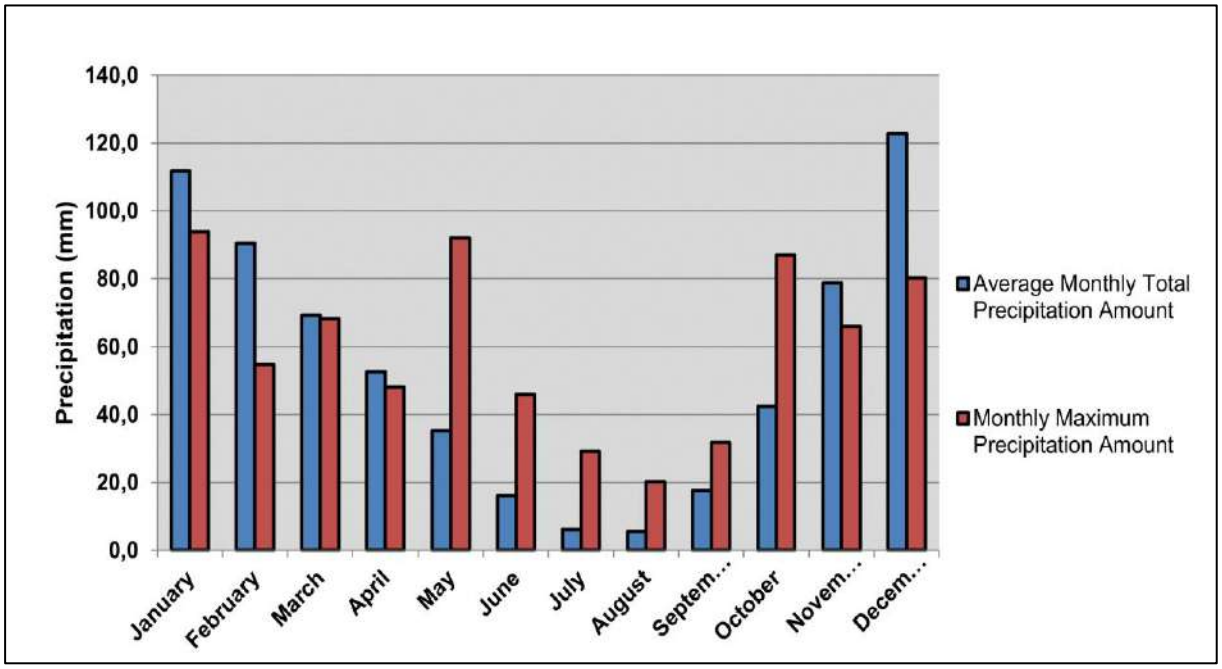


Figure 10.18 Aydın Meteorology Station Average Monthly Precipitation and Daily Maximum Precipitation Amounts

Table 10.25 Aydın Meteorology Station Average Monthly Precipitation and Daily Maximum Precipitation Amounts

Months	Average Monthly Total Precipitation Amount (mm)	Monthly Maximum Precipitation Amount (mm)
January	111.7	93.8
February	90.4	54.8
March	69.3	68.2
April	52.7	48.2
May	35.3	92.0
June	16.0	46.0
July	6.2	29.3
August	5.5	20.3
September	17.7	31.8
October	42.4	86.9
November	78.7	65.9
December	122.8	80.2
Annual	**648.7**	**93.8**

Humidity Distribution

According to Aydın Meteorology Station records, average annual humidity is 62.4%. Minimum monthly relative humidity is recorded in July (49.1%) and maximum relative humidity is recorded in December (74.5%). The monthly average and minimum relative humidity values are given graphically in Figure 10.19 and in tabular format in Table 10.26.

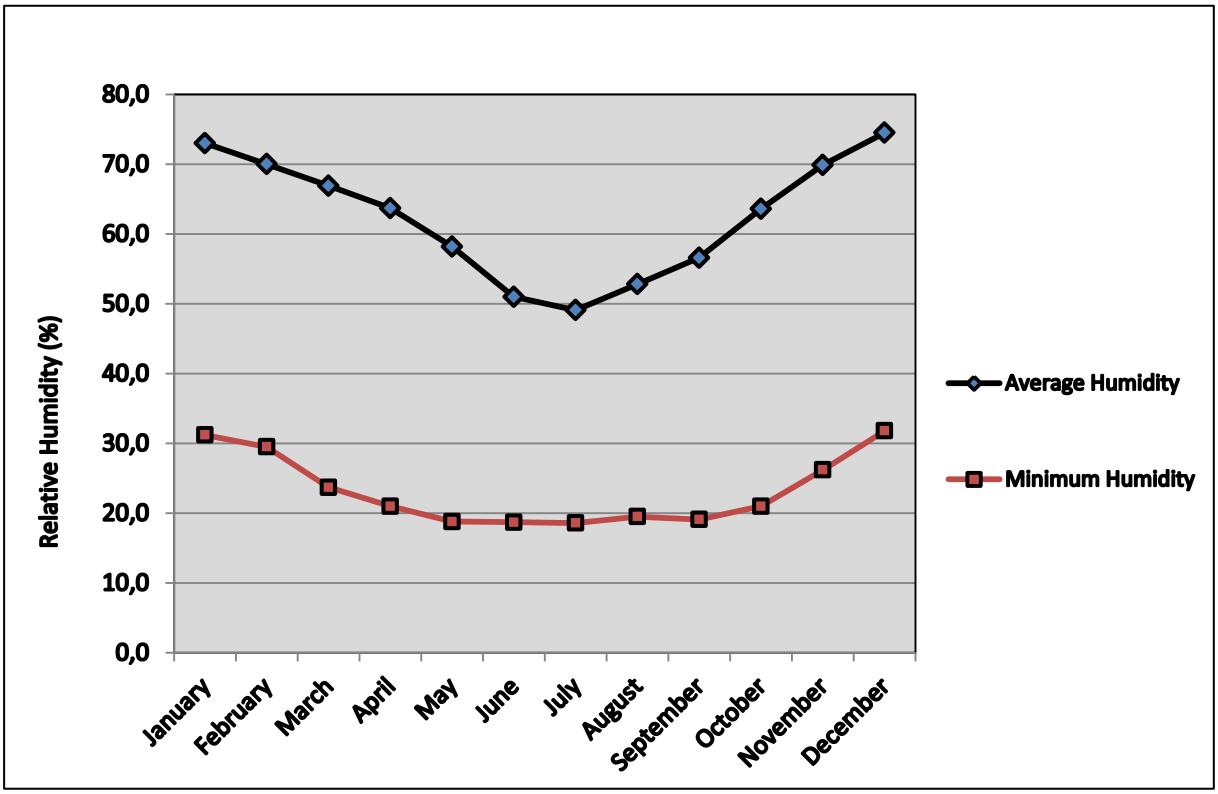


Figure 10.19 Aydın Meteorology Station Average and Minimum Relative Humidity Values

Table 10.26 Aydın Meteorology Station Average and Minimum Relative Humidity Values

Months	Average Relative Humidity (%)	Minimum Relative Humidity (%)
January	73.0	31.2
February	70.0	29.5
March	66.9	23.7
April	63.7	21.0
May	58.2	18.8
June	51.0	18.7
July	49.1	18.6
August	52.8	19.5
September	56.6	19.1
October	63.6	21.0
November	69.9	26.2
December	74.5	31.8
Annual	**62.4**	**23.3**

Evaporation

According to Aydın observation records monthly maximum open surface evaporation is 16.8 mm, measured in July. Annual total average open surface evaporation is 1487.6 mm. Monthly maximum and average open surface evaporation values are provided graphically in Figure 10.20 and in tabular format in Table 10.27.

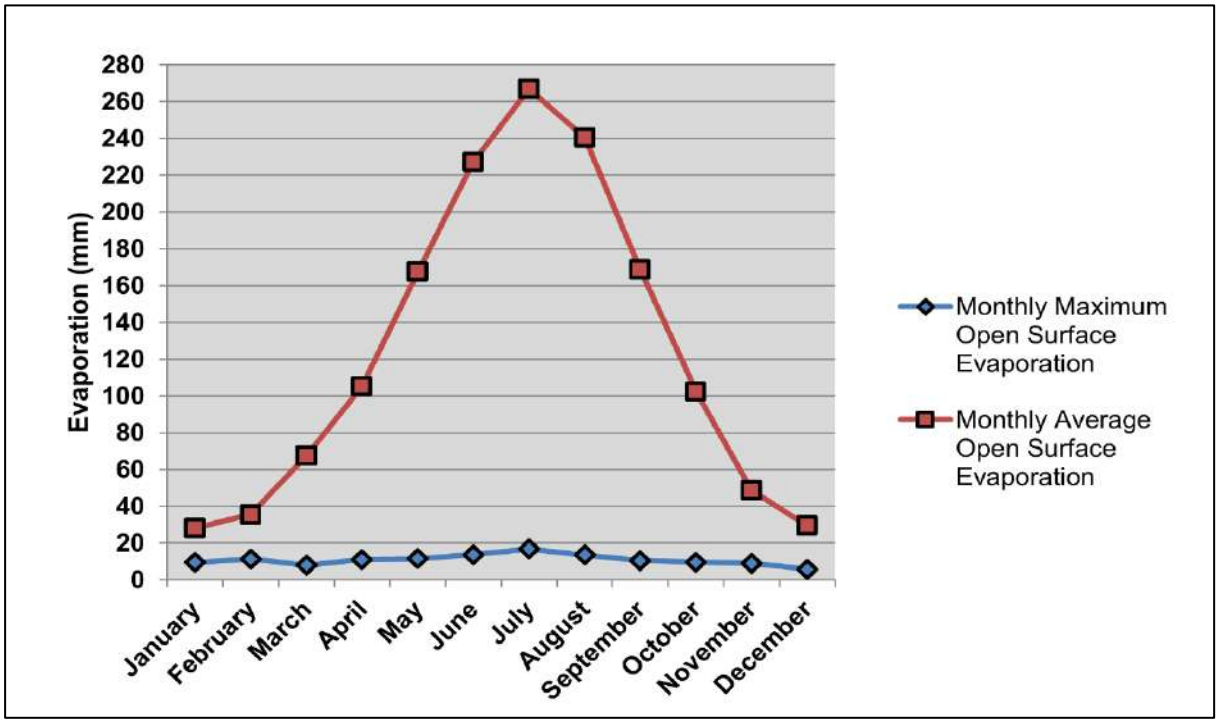


Figure 10.20 Aydın Meteorology Station Monthly Maximum and Monthly Average Open Surface Evaporation Values

Table 10.27 Aydın Meteorology Station Monthly Maximum and Monthly Average Open Surface Evaporation Values

Months	Monthly Maximum Open Surface Evaporation (mm)	Monthly Average Open Surface Evaporation (mm)
January	9.40	28.1
February	11.30	35.5
March	8.00	67.5
April	11.00	105.3
May	11.50	167.6
June	13.70	227.0
July	16.80	266.9
August	13.50	240.4
September	10.40	168.7
October	9.60	102.4
November	9.00	48.8
December	5.80	29.4
Annual	**16.8**	**1487.6**

Cloud Cover

Annual average number of clear days (cloud cover: 0.0-1.9) in Aydın Meteorology Station is 195.8. Annual average number of partly cloudy days (cloud cover: 2.0-8.0) is 161 and annual average number of cloudy days (cloud cover: 8.1-10.0) is 21.9. Average numbers of clear, partly cloudy and cloudy numbers of days are given in graphically in Figure 10.21 and in tabular format in Table 10.28.

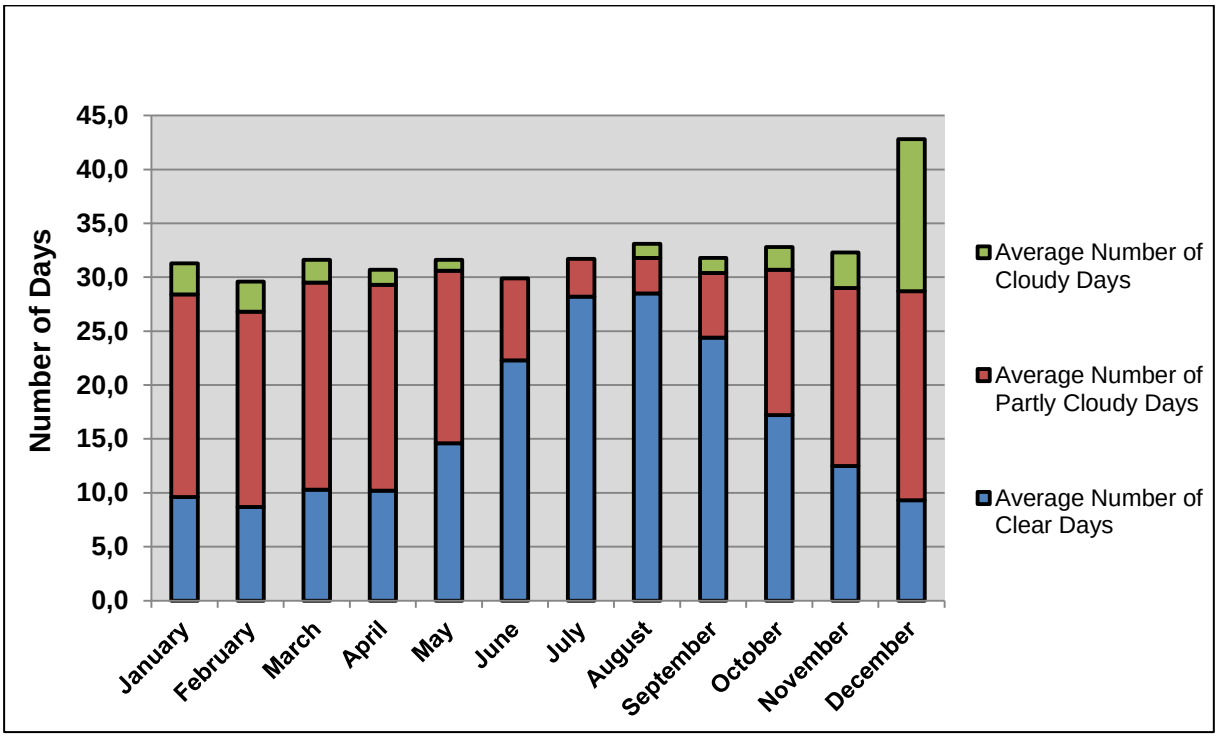


Figure 10.21 Aydın Meteorology Station Average Number of Clear, Partly Cloudy and Cloudy Days

Table 10.28 Aydın Meteorology Station Average Number of Clear, Partly Cloudy and Cloudy Days

Months	Average Number of Clear Days	Average Number of Partly Cloudy Days	Average Number of Cloudy Days
January	9.60	18.80	3.60
February	8.70	18.10	2.90
March	10.30	19.20	2.80
April	10.20	19.10	2.10
May	14.60	16.00	1.40
June	22.30	7.60	1.00
July	28.20	3.50	-
August	28.50	3.30	-
September	24.40	6.00	1.30
October	17.20	13.50	1.40
November	12.50	16.50	2.10
December	9.30	19.40	3.30
Annual	**195.80**	**161.00**	**21.90**

Foggy, Snowy, Haily, Frosty and Stormy Days Distribution

According to Aydın Meteorology Station records, the number of annual average snowy days is 0.4 and annual average number of days with snow covered is 0.2. Monthly distribution of average foggy, snowy, snow covered, haily, frosty and stormy days are given in Figure 10.22 and Table 10.29.

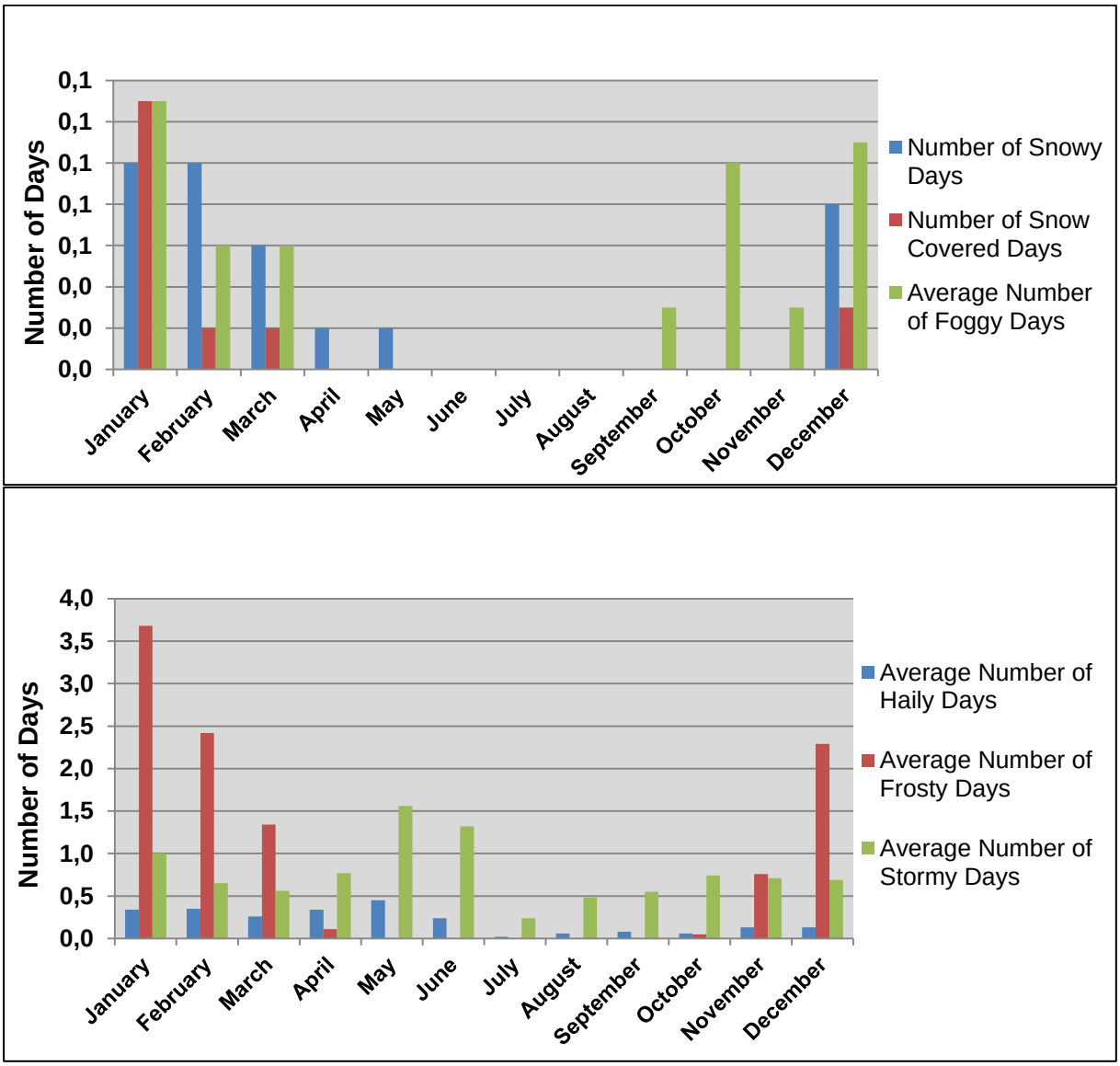


Figure 10.22 Aydın Meteorology Station Monthly Average Foggy, Snowy, Snow Covered, Haily, Frosty and Stormy Days Distribution

Table 10.29 Aydın Meteorology Station Monthly Average Foggy, Snowy, Snow Covered, Haily, Frosty and Stormy Days Distribution

Months	Number of Snowy Days	Number of Snow Covered Days	Average Number of Foggy Days	Average Number of Haily Days	Average Number of Frosty Days	Average Number of Stormy Days
January	0.10	0.13	0.13	0.34	3.68	1.0
February	0.10	0.02	0.06	0.35	2.42	0.65
March	0.06	0.02	0.06	0.26	1.34	0.56
April	0.02			0.34	0.11	0.77
May	0.02			0.45		1.56
June				0.24		1.32
July				0.02		0.24
August				0.06		0.48
September			0.03	0.08		0.55
October			0.10	0.06	0.05	0.74
November			0.03	0.13	0.76	0.71
December	0.08	0.03	0.11	0.13	2.29	0.69
Annual	**0.38**	**0.20**	**0.52**	**2.46**	**10.65**	**9.27**

Maximum Snow Depth

According to Aydın Meteorology Station records, monthly distribution of maximum snow cover depths recorded are represented graphically in Figure 10.23 and in tabular format in Table 10.30. According to the Aydın Meteorology Station records, the maximum snow cover depth is 6 cm in January.

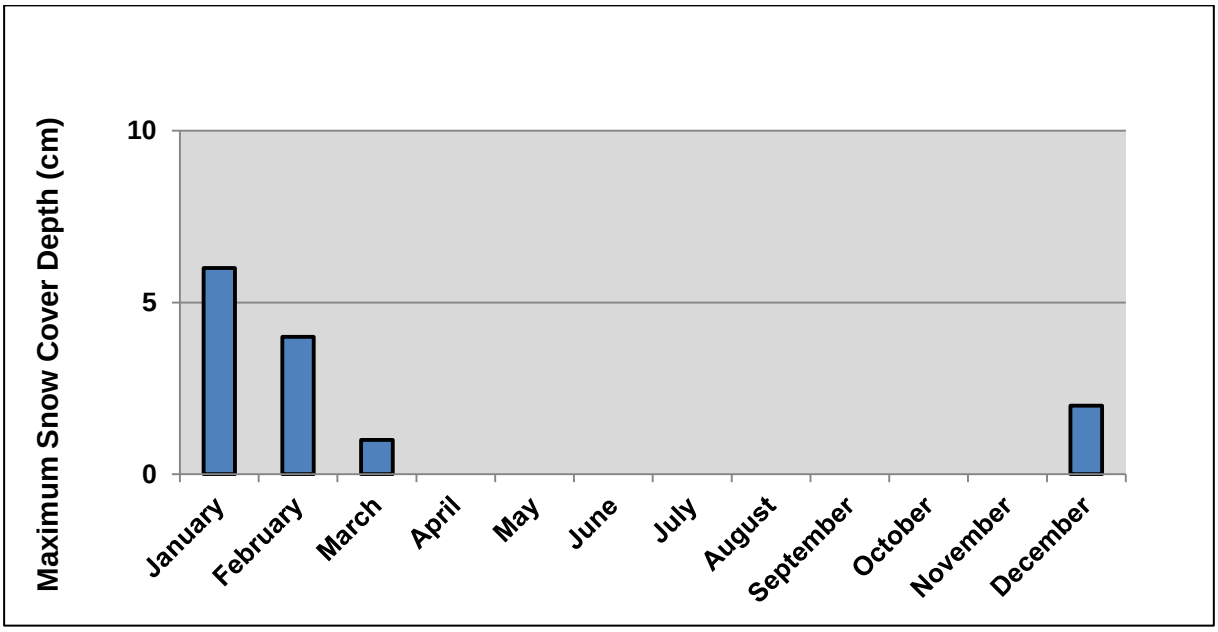


Figure 10.23 Aydın Meteorology Station Monthly Distribution of Maximum Snow Cover Depths

Table 10.30 Aydın Meteorology Station Monthly Distribution of Maximum Snow Cover Depths

Months	January	February	March	December	Annual
Maximum Snow Depth (cm)	6	4	1	2	6

Wind Distribution

The monthly, yearly and seasonally distribution of wind blow numbers and wind speeds recorded in Aydın Meteorological Station are given in Table 10.31, Table 10.32, Table 10.33, Table 10.34 and graphical representations are provided in Figure 10.24, Figure 10.25, Figure 10.26 and Figure 10.27. According to annual wind blow numbers, 1st dominant wind direction is E (east). 2nd dominant wind direction is ESE (east-southeast). 3rd dominant wind direction is W (west) and 4th dominant wind direction is ENE (east- northeast).

Table 10.31 Aydın Meteorology Station Distribution of Monthly and Yearly Wind Blow Numbers According to Directions (1961-2015)

Months	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
January	1277	1159	2076	6375	14113	6494	1914	695	815	749	1120	1511	1903	1476	900	876
February	1449	1206	1822	4927	11144	5342	1665	640	766	831	1328	1811	2485	2207	1121	1086
March	1324	1072	1656	3825	9989	5288	1628	790	991	1155	2044	2822	4187	3856	1683	1191
April	1148	951	1326	2997	8407	4292	1532	811	986	1315	2547	3183	4785	4614	2082	1305
May	1236	914	1247	2552	7802	3760	1505	730	1001	1158	2804	3278	6529	5508	2388	1344
June	1362	935	1160	2210	6644	3181	1533	787	1114	1309	3109	3719	6468	5083	2371	1462
July	1244	1235	1002	1819	5682	3781	1792	1058	1315	1937	4176	4759	6576	4952	1471	1180
August	1013	1087	936	1846	6832	3980	1596	984	1071	1882	4042	4858	6769	4444	1341	788
September	818	1110	884	2475	7828	4143	1387	721	888	1259	3116	4375	5902	4422	1363	761
October	836	1117	1447	4182	10103	5110	1245	647	805	907	2204	3134	4552	3797	1384	893
November	1197	1398	2061	5703	12932	5394	1415	572	678	608	1119	1709	2400	2105	1098	995
December	1440	1269	2053	6961	15168	6251	1790	633	731	647	974	1158	1419	1401	846	861
Annual	14344	13453	17670	45872	116644	57016	19002	9068	11161	13757	28583	36317	53975	43865	18048	12742

Table 10.32 Aydın Meteorology Station Distribution of Monthly and Yearly Average Wind Speeds According to Directions (m/sec) (1961-2015)

Months	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
January	1	0.9	1.1	1.4	1.9	1.6	1.3	1	1.1	0.9	1.2	1.2	1.3	1.1	1.1	0.9
February	1.1	1	1.2	1.4	1.8	1.6	1.4	1.1	1.2	1.1	1.2	1.3	1.5	1.3	1.2	1
March	1.2	1	1.2	1.4	1.7	1.5	1.3	1.1	1.3	1.2	1.4	1.6	1.8	1.6	1.5	1.2
April	1.2	1	1.1	1.2	1.6	1.5	1.2	1.1	1.2	1.4	1.5	1.6	2	1.8	1.6	1.3
May	1.3	-	1.1	1.1	1.4	1.3	1.1	1.1	1.2	1.4	1.5	1.7	2.2	1.9	1.7	1.4
June	1.6	1.3	1.2	1.2	1.4	1.2	1	0.9	1.2	1.2	1.6	1.7	2.2	2	1.9	1.7
July	1.8	1.7	1.4	1.1	1.2	1.1	1	0.9	1.2	1.3	1.7	1.9	2.3	2	1.9	1.8
August	1.7	1.4	1.3	1	1.3	1.1	0.9	1	1	1.4	1.8	2	2.3	2	1.6	1.6
September	1.3	1.3	1	1	1.3	1.2	1	0.9	1.1	1.1	1.5	1.8	2.2	1.9	1.6	1.3
October	1	0.9	0.9	1.1	1.4	1.3	1	0.9	1	1	1.2	1.4	1.6	1.5	1.2	1
November	0.9	0.9	1	1.3	1.7	1.5	1.2	0.9	1	0.8	1	1.1	1.3	1.2	1.1	0.9
December	1	0.8	1	1.4	1.8	1.6	1.3	1	1	0.9	1	1	1.3	1.1	1.1	0.8
Annual	1.3	1.1	1.1	1.2	1.5	1.4	1.1	1.0	1.1	1.1	1.4	1.5	1.8	1.6	1.5	1.2

Table 10.33 Aydın Meteorology Station Seasonal Distribution of Wind Blow Numbers According to Directions (1961-2015)

Season	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Winter	4166	3634	5951	18263	40425	18087	5369	1968	2312	2227	3422	4480	5807	5084	2867	2823
Spring	3708	2937	4229	9374	26198	13340	4665	2331	2978	3628	7395	9283	15501	13978	6153	3840
Summer	3619	3257	3098	5875	19158	10942	4921	2829	3500	5128	11327	13336	19813	14479	5183	3430
Autumn	2851	3625	4392	12360	30863	14647	4047	1940	2371	2774	6439	9218	12854	10324	3845	2649

Table 10.34 Aydın Meteorology Station Seasonal Distribution of Average Wind Speeds According to Directions (m/sec) (1961-2015)

Season	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
Winter	1,0	0,9	1,1	1,4	1,8	1,6	1,3	1,0	1,1	1,0	1,1	1,2	1,4	1,2	1,1	0,9
Spring	1,2	1,0	1,1	1,2	1,6	1,4	1,2	1,1	1,2	1,3	1,5	1,6	2,0	1,8	1,6	1,3
Summer	1,7	1,5	1,3	1,1	1,3	1,1	1,0	0,9	1,1	1,3	1,7	1,9	2,3	2,0	1,8	1,7
Autumn	1,1	1,0	1,0	1,1	1,5	1,3	1,1	0,9	1,0	1,0	1,2	1,4	1,7	1,5	1,3	1,1

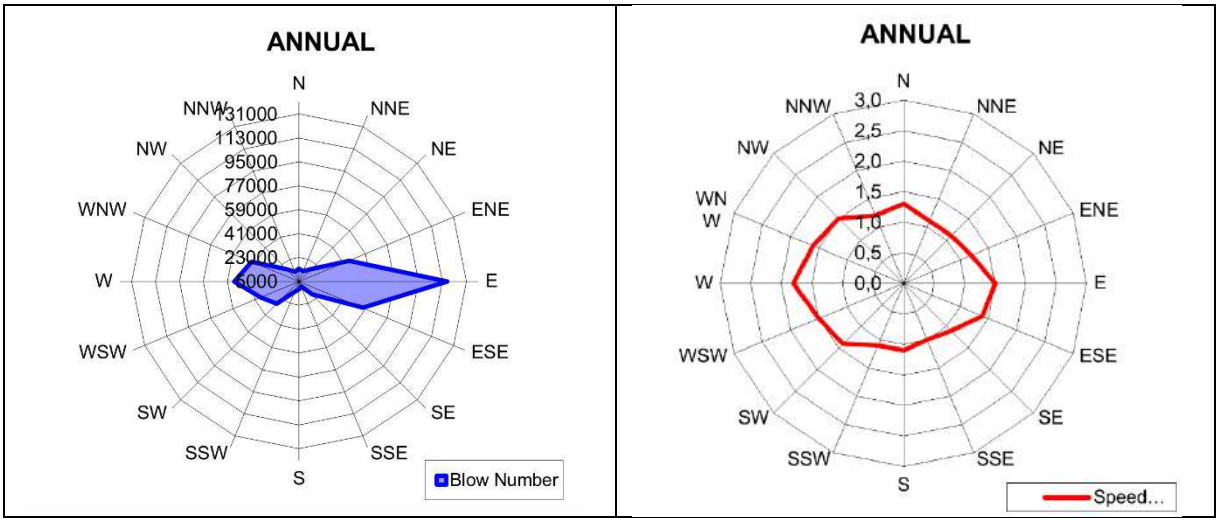


Figure 10.24 Aydın Meteorology Station Annual Wind Diagram of Wind Blow Numbers and Average Wind Speeds

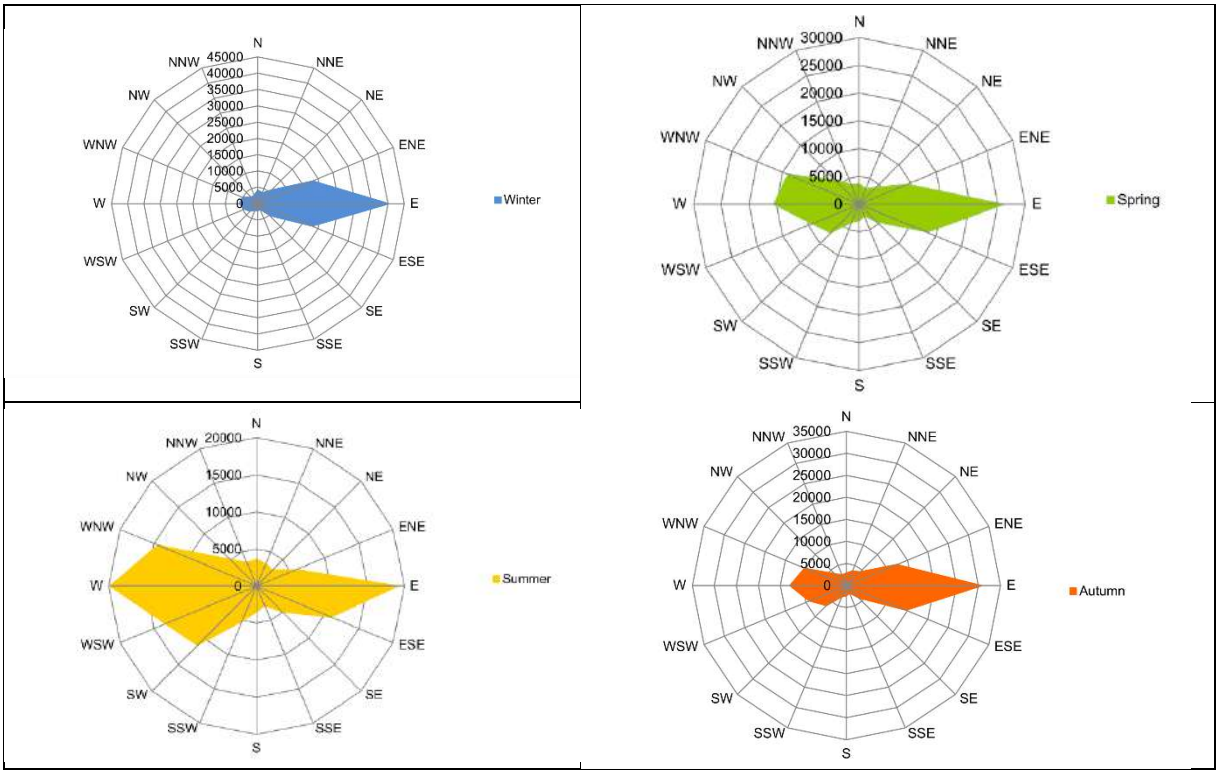


Figure 10.25 Aydın Meteorology Station Seasonal Wind Diagram of Wind Blow Numbers

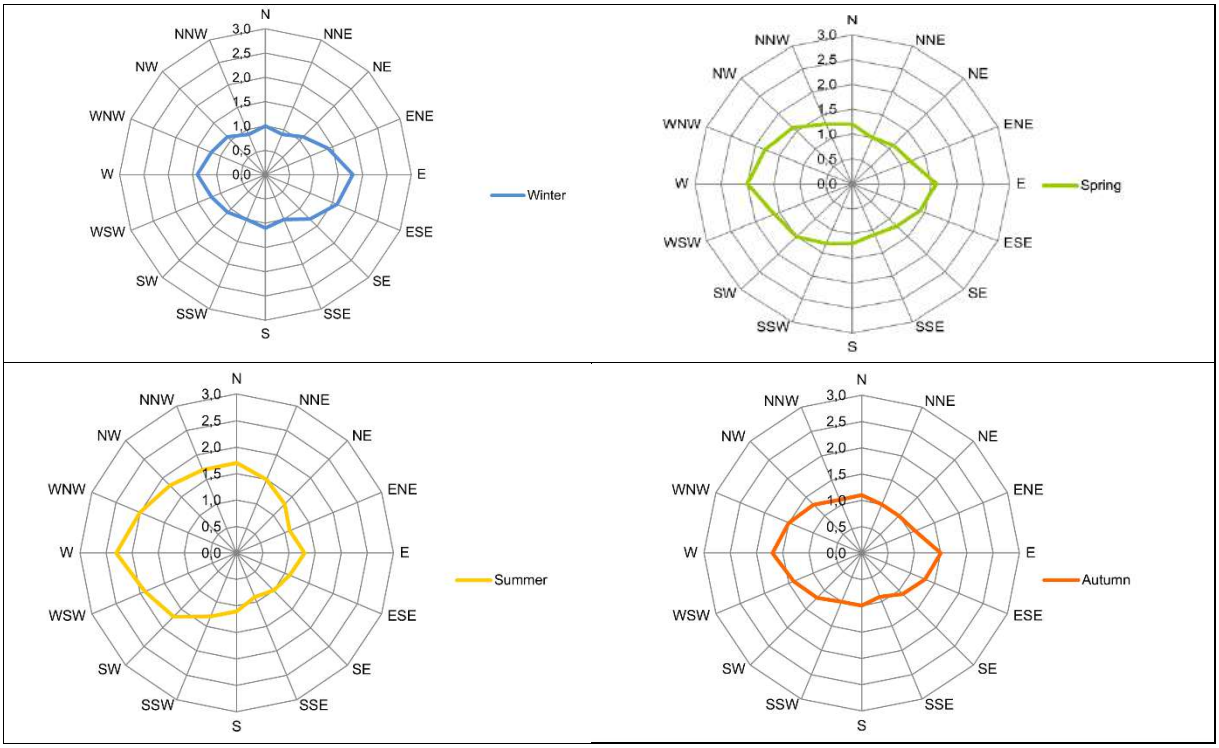


Figure 10.26 Aydın Meteorology Station Seasonal Wind Diagram of Average Wind Speeds (m/sec)

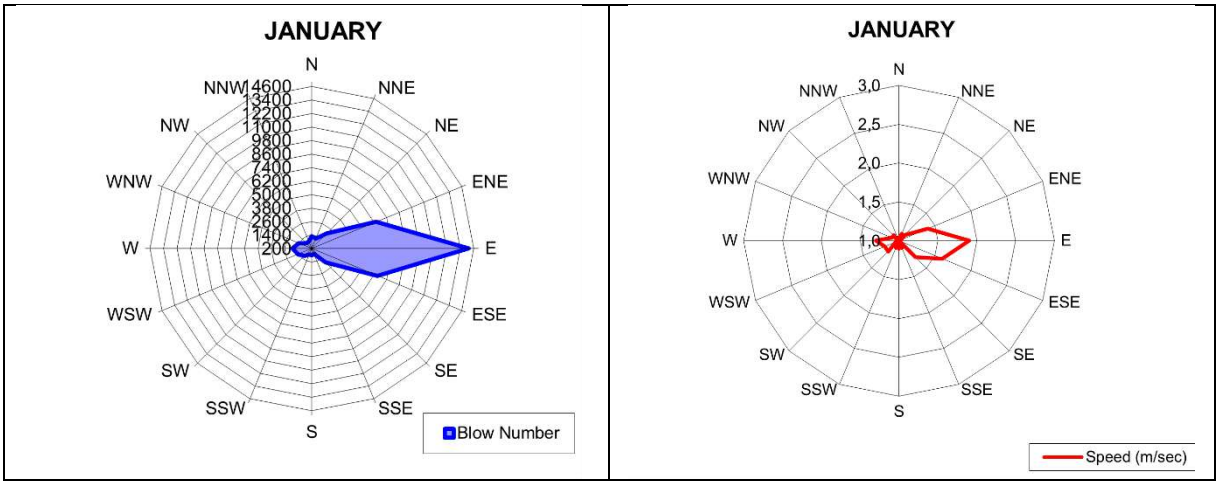


Figure 10.27 Aydın Meteorology Station Monthly Wind Diagrams of Wind Blow Numbers and Average Wind Speeds

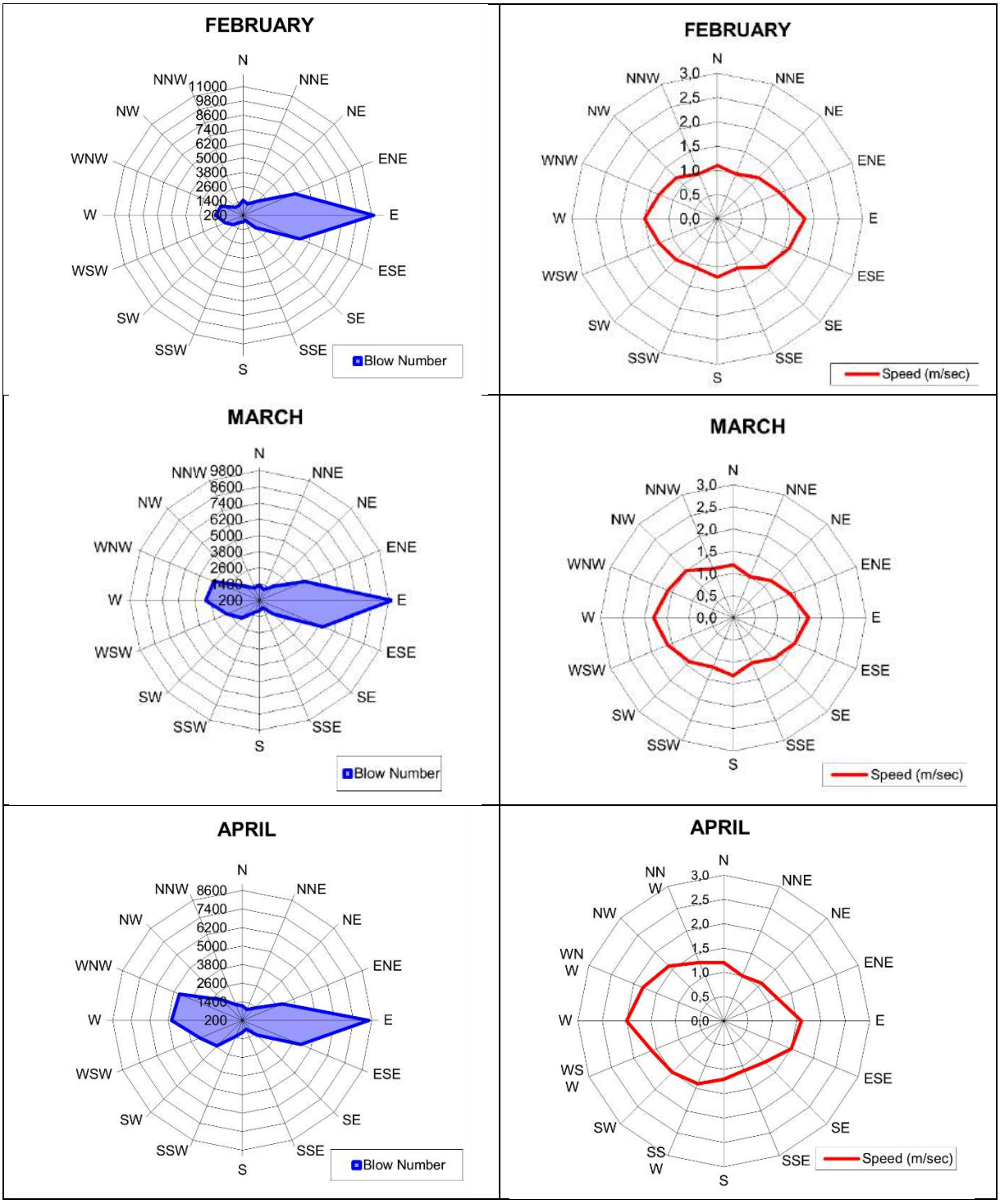


Figure 10.27 Aydın Meteorology Station Monthly Wind Diagrams of Wind Blow Numbers and Average Wind Speeds (Continued)

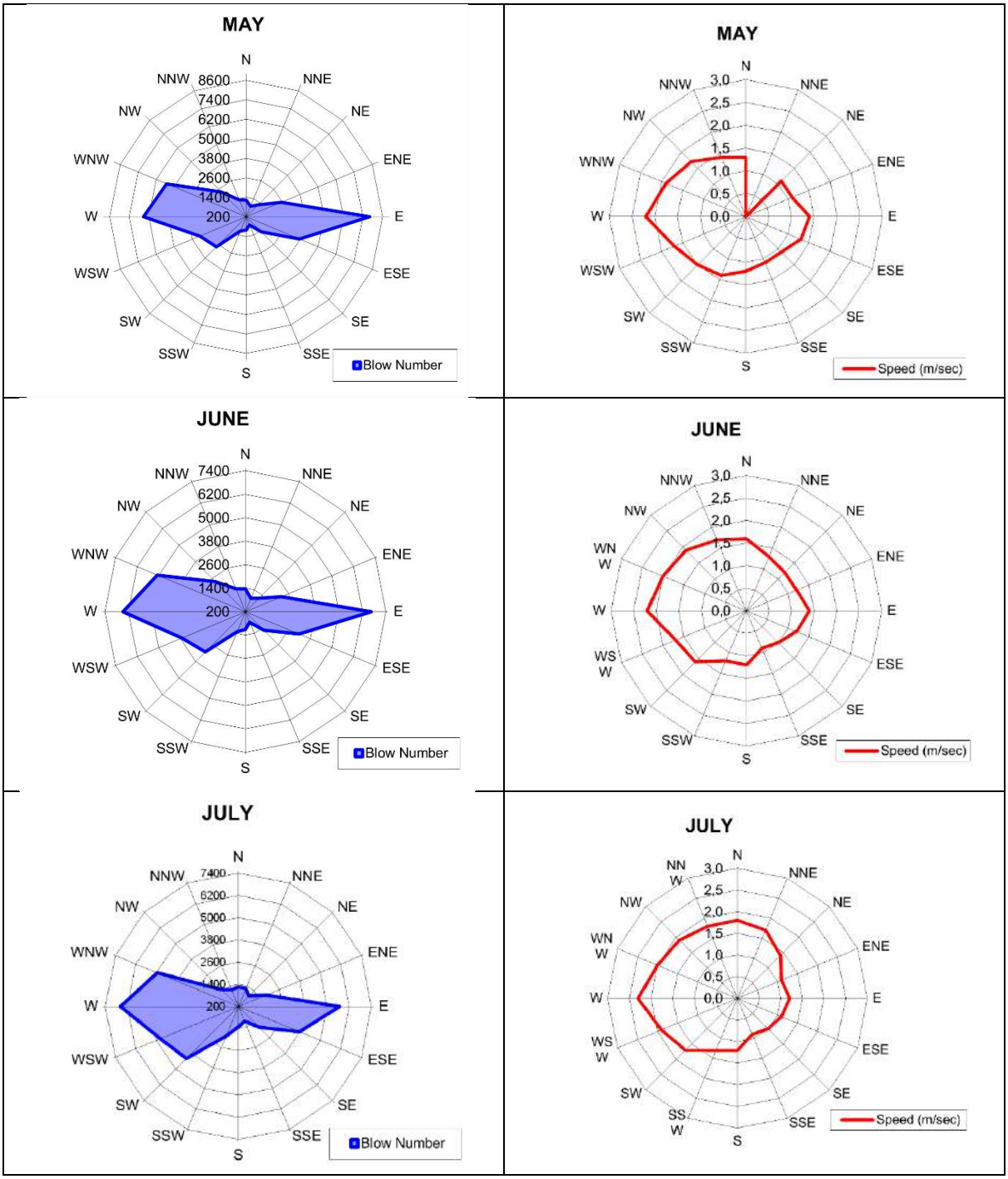


Figure 10.27 Aydın Meteorology Station Monthly Wind Diagrams of Wind Blow Numbers and Average Wind Speeds (Continued)

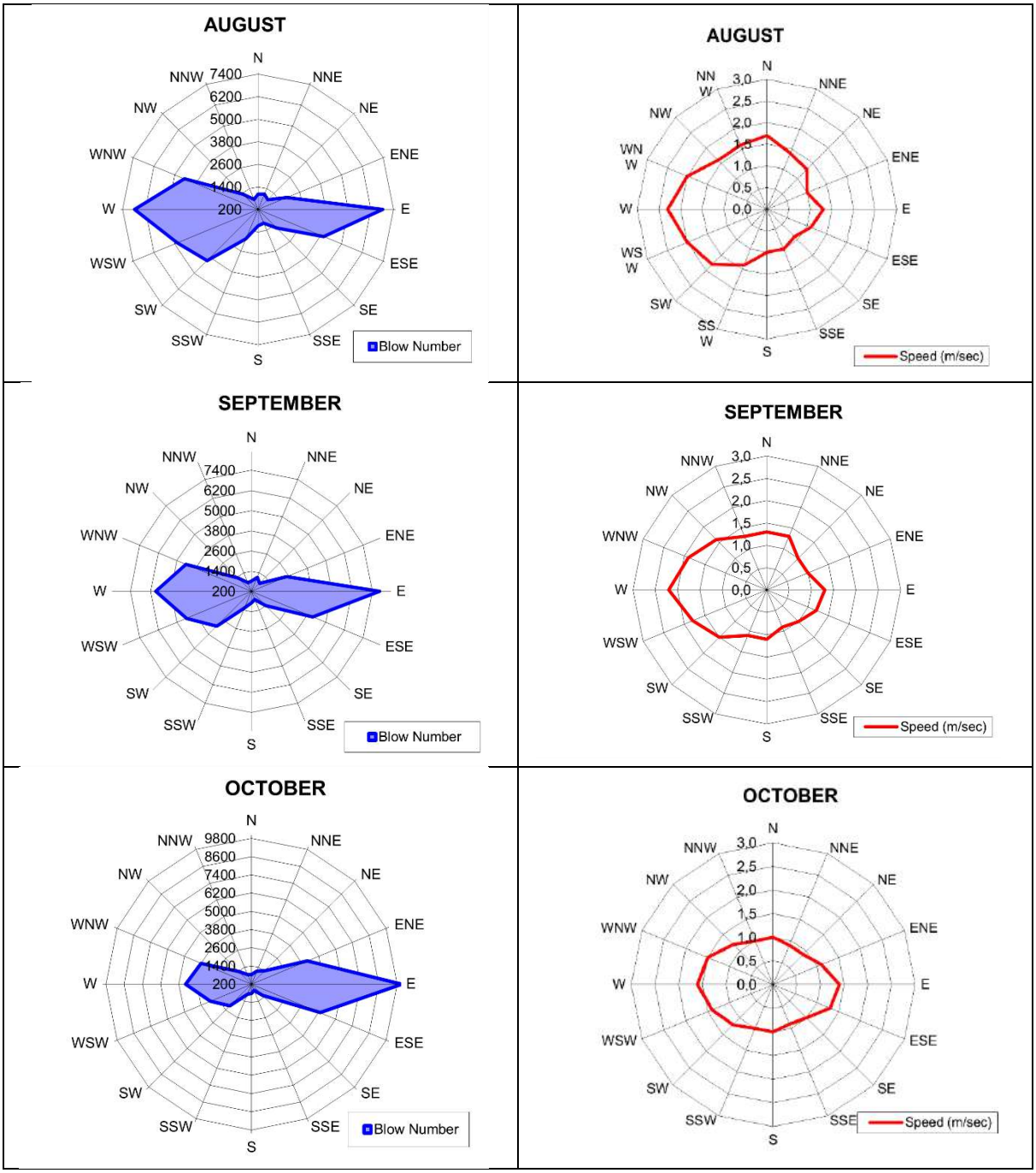


Figure 10.27 Aydın Meteorology Station Monthly Wind Diagrams of Wind Blow Numbers and Average Wind Speeds (Continued)

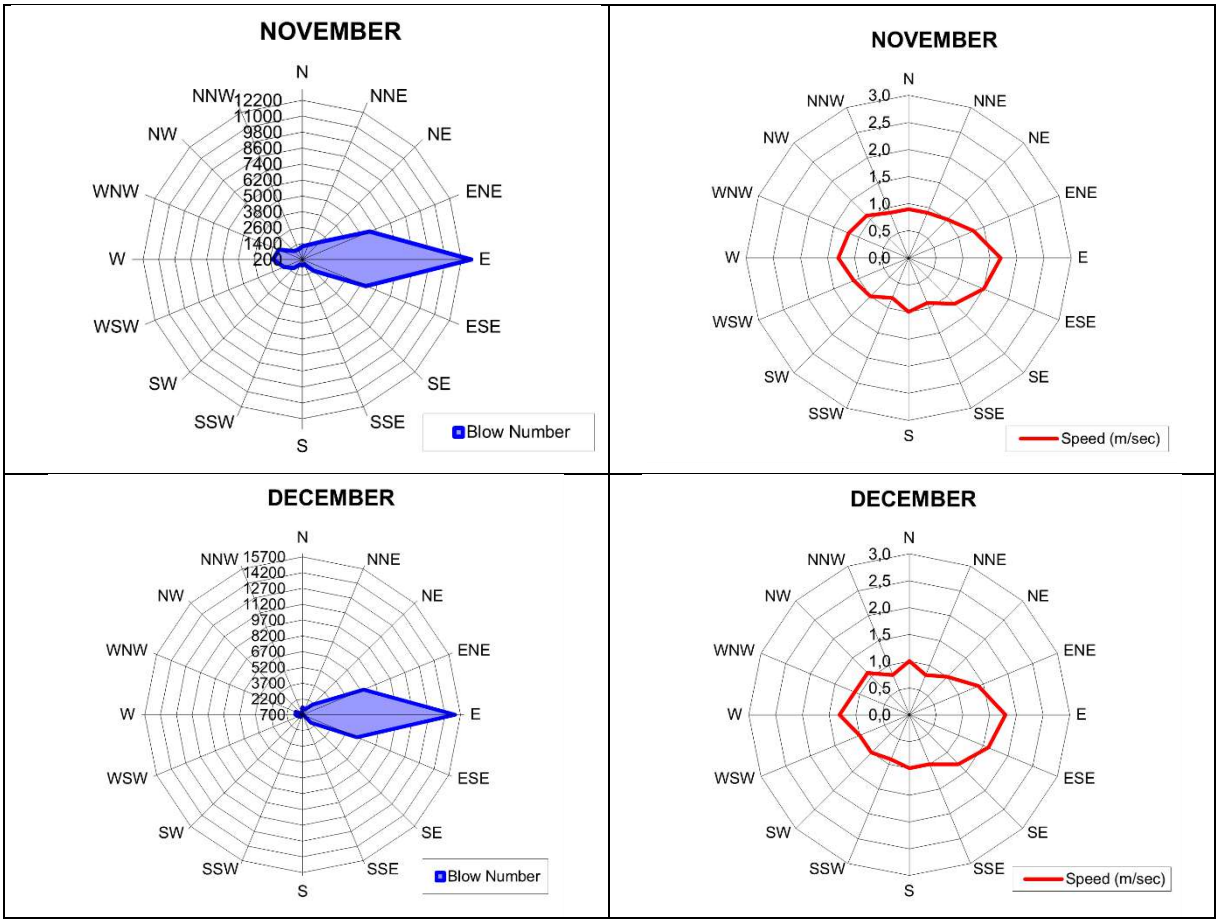


Figure 10.27 Aydın Meteorology Station Monthly Wind Diagrams of Wind Blow Numbers and Average Wind Speeds (Continued)

Average Wind Speed Distribution

According to Aydın Meteorology Station records, annual average wind speed is 1.7 m/sec. Monthly average wind speeds are given numerically in Table 10.35 and graphically in Figure 10.28.

Table 10.35 Aydın Meteorology Station Monthly Average Wind Speeds

Months	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Average
Average Wind Speed (m/sec)	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.8	1.6	1.4	1.5	1.7	**1.7**

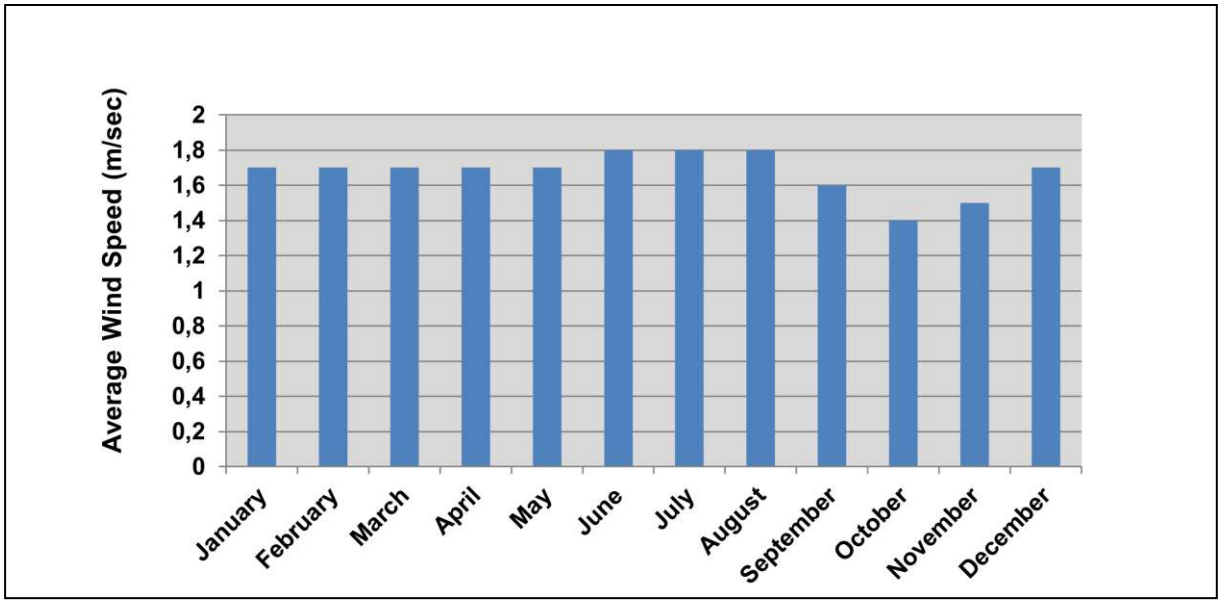


Figure 10.28 Aydın Meteorology Station Monthly Average Wind Speeds

Wind Speed According to Directions and Speed & Direction of the Maximum Wind and Average Number of Stormy Days and Strong Windy Days

According to Aydın Meteorology Station records, the direction of the highest wind speed is south-southeast (SSE) with 29.5 m/sec. According to Aydın Meteorology station records, number of annual average stormy days is 3.74 and number of annual average strong windy days is 57.9. Maximum wind speeds and directions and average stormy and strong windy day numbers are provided in Table 10.36 with graphical representations in Figure 10.29 and Figure 10.30.

Table 10.36 Aydın Meteorology Station Maximum Wind Speeds and Directions, Average Numbers of Stormy and Windy Days (1961-2015)

Months	Direction of Maximum Wind	Maximum Wind Speed (m/sec)	Average Number of Stormy Days*	Average Number of Strong Windy Days**
January	E	23.4	0.67	4.6
February	WSW	28.0	0.53	4.4
March	SW	27.5	0.56	4.6
April	SSE	29.5	0.25	4.7
May	SSW	21.5	0.09	4.7
June	NNE	22.3	0.22	5.8
July	NE	21.7	0.27	6.9
August	SE	25.6	0.31	6.8
September	N	20.0	0.15	5.3
October	WNW	27.5	0.15	2.7
November	SW	25.5	0.09	3.1
December	W	25.9	0.45	4.4

* Wind Speed >= 17.2 m/sec.
*** Wind Speed: 10.8 – 17.1 m/sec*

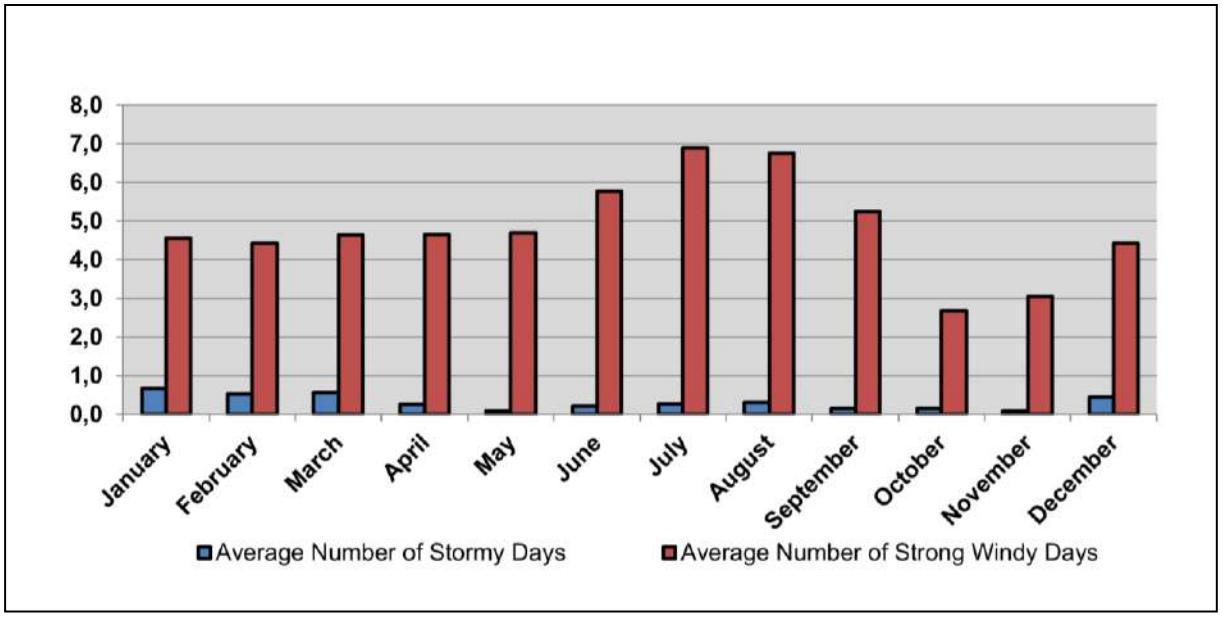


Figure 10.29 Aydın Meteorology Station Average Number of Stormy Days and Strong Windy Days

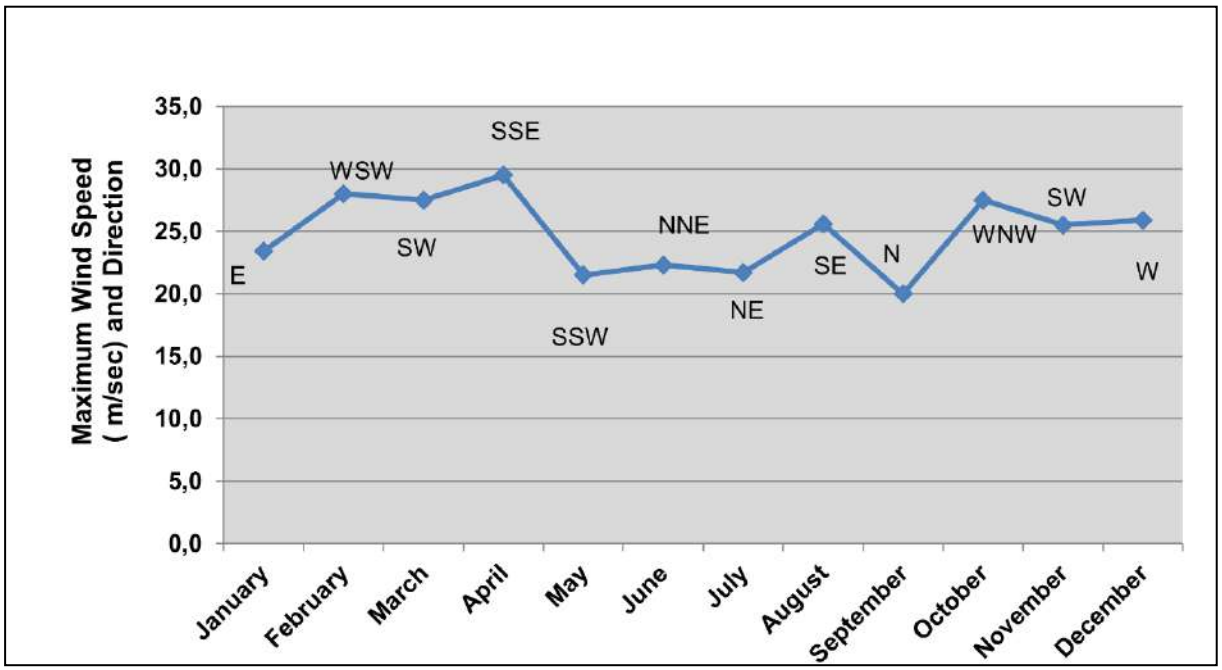


Figure 10.30 Aydın Meteorology Station Maximum Wind Direction and Speed

Peak Precipitation Values Observed on Standard Time and Precipitation Intensity-Duration-Frequency Curves

Precipitation intensity – duration – frequency curves recorded in Aydın Meteorology Station is given in Figure 10.31 and peak precipitation values observed on standard time in Aydın Meteorology Station is provided in Table 10.37.

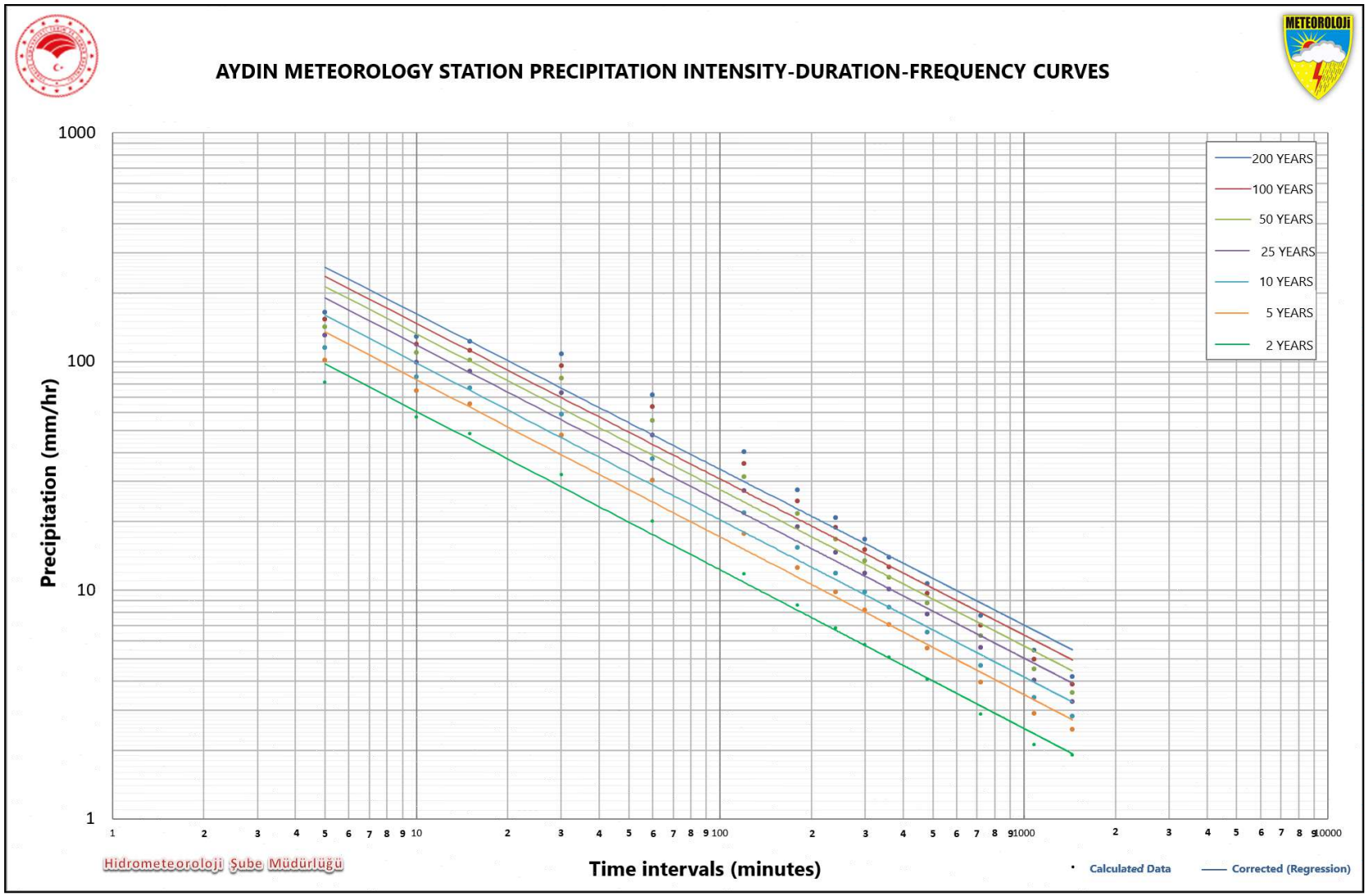


Figure 10.31 Aydın Meteorology Station Precipitation Intensity-Duration-Frequency Curves

Table 10.37 Aydın Meteorology Station Peak Precipitation Values Observed on Standard Time

OBS.	MINUTE				HOUR										
YEAR	5	10	15	30	1	2	3	4	5	6	8	12	18	24	24 +
2015	5.7	10.0	12.8	20.3	23.2	24.5	27.4	27.9	27.9	30.1	35.1	41.7	48.0	48.6	
2014	6.8	10.4	14.2	16.2	17.5	21.3	22.6	22.6	22.9	24.3	32.3	33.2	42.7	65.9	
2013	10.4	14.3	20.8	35.0	46.2	46.6	46.9	47.1	47.1	47.1	47.1	47.2	56.3	56.8	
2012	10.6	18.0	27.7	39.1	40.4	42.6	42.7	42.7	42.8	42.8	42.8	44.4	50.3	51.3	
2011	5.3	6.8	8.9	13.9	14.2	20.0	21.7	22.1	22.6	23.2	26.6	37.7	43.0	43.0	
2010	7.7	9.9	14.0	17.5	30.0	36.3	47.7	48.5	48.5	48.5	48.5	51.2	58.1	59.3	
2009	6.0	8.8	11.6	16.0	23.8	29.7	30.8	30.8	30.9	30.9	31.9	34.4	46.5	93.8	*
2008	4.8	9.1	12.0	13.4	13.4	16.9	20.6	23.3	24.2	24.8	24.9	24.9	25.0	33.0	
2007	4.8	8.0	11.3	18.1	34.2	58.9	59.5	59.6	59.6	59.6	59.7	60.1	60.4	60.6	
2006	6.4	9.2	14.1	20.5	24.7	27.2	29.4	31.3	31.6	31.9	32.8	43.2	47.5	48.7	
2005	6.0	9.0	9.0	13.9	19.2	30.7	34.4	35.4	35.5	37.9	38.9	38.9	47.2	50.9	
2004	5.9	9.2	12.4	18.5	24.8	25.4	29.6	29.7	29.7	33.3	44.1	44.1	48.2	51.6	
2003	10.7	21.3	32.0	59.8	78.1	87.3	87.4	91.4	91.4	91.4	91.6	91.7	91.9	92.0	
2002	7.0	12.8	16.4	22.7	23.3	24.5	24.5	24.5	26.6	30.1	30.2	30.2	34.3	47.2	
2001	4.1	6.0	6.4	7.9	12.8	19.8	22.9	23.5	23.6	23.6	23.6	23.6	24.9	63.7	*
2000	8.7	10.5	15.0	19.0	22.1	23.1	23.5	23.5	23.5	23.8	29.7	29.7	29.7	29.7	
1999	5.7	9.3	9.9	16.6	18.5	18.6	18.6	18.6	18.7	18.7	18.7	18.7	18.8	18.8	
1998	6.3	8.7	11.2	17.9	31.0	40.4	46.2	48.3	48.3	48.3	48.4	49.7	57.7	58.2	
1997	6.9	9.1	11.1	13.8	15.3	16.1	16.7	16.7	17.0	17.8	17.8	21.6	24.5	74.9	*
1996	6.8	8.4	13.1	19.6	27.8	28.0	30.4	31.4	31.4	31.4	31.5	31.5	31.6	42.1	
1995	8.1	11.1	14.9	21.1	23.0	23.8	24.1	24.2	24.2	24.6	24.7	24.8	24.9	33.6	
1994	5.4	7.1	9.7	13.6	14.5	22.9	29.9	36.1	40.0	42.6	45.6	53.1	53.7	53.8	
1993	1.6	2.7	3.5	5.9	9.0	13.6	15.0	16.0	16.1	18.6	19.7	21.2	23.0	48.1	*
1992	7.4	9.4	11.7	18.9	19.9	22.6	23.0	24.1	24.3	27.5	29.9	29.9	29.9	29.9	
1991	9.8	11.9	13.2	15.0	15.7	16.5	17.3	20.2	22.5	24.2	25.8	29.3	35.4	42.7	
1990	5.5	6.9	8.9	16.0	20.3	20.5	23.5	30.8	32.6	38.4	44.0	46.5	48.2	80.2	
1989	1.5	3.0	3.5	4.5	6.0	11.6	15.4	17.5	17.6	18.0	22.8	26.6	27.0	53.0	*
1988	7.8	8.8	9.0	9.3	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	34.2	*
1987	4.4	6.0	7.9	8.5	11.9	13.8	14.2	16.7	25.0	26.8	28.3	28.3	35.1	51.1	
1986	9.8	12.6	18.2	29.9	39.9	43.3	45.9	46.0	46.0	46.0	46.0	46.0	46.0	60.8	
1985	6.9	10.2	11.7	13.7	13.8	14.2	16.3	17.7	18.0	21.1	28.4	29.4	29.9	37.8	
1984	8.9	9.9	10.3	12.3	17.2	23.1	30.4	35.2	38.9	40.1	42.0	44.6	44.8	54.8	
1983	6.6	8.0	10.0	11.8	14.7	17.5	17.7	18.9	23.4	25.2	26.6	28.6	30.9	33.4	
1982	7.5	11.1	13.9	16.3	20.6	24.8	24.9	24.9	24.9	24.9	24.9	24.9	24.9	45.3	
1981	5.0	5.5	7.5	9.4	15.4	26.1	26.1	28.5	36.3	42.1	53.6	75.2	87.0	89.3	
1980	9.3	10.9	12.3	20.8	38.9	42.4	46.3	46.4	46.4	46.4	46.4	46.4	46.4	49.3	
1979	9.7	12.2	12.7	13.3	14.5	14.6	14.9	19.7	22.0	22.6	22.8	23.1	28.1	29.3	
1978	11.6	17.4	17.4	20.1	22.4	23.1	23.1	25.9	26.8	26.8	27.0	27.4	31.2	53.1	
1977	7.4	9.6	10.8	12.1	12.1	17.5	17.5	17.5	19.5	22.7	22.8	22.8	22.8	30.4	
1976	8.5	14.8	18.0	26.0	28.6	31.4	32.3	32.8	43.9	50.0	51.6	59.8	59.9	60.5	
1975	7.0	11.9	15.2	19.9	29.4	29.7	29.7	29.7	29.7	29.7	29.7	29.7	30.6	41.4	
1974	3.7	7.9	9.5	11.5	11.5	13.5	13.6	13.6	14.0	14.6	14.6	14.6	18.7	51.7	*
1973	4.0	6.5	8.7	9.7	18.0	20.2	22.1	22.7	24.5	25.4	29.3	29.5	30.0	55.3	

1972	7.1	10.8	12.6	14.7	18.2	19.5	20.5	20.5	20.5	20.5	20.5	21.6	22.6	25.9	
1971	6.3	7.3	8.4	9.0	11.3	15.7	22.6	29.4	35.5	39.7	42.3	43.8	47.8	50.5	
1970	5.2	8.3	8.5	14.4	16.6	22.9	24.2	24.4	26.1	27.1	27.2	27.6	28.2	39.7	
1969	4.0	6.5	9.8	13.7	13.8	15.1	15.8	15.9	15.9	16.9	17.4	20.2	41.7	48.6	
1968	5.0	6.8	9.1	11.6	12.4	17.3	23.4	25.2	29.3	33.7	37.0	39.5	48.8	48.8	
1967	5.2	7.4	12.4	16.8	21.0	23.9	28.5	29.3	29.3	29.3	29.3	29.4	32.6	34.2	
1966	5.6	9.0	12.1	20.8	23.3	23.4	23.4	23.4	23.4	23.4	23.4	26.6	28.2	37.5	
1965	6.0	6.9	7.2	8.7	17.4	24.3	26.9	26.9	29.5	31.9	33.6	33.6	34.2	39.5	
1964	8.7	8.7	8.7	8.7	8.7	9.7	11.6	12.0	12.2	12.2	15.1	17.6	17.6	68.8	*
1963	6.0	9.0	9.3	9.6	9.6	10.6	10.6	10.6	11.0	15.4	16.7	16.7	17.2	39.2	*
1962	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*
1961	5.5	7.4	8.7	9.0	9.4	17.2	17.2	17.2	17.9	17.9	17.9	17.4	20.3	35.7	
1960	9.0	12.0	14.7	15.0	16.2	17.1	17.1	18.9	20.3	21.8	23.6	28.0	38.4	52.3	
1959	3.3	5.2	6.3	7.6	9.2	9.4	9.4	14.9	20.0	20.4	20.4	25.6	32.4	56.9	*
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N	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**46**	**56**
Y-ORT	7.0	10.0	12.9	17.9	22.6	26.5	28.5	29.9	31.5	33.0	34.9	37.1	40.7	47.9	49.8
Y-EB	11.6	21.3	32.0	59.8	78.1	87.3	87.4	91.4	91.4	91.4	91.6	91.7	91.9	92.0	93.8
Std.S	1.95	3.24	4.80	8.91	11.91	13.31	13.55	13.69	13.48	13.43	13.53	14.80	15.56	15.03	15.88
Car.K	0.61	1.46	2.12	2.78	2.61	2.65	2.30	2.41	2.27	2.08	1.80	1.54	1.29	0.90	0.85
UDF	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**	**LN2**
2 YEAR	6.7	9.5	12.0	16.0	20.0	23.6	25.8	27.2	29.0	30.5	32.5	34.4	38.0	45.7	47.4
5 YEAR	8.5	12.4	16.3	23.8	30.3	35.2	37.7	39.3	40.9	42.5	44.6	47.6	51.9	59.1	61.6
10 YEAR	9.6	14.3	19.1	29.3	37.7	43.4	45.9	47.6	49.0	50.5	52.5	56.4	61.1	67.7	70.7
25 YEAR	10.9	16.6	22.7	36.6	47.6	54.3	56.8	58.4	59.4	60.6	62.6	67.5	72.6	78.1	81.8

50 YEAR	11.8	18.2	25.3	42.1	55.3	62.7	65.1	66.6	67.2	68.3	70.2	75.8	81.2	85.7	89.9
100 YEAR	12.7	19.9	27.9	47.9	63.2	71.4	73.6	75.0	75.2	76.0	77.7	84.2	89.8	93.2	97.8
200 YEAR	13.6	21.5	30.5	53.8	71.5	80.3	82.3	83.2	83.6	83.7	85.3	92.7	98.4	100.6	105.7
PLF	0.14	0.21	0.29	0.46	0.59	0.68	0.71	0.73	0.75	0.76	0.79	0.85	0.92	1.00	1.05
PLV	0.16	0.23	0.29	0.39	0.49	0.56	0.61	0.64	0.67	0.70	0.74	0.78	0.85	1.00	1.00

Extreme Meteorology Events Recorded in Aydın Meteorology Station

Long term extreme meteorology events report obtained from Aydın Meteorology Station is provided in Table 10.38.

Table 10.38 Extreme Meteorology Events Recorded at Aydın Station

Date	Location	Event	Description
1.09.2007	Aydın	High temperature	Stream water level has decreased or dried up
22.11.2008	Aydın	Storm	Residential areas damaged by storm
23.11.2008	Aydın	Storm	Residential areas damaged by storm
2.01.2009	Aydın	Rain and flood	The crops were laid
23.01.2009	Aydın	Storm	People, animals, transportation and settlements were damaged
26.01.2009	Aydın	Hail	Vegetable gardens damaged
9.02.2009	Aydın	Hail	Road transport was disrupted
19.02.2009	Aydın	Rain and flood	Cultivated farmlands flooded
26.01.2010	Aydın	Frost	Trees damaged by frost
16.10.2010	Aydın	Rain and flood	Residential areas damaged
10.12.2010	Aydın	Rain and flood	People, animals, transportation and settlements were damaged
22.01.2011	Aydın	Rain and flood	Cultivated farmlands flooded
17.05.2011	Aydın	Hail	Road transport was disrupted
10.06.2011	Aydın	Hail	Road transport was disrupted
16.06.2011	Aydın	Hail	Branches broke on trees
7.10.2011	Aydın	Rain and flood	Industrial crops damaged
09.10.2011	Aydın	Wind	People were damaged
07.12.2011	Aydın	Rain and flood	Railway transportation was disrupted
25.01.2012	Aydın	Rain and flood	Cultivated farmlands flooded
30.05.2012	Aydın	Rain and flood	Railway transportation was disrupted
03.06.2012	Aydın	Hail	The fruits on the trees fell
03.04.2013	Aydın	Full storm (24.5-28.4 m/s)	People, animals, transportation and settlements were damaged
17.07.2013	Aydın	Strong storm (20.8-24.4 m/s)	Trees uprooted
01.10.2013	Aydın	Storm Tornado	Trees uprooted
02.10.2013	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
27.04.2014	Aydın	Hail	Cultivated agricultural lands damaged
17.09.2014	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
13.11.2014	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
20.11.2014	Aydın	Heavy rain Flood, Overflood	Road transport was disrupted
08.12.2014	Aydın	Heavy rain Flood,	Residential areas damaged

Date	Location	Event	Description
		Overflood	
27.12.2014	Aydın	Heavy rain Flood, Overflood	Cultivated agricultural lands damaged
07.01.2015	Aydın	Frost	Cultivated agricultural lands damaged
31.01.2015	Aydın	Storm Tornado	Branches broke on trees
27.02.2015	Aydın	Storm Tornado	Residential areas damaged
06.04.2015	Aydın	Storm Tornado	Branches broke on trees
03.06.2015	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
03.06.2015	Aydın	Rain and flood	Residential areas damaged
06.08.2015	Aydın	Storm Tornado	Residential areas damaged
22.09.2015	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
21.10.2015	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
26.11.2015	Aydın	Storm Tornado	Residential areas damaged
03.01.2016	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
04.01.2016	Aydın	Heavy rain Flood, Overflood	Road transport was disrupted
07.01.2016	Aydın	Storm Tornado	Residential areas damaged
17.01.2016	Aydın	Storm Tornado	Residential areas damaged
17.01.2016	Aydın	Lightning Strike	People, animals, transportation and settlements were damaged
17.01.2016	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
23.03.2016	Aydın	Storm Tornado	Residential areas damaged
18.06.2016	Aydın	Severe cold and high temperature	Forest fire broke out
10.08.2016	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
20.08.2016	Aydın	Hail	Greenhouses damaged
03.09.2016	Aydın	Hail	Cultivated agricultural areas were damaged
20.09.2016	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
09.11.2016	Aydın	Storm Tornado	Residential areas damaged
29.11.2016	Aydın	Heavy rain Flood, Overflood	Road transport was disrupted
04.01.2017	Aydın	Heavy rain Flood, Overflood	Road transport was disrupted
06.01.2017	Aydın	Storm Tornado	Branches broke on trees
10.01.2017	Aydın	Snow	Road transport was disrupted
07.02.2017	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
30.03.2017	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
03.05.2017	Aydın	Hail	Cultivated agricultural areas were damaged
29.05.2017	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
12.06.2017	Aydın	Heavy rain Flood, Overflood	Cultivated agricultural areas were damaged
03.08.2017	Aydın	Heavy rain Flood, Overflood	Cultivated agricultural areas were damaged
05.08.2017	Aydın	Storm Tornado	Branches broke on trees
05.08.2017	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
28.02.2018	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
22.03.2018	Aydın	Storm Tornado	Branches broke on trees

Date	Location	Event	Description
30.04.2018	Aydın	Lightning Strike	People got hurt (Death/Injury)
11.06.2018	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
11.06.2018	Aydın	Hail	Cultivated agricultural areas were damaged
16.06.2018	Aydın	Hail	People, animals, transportation and settlements were damaged
30.07.2018	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
04.08.2018	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
17.11.2018	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
16.12.2018	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
24.01.2019	Aydın	Storm Tornado	People, animals, transportation and settlements were damaged
11.06.2019	Aydın	Hail	Cultivated agricultural areas were damaged
16.06.2019	Aydın	Hail	Cultivated agricultural areas were damaged
18.06.2019	Aydın	Storm Tornado	Trees uprooted
17.07.2019	Aydın	Heavy rain Flood, Overflood	Residential areas damaged
13.09.2019	Aydın	Lightning Strike	People got hurt (Death/Injury)
24.09.2019	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
05.02.2020	Aydın	Storm Tornado	Residential areas damaged
15.05.2020	Aydın	Severe cold and high temperature	Cultivated agricultural areas were damaged
23.06.2020	Aydın	Storm Tornado	People got hurt (Death/Injury)
09.08.2020	Aydın	Heavy rain Flood, Overflood	People, animals, transportation and settlements were damaged
12.09.2020	Aydın	Heavy rain Flood, Overflood	Residential areas damaged

10.2.3 Potential Impacts

10.2.3.1 Land Preparation and Construction Phase

During the construction phase of the project, GHGs will be generated as a result of operation of construction machinery and equipment for motorway construction, operations in quarries and material transportation.

The total GHG emissions for the construction of a 1 km section of each type of road is estimated by The World Bank Group (2011) and presented in Table 10.39. When compared to other road types, during construction, motorways are the roads where higher GHGs are emitted. It is also possible to present the breakdown of emission factors for different phases of construction such as earthworks, pavement, road furniture etc. Breakdown of GHG emissions for different steps of road construction for motorways is provided in Table 10.40. As can be observed from the table, pavement and construction of road structures are steps where highest GHG emissions are generated.

Table 10.39 Typical Unit GHG Emissions of Construction of Various Road Categories (WB Group, 2011)

	Expressway*	National Road	Provincial Road	Rural Road-Gravel	Rural Road - DBST
Emission (ton CO_2eq./km)	3,234	794	207	90	103

**Expressway is defined as divided highway used by high-speed traffic with controlled or partially controlled access.*

Table 10.40 Typical Breakdown of GHG Emissions for Expressways* (ton CO_2eq/km) (WB Group, 2011)

Construction Activity	Emissions (ton CO_2eq/km)
Earthworks	161
Pavement	1,334
Culverts	238
Structures	1,068
Road Furniture	432
TOTAL	**3,234**

**Expressway is defined as divided highway used by high-speed traffic with controlled or partially controlled access.*

Distribution of GHG emissions for different life cycle stages of construction off motorways such as transportation, fabrication/extraction of construction materials, machinery and equipment operations is provided in Table 10.41. As can be observed, material extraction is the main contributor to GHG emissions.

Table 10.41 Distribution of GHG Emission Factors for Construction Activities (WB Group, 2011)

Construction Activity	Emission Factors (ton CO_2eq/km)
Transport Emissions	1,004
Material Extraction Emissions	2,122
Machinery and Equipment Emissions	109
TOTAL	**3,235**

In order to predict the amount of GHG emissions generated during the construction of the motorway project, emissions are calculated for South Alternative according to the length of the motorway to be constructed and presented in Table 10.42.

Table 10.42 GHG Emissions from Road Construction Activities

Motorway Section	Length of the Section (km)	GHG Emissions (ton CO_2eq)
South Alternative	26	84,110

Total GHG gas emission generated as a result of road construction activities for the South Alternative is estimated as 84,110 tons CO_2eq. It should be noted that GHG emissions from the extraction of construction materials are accepted as the main contributor while transportation of materials is also a significant GHG producer. Distribution of GHG emissions for road construction activities is presented in Table 10.43.

Table 10.43 Distribution of GHG Emissions from Road Construction Activities

Construction Activity	GHG Emissions (ton CO_2eq)
	South Alternative
Transport Emissions	26,104
Material Extraction Emissions	55,172
Machinery and Equipment Emissions	2,834
TOTAL	**84,110**

Distribution of GHG emissions indicate that highest emissions are allocated to material extraction phase while when compared to transportation and material extraction, machinery and equipments are found to be responsible from lower GHG amounts.

10.2.3.2 Operation Phase

Potential impacts of the project on climate change would be through greenhouse gas emissions emitted during operation phase. Greenhouse gas emissions from the project are estimated in terms of CO_2eq which represents all of the greenhouse gas emissions in CO_2 form.

Inevitably, the estimation of amount of greenhouse gas emissions generated from operation activities of the Motorway includes some assumptions. Below bullets provide the main assumptions made in scope of the assessment.

- Main motorway lengths are considered in the assessment and emissions from transportation on access roads are omitted since they are relatively smaller in length.
- Traffic load data is obtained from traffic forecast provided in the Feasibility Report prepared for the Aydın-Denizli Project. In order to represent the worst case scenario, traffic projections for 2041 are considered (highest traffic flow data).
- It is assumed that traffic load for 2041 will be valid for each section and that vehicles travel through the whole length of the road section (This assumption represents the worst case, as in reality vehicles are not supposed to drive through the whole Motorway section).
- The Motorway is planned to be in operation after 2024. For the assessment, emission factor provided for 2024 in the WebTAG Databook Sheet A3.3. (Department for Transport, WebTAG Databook, July 2021, v1.15) is used (emission factors for further years are fixed and same as for 2024).
- Calculations were carried out by assuming all vehicles are passenger cars.
- Calculations were carried out for both petroleum and diesel fueled vehicles (Proportion of LPG (liquefied petroleum gas) fueled vehicles are included in petroleum fueled vehicle amount. This can be accepted as a worst case scenario as LPG is known to result in smaller amount of emissions).

Emission factor for greenhouse gas emissions was obtained from the WebTAG Databook Sheet A3.3. (Department for Transport, WebTAG Databook, July 2021, v1.15).

According to TurkStat 2022 data showing the distribution of cars registered to the traffic according to their fuel types, 37.6% of motor vehicles use diesel fuel while others use gasoline and LPG. This data is used to calculate the greenhouse gases generated by both types of vehicles. Traffic load data and distribution of the amount of petroleum and diesel vehicles are presented in Table 10.44.

Table 10.44 Traffic Load Data and Distribution of the Amount of Petroleum and Diesel Vehicles

Motorway Section	Traffic Loads (cars/day)	Traffic Loads (cars/year)	Traffic Load of Petroleum Vehicles (cars/year)	Traffic Load of Diesel Vehicles (cars/year)
South Alternative	21,034	7,677,410	4,713,929	2,886,706

GHG emissions from petroleum and diesel fueled vehicles are calculated for each motorway section and presented in Table 10.45 and Table 10.46. Within this scope, fuel consumption amounts, speed of vehicles and length of the motorway are taken into consideration.

Table 10.45 Greenhouse Gas Emissions from Petroleum Fueled Vehicles

Motorway Section	Length of the Section (km)	Fuel Consumption Amount* (L/km/car)	Design Speed (km/hr)	CO_2 Emission Factor (kg CO_2eq/L of fuel)	Traffic Load of Petroleum Vehicles (cars /year)	CO_2 Emissions (ton CO_2eq/year)
South Alternative	26	0.073	120	2.071	4,713,929	18,529

*Fuel consumption amount for petroleum vehicles are calculated from data provided in WebTAG Databook Sheet A 1.3.8. (*Department for Transport, WebTAG Databook, July 2021, v1.15)*

Table 10.46 Greenhouse Gas Emissions from Diesel Fueled Vehicles

Motorway Section	Length of the Section (km)	Fuel Consumption Amount* (L/km/car)	Design Speed (km/hr)	CO_2 Emission Factor (kg CO_2eq/L of fuel)	Traffic Load of Diesel Vehicles (cars/year)	CO_2 Emissions (ton CO_2eq/year)
South Alternative	26	0.069	120	2.420	3,502,166	15,205

*Fuel consumption amount for petroleum vehicles are calculated from data provided in WebTAG Databook Sheet A 1.3.8. (*Department for Transport, WebTAG Databook, July 2021, v1.15)*

As can be seen in Table 10.45 and Table 10.46, annual amount of greenhouse gases emitted from petroleum and diesel vehicles within the scope of South Alternative is around 20 thousand CO_2eq/year and 16 thousand tons CO_2eq/year, respectively. Total annual amount of emissions correspond to 0.36 million tons CO2eq. This amount corresponds to 0.063% of the 564.4 million tons CO_2eq, which is the total greenhouse gas emissions calculated for 2021 as reported by TurkStat (2023).

Carbon Capture Capacity

Carbon is retained in biomass, decomposing organic matter and soil in terrestrial ecological systems. Carbon stock in terrestrial ecological systems plays an important role in the global carbon cycle. Carbon is exchanged between ecological systems and the atmosphere through natural processes such as photosynthesis, respiration, decomposition and combustion. Human activities change the carbon stocks in ecological systems and alter the exchanges between the carbon pools and the atmosphere through land use and land use change (IPCC, 2000).

South Alternative is considered to have a potential impact on regional carbon stocks through removal of forests for motorway construction. In this section, the losses in carbon capture and oxygen generation capacities due to deforestation activities are estimated. Loss of carbon capture capacity is based on a comparative analysis of this capacity with regard to the official data held by the District and Sub-District Directorates of Forestry regarding the capacity that has been calculated to exist in the region of responsibility of each directorate. The region of responsibility is the geographical area/region where the directorate is responsible for managing all the forest areas and assets in this region (including provision of permits in the forest areas, reforestation/afforestation activities, tree planting and removing). As a result of this evaluation, the significance assessment has been made based on the calculated availability of carbon capture capacity and the forest area to be lost.

Number of trees to be removed and the area they occupy are determined and calculated from forestry inventory data in forest management plans of the relevant directorates (Aydın Districts Forestry Operation Directorate) and summarized in Table 10.47.

Table 10.47 Number of Trees to be Removed, Area Occupied and Total Forest Area

Number of Trees Removed	Area Occupied by Trees Removed (ha)	Total Forest Area Under Responsibility of the Directorates (ha)
61,678	248,64	151,400.60

Loss in the amount of carbon capture capacity and oxygen generation capacity is estimated from the data provided in the forest management plans and the amount of forest area to be lost in scope of the project and presented in Table 10.48.

Table 10.48 Loss of Carbon Capture Capacity and Oxygen Generation Capacity

Carbon Capture Capacity		
Total Carbon Capture Capacity of the Forest Area	tons	5,617,440
Loss of Carbon Capture Capacity	tons	15,061
Loss of Carbon Capture Capacity	%	0.27
Oxygen Generation Capacity		
Total Oxygen Generation Capacity of the Forest Area	tons	208,632
Loss of Oxygen Generation Capacity	tons	559
Loss of Oxygen Generation Capacity	%	0.27

As it can be seen in Table 10.48, loss of carbon capture capacity and oxygen generation capacity as a result of removal of forests corresponds to 0.27% of the total carbon capture and oxygen generation capacities of the forests in the responsibility of District and Sub-District Directorates of Forestry.

10.2.4 Mitigation Measures

The following section describes the actions and strategies designed to avoid, minimize or offset the potential adverse impacts of the project on climate change, or to enhance potential project benefits.

10.2.4.1 Land Preparation and Construction Phase

GHG emissions generated during land preparation and construction phase of the project can be considered as relatively short term emissions when compared to the emissions of operation of the motorway. Within this regard the following measures are suggested to mitigate the potential impacts of the project on climate change through greenhouse gas emissions:

- Construction operations of the project will be in line with good industrial practices.
- Speed restrictions will be adopted by construction vehicles and equipment to optimize fuel efficiency.
- Regular maintenance of construction vehicles and equipments will be applied.
- Energy uses associated with construction vehicles and equipment will be monitored.
- Trainings will be performed on site personnel regarding energy efficiency.

10.2.4.2 Operation Phase

The contribution of the project on climate change is estimated in above sections and found to correspond to 0.03% of the total amount of greenhouse gas emissions calculated for 2021 reported by TurkStat (2023). The GHG generated by transportation projects depend on a variety of issues such as vehicle fuel efficiency, motorway system improvements, travel behavior, speed regulations etc. Therefore mitigation of climate change through GHG emissions should be considered in context of a comprehensive and extensive plan to be applied nationally and on a global scale.

On the other hand, project proposes measures to offset the potential impacts. In contrast to the loss in carbon capture capacity and oxygen generation capacity as a result of trees removed for motorway establishment in scope of the Afforestation Plan prepared the carbon capture and oxygen generation capacity of the region will be improved (see Annex-4 for the Afforestation Plan). Within the scope of this plan, number, type and location of trees planned to be planted within the scope of the project are determined. The application of this plan will increase the carbon capture capacity and oxygen generation capacity and compensate the potential impacts. Implementation of the Afforestation Plan will be initiated in the construction phase and may continue through the initial phases of the operation period. In order to compensate for the loss of forest assets in the Project Area, it is advised that the planting would be five times of the number of trees to be removed from the Project Area. Practically it can be said that depending on the growing of trees, carbon capture and oxygen generation amounts to be reached with afforestation activities are expected to be five times the amount of loss.

It should also be noted that the traffic on existing road routes will shift on the planned motorway route. This means that the GHGs generated on the planned motorway would be emitted from existing road network.

10.2.5 Summary of Assessment and Residual Impact

Total annual amount of greenhouse gas emissions resulting from the project correspond to 0.15 million tons CO_2eq. This amount corresponds to 0.03% of the total greenhouse gas emissions calculated for 2021 as reported by TurkStat (2023). So, significance of the impact of the project on climate change is evaluated as low.

The summary of the assessment made in the general framework is provided in Table 10.68. Assessment based on sensitive locations/receptors, project stages, air quality measurement results and air quality modeling studies were made in this ESIA Report.

10.2.6 Impact of Climate Change on the Project

Changes in the air temperature and precipitation regimes in the future years are expected due to the impacts of the climate change. In order to analyze mentioned and other impacts of the climate change, modeling studies are carried out by generating various scenarios. These scenarios are defined as a specific pathway or storyline within the Shared Socioeconomic Pathways (SSPs) framework. The SSPs are developed by the Intergovernmental Panel on Climate Change (IPCC) to explore different possible futures based on varying combinations of socioeconomic development and climate policies. Based on the evaluations on these scenarios, two of these scenarios were chosen to assess the climate change vulnerability of the project. Two extreme SSP5-8.5 (Fossil Fuel Development Pathway) and SSP1-2.6 (Sustainability Pathway) scenarios were selected for the modeling study.

SSP1-2.6 (Sustainability Pathway):

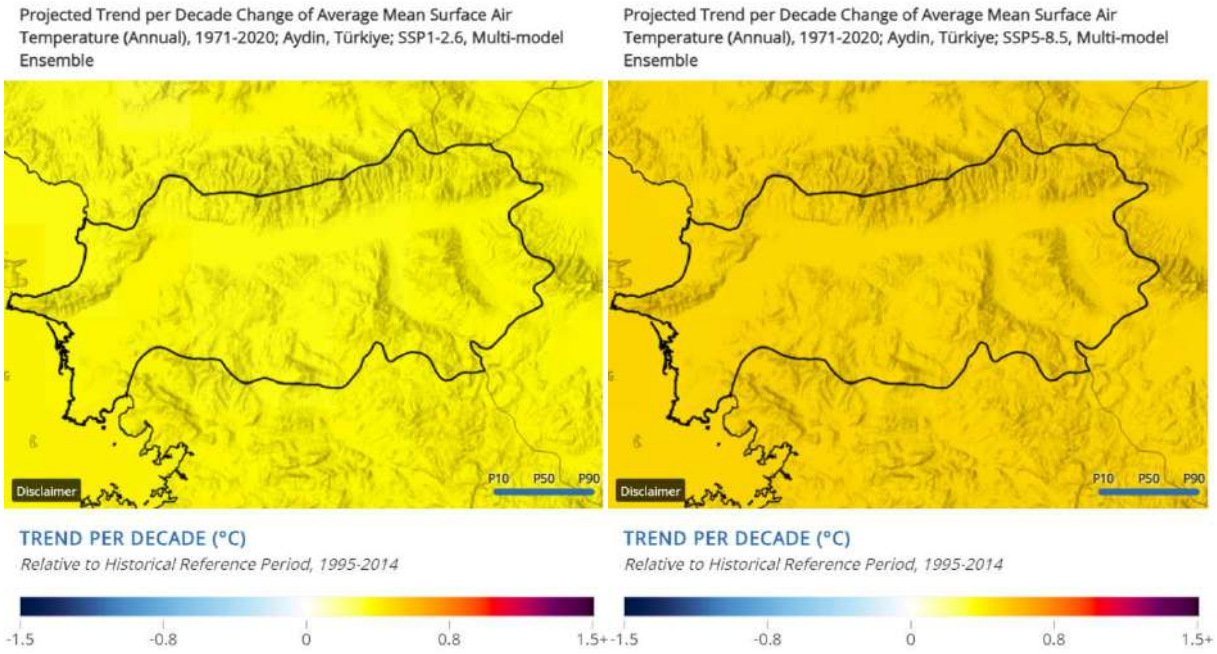
The SSP1-2.6 scenario, often referred to as the "Sustainability Pathway," envisions a future where strong efforts are made to achieve sustainable development goals and mitigate climate change. This scenario assumes a high level of international cooperation, rapid technological advancement, and ambitious climate policies aimed at limiting global warming to well below 2 degrees Celsius above pre-industrial levels by the end of the century. The SSP1-2.6 Scenario features robust economic growth coupled with equitable distribution of resources and wealth. Investments in education, healthcare, and infrastructure contribute to improved human well-being and social equality. Technological innovation plays a crucial role in SSP1-2.6, with widespread adoption of clean and renewable energy sources, energy-efficient technologies, and sustainable agricultural practices. Carbon capture and storage (CCS) technologies are deployed to reduce emissions from industries and power generation. Stringent

environmental regulations are implemented globally to limit greenhouse gas emissions and protect natural ecosystems. International cooperation is strong, with countries collaborating on climate mitigation efforts through mechanisms such as carbon pricing and technology transfer. As a result of these efforts, greenhouse gas emissions are significantly reduced, leading to a trajectory consistent with limiting global warming to 2.6°C or lower by the end of the century.

SSP5-8.5 (Fossil-Fueled Development Pathway):

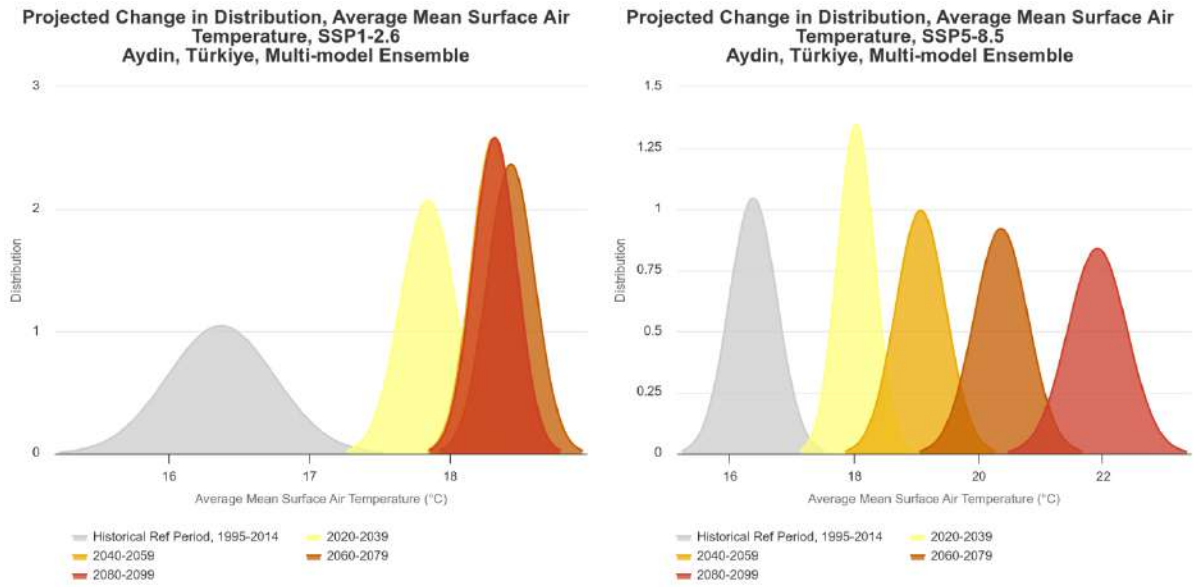
SSP5-8.5 represents a future where socioeconomic development is characterized by high population growth, rapid urbanization, and reliance on fossil fuels. In this scenario, there is limited international cooperation, and efforts to address climate change are insufficient to curb greenhouse gas emissions effectively. The SSP5-8.5 Scenario features uneven economic growth, with disparities in wealth and access to resources. Urbanization is rapid, leading to increased energy demand and environmental degradation in some regions. Technological progress in SSP5-8.5 is driven by market forces and economic considerations rather than sustainability goals. There is continued reliance on fossil fuels for energy production, transportation, and industrial processes, leading to high greenhouse gas emissions. Environmental regulations in SSP5-8.5 are relatively weak, and there is limited international cooperation on climate mitigation efforts. Policies prioritize economic growth and energy security over environmental protection. Greenhouse gas emissions continue to rise unchecked in SSP5-8.5, leading to significant global warming and associated climate impacts such as sea-level rise, extreme weather events, and ecosystem disruption. The trajectory of warming under this scenario exceeds 8.5°C above pre-industrial levels by the end of the century.

These scenarios represent two contrasting futures based on different socioeconomic pathways and climate policies, highlighting the importance of global action to address climate change and transition towards sustainable development. Future projections of precipitation and mean temperature changes for each scenario are given for Aydın province in the figures below.



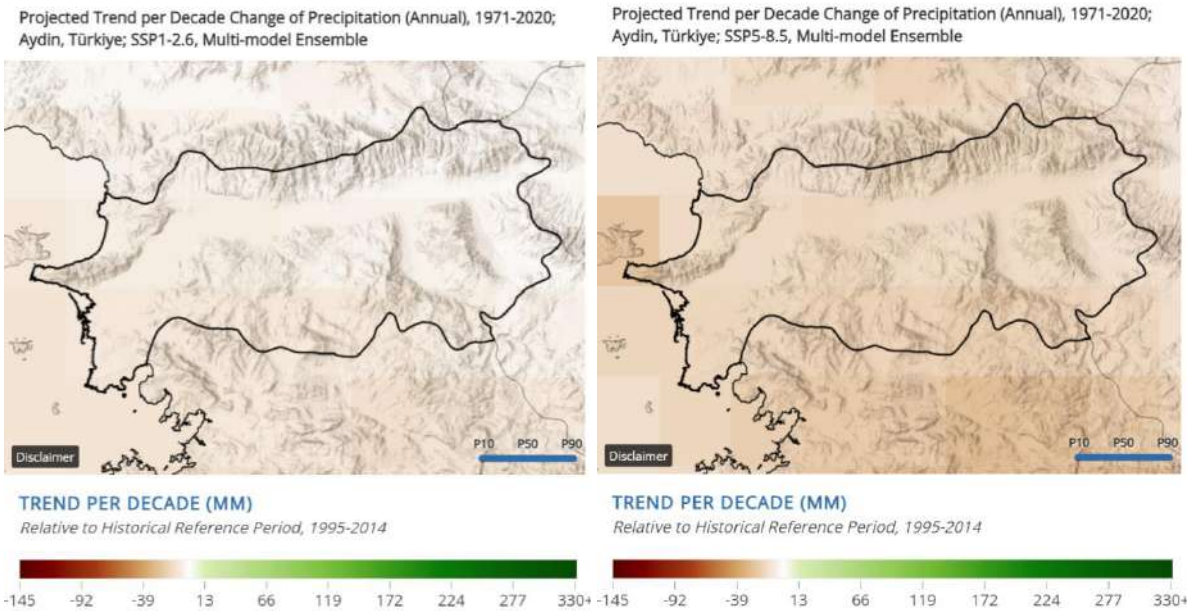
Source: World Bank, Climate Change Portal, 2024 (https://climateknowledgeportal.worldbank.org/country/turkiye/trends-variability-projections).

Figure 10.32 Projected Average Mean Surface Air Temperature Changes of Aydın per Decade until 2050 according to SSP1-2.6 and SSP5-8.5



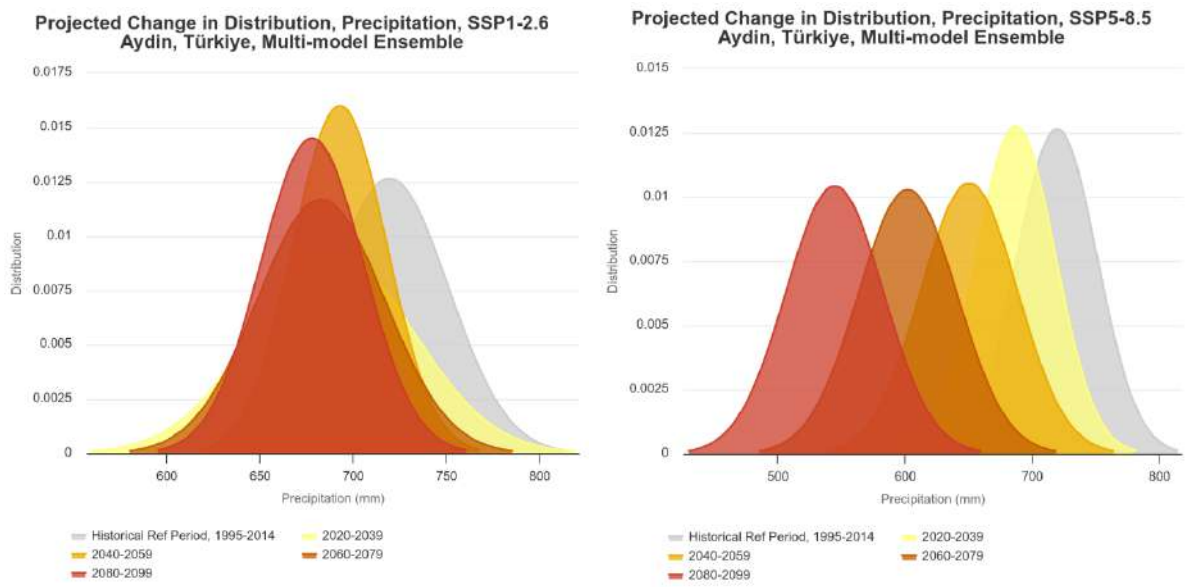
Source: World Bank, Climate Change Portal, 2024 (https://climateknowledgeportal.worldbank.org/country/turkiye/trends-variability-projections).

Figure 10.33 Projected Average Mean Surface Air Temperature Change Distributions of Aydın according to SSP1-2.6 and SSP5-8.5



Source: World Bank, Climate Change Portal, 2024 (https://climateknowledgeportal.worldbank.org/country/turkiye/trends-variability-projections).

Figure 10.34 Projected Precipitation Changes of Aydın per Decade until 2050 according to SSP1-2.6 and SSP5-8.5



Source: World Bank, Climate Change Portal, 2024 (https://climateknowledgeportal.worldbank.org/country/turkiye/trends-variability-projections).

Figure 10.35 Projected Precipitation Change Distributions of Aydın according to SSP1-2.6 and SSP5-8.5

The summary of the evaluations of the given images above are comprised below:

- According to SSP1-2.6 scenario, the average air temperature is expected to increase by approximately 1.4 degrees by 2039 and by approximately 1.9 degrees by 2059 while average precipitation is expected to increase by approximately 2 mm to 473.4 mm by 2039, and to decrease to 473.7 mm by 2059 in Aydın.
- According to SSP5-8.5 scenario, the average air temperature is expected to increase by approximately 1.6 degrees in Aydın by 2039 and by approximately 2.7 degrees by 2059 while average precipitation is expected to decrease by approximately 32.5 mm, reaching 686.9 mm by 2039, and to decrease further to 650.3 mm by 2059 in Aydın.

In Section 10.2.2, the meteorological conditions of the South Alternative are evaluated in terms of meteorological and climatic characteristics according to the observations of Aydın Meteorological Stations. According to Aydın Meteorology Station records, the number of annual average snowy days is 0.4 and annual average number of days with snow covered is 0.2. The average annual total number of frosty days is 10.65 with the highest average in January and the average annual total number of stormy days is 9.27 with the highest average in May (see Table 10.29).) According to these data;

- In the SSP1-2.6 scenario, characterized by low carbon emissions and sustainable development policies, a reduction in the number of snowy days and snow-covered days can be expected due to an overall warmer climate. The total frosty days might not show a significant change as frost events are primarily related to cold weather conditions, which may not change noticeably in this scenario. The total stormy days are not expected to change significantly in the SSP1-2.6 scenario due to the relatively lower impact of climate change.

- In contrast, the SSP5-8.5 scenario, characterized by high carbon emissions and low environmental policies, might lead to either a decrease or increase in snowy days and days covered with snow, but generally, a decrease is expected in a warmer climate. The total frosty days would likely decrease in the SSP5-8.5 scenario due to overall warmer temperatures and reduced frost occurrences. There might be an increase in total stormy days in the SSP5-8.5 scenario due to higher temperatures and more pronounced climate change effects.

Section 10.2.2.1 Meteorological and Climate Characteristics, as seen in Table 10.24, the highest temperatures of the year (above 40 degrees Celsius) were recorded in May, June, July, August and September. The lowest temperature was observed in January with an average temperature of -7.6 degrees. According to these data;

- In the SSP1-2.6 scenario, there might be an increase in the highest temperatures recorded during the seasonal months, but this increase is not likely to be significant. Given that the lowest temperature is recorded at -7.6 degrees Celsius in January, no significant change in average lowest temperatures is expected under the SSP1 scenario.

- In the SSP5-8.5 scenario, there could be an increase in the highest temperatures recorded during the seasonal months. Higher carbon emissions and increased greenhouse gases could elevate temperatures. Under the SSP5 scenario, with the lowest temperature recorded at -7.6 degrees Celsius in January, there might be an increase in average lowest temperatures.

Assessment of Possible Exposures Caused by Climate Change

As can be seen from the results of the scenario used to determine the impacts that may occur due to climate change, it has been revealed that extreme temperature changes and extreme precipitation may occur. The project infrastructure is likely to be affected by these extreme weather conditions. Potential impacts and adaptation measures to be taken are summarised in this section.

Water Drainage Infrastructures: It may cause deformations, cracking and corrosion in the materials and structure of water discharge substructures. Especially concrete structures can be sensitive to extreme temperatures and cold temperatures. While cracking may occur in materials that expand under extreme heat, brittleness and cracking of materials may occur under extreme cold.

As a result of changes in the amount, intensity and distribution of precipitation, water drainage infrastructures will be under more stress during excessive precipitation and the risk of floods may increase. In addition, impacts such as sea level rise may affect the design and resilience of drainage infrastructure. The Southern Alternative Motorway is located at the lowest elevation, 40-50 metres above sea level, and its access roads are approximately 50 km as the crow flies from the sea. At this distance, a natural event that may affect the region is likely to cause major damage to the areas between the motorway and the sea. Therefore, considering the 2050 scenarios, it is considered that sea level rise will not have an impact on the Project.

Extreme weather events can make it difficult to access infrastructure. Especially during heavy rainfall, problems such as clogging and cleaning of drainage systems may occur.

Working Days: Working in extreme heat can lead to heat-related illnesses such as heat exhaustion, heatstroke, and dehydration, impacting workers' health and productivity. High temperatures can decrease employees' concentration, physical endurance, and overall performance, leading to lower productivity levels. Extreme heat can create hazardous working conditions, increasing the risk of accidents and injuries among workers. High temperatures can also affect the functioning of machinery, electronics, and other equipment, causing delays and disruptions in work processes.

Working in extreme cold can result in health issues like frostbite, hypothermia, and respiratory problems, compromising workers' well-being and ability to work effectively. Cold temperatures can cause equipment malfunctions, frozen pipes, frost on the motorway, and other technical issues, impacting productivity and workflow.

Precipitation can lead to road closures, traffic congestion, and public transportation delays, affecting employees' ability to reach the workplace. Flooding and severe storms can damage buildings, roads, and utilities, causing disruptions in business operations and potentially leading to temporary closures.

In summary, extreme high and low temperatures, as well as extreme precipitation, can pose health risks, reduce efficiency, create safety hazards, disrupt transportation, and damage infrastructure, all of which can impact working days and business continuity.

Machinery and Equipment: Extreme hot weather conditions can adversely affect the performance of some machinery equipment. Electronic equipment can overheat and lose functionality when exposed to high temperatures. This is particularly crucial for computers, traffic control systems, and other sensitive electronic devices. Additionally, effects such as expansion of metal parts and changes in the viscosity of oils can also impact the mechanical components of machinery equipment.

Extreme cold weather conditions can also have adverse effects on machinery equipment. Materials such as lubrication systems, hydraulic systems, and plastic components may be less effective in extreme cold. Issues like freezing and becoming brittle can occur with metal parts. Additionally, extreme cold weather conditions can negatively impact the performance of chemical components such as batteries and accumulators.

Slope and Stability: Slope and pile stability depends on the type of soil, capillary structures, water permeability and water holding capacity. Water-absorbent soils such as clay may be more affected by precipitation, while sandy soils may allow water to pass through faster. The slope and height of the pile have a significant influence on stability. Steep slopes or high piles can be more susceptible to the impact of precipitation and therefore cause greater changes in stability. Both heavy precipitation and continuous moderate Precipitation can increase the saturation of the ground and the risk of erosion. Especially severe and prolonged precipitation can lead to soil erosion and the risk of landslides.

Adaptation Measures for Climate Change Impacts

Water Drainage Infrastructures:

- General hydrological considerations/design of the project will be in accordance with KGM design standards and AASHTO Highway Drainage Principles. In this regard, generally, 100-year flood flow will be taken into account on stream passage designs (Ref. State Highways Technical Requirements, Item 9.3). Minimum dimensions of all culverts will be 2m x 2m except discharge culverts.

- Culverts will be designed with one outlet whenever possible. In order to minimize changes in the hydrology and flow of water courses, design of structures will be done accordingly. The design will also ensure an appropriate capacity for culverts through embankments when flood plains are cut off.

- The design will be done in a way to minimize the risks of flooding. During the operation phase, reviewed Emergency Preparedness and Response Plan (See Annex-3) will be used to mitigate flood events.

- Storm water management practices that slow peak runoff flow, reduce sediment load, and increase infiltration, including vegetated swales (planted with salt-resistant vegetation), filter strips, terracing, detention ponds or basins, and infiltration trenches, will be planned.

Working Days:

- Adjustments will be made to working hours based on weather forecasts to avoid working during periods of extreme heat, heavy rainfall or high winds.

- Predicted changes in weather conditions will be monitored using meteorological stations and work schedule will be planned according to this information.

- Shaded rest areas will be provided for workers during hot weather periods, adequate water supply will be ensured and heat-related illnesses and injuries will be prevented by taking frequent breaks.

- During periods of cold weather, workers will be provided with appropriate protective equipment such as insulated clothing, gloves and shoes.

- Storm preparedness plans will be developed for workers that include procedures for evacuating work areas during storms or lightning storms.

- Workers will be trained on emergency response procedures specific to climate-related events.

Machinery and Equipment:

- Materials resistant to climate change will be selected. Regular maintenance/repair and monitoring of machinery equipment will be provided.

- Protection of machinery and equipment will be ensured through appropriate drainage system designs.

- Energy efficient machinery and equipment will be preferred to minimize the contribution to climate change.

- Emergency response plans will be developed for climate-related events that may have an impact on machinery and equipment. This will include equipment shutdown protocols, evacuation procedures, and emergency plans for rapid repairs and recovery.

Slope and Stability:

- Retaining walls will be constructed in certain sections to ensure ground and slope stability.

- Areas prone to slope instability resulting from climate change factors, such as increased precipitation, soil erosion or temperature fluctuations, will be identified and these areas will be constantly monitored.

- Water will be removed from the slopes using structures such as waterways, culverts and erosion control structures.

- Vegetation management measures will be implemented to stabilize slopes and reduce soil erosion.

- Comprehensive risk assessments will be conducted to identify potential hazards associated with slope instability in changing climate conditions.

- Provide training to employees on slope stability principles, climate change impacts and adaptation strategies.

International Requirements

There are some international agreements on combating climate change. These international agreements ensure that countries make common commitments to combat climate change. These

agreements may include efforts to reduce greenhouse gas emissions, increase the use of renewable energy, and adapt to climate change. International agreements are mentioned below:

The Paris Agreement is an international climate change agreement adopted in 2015 in the capital of France, Paris, under the United Nations Framework Convention on Climate Change (UNFCCC). This agreement represents a significant step worldwide for limiting global warming and combating climate change. Turkey signed the Paris Agreement and ratified it on April 22, 2016. Turkey's goals regarding the Paris Agreement are as follows:

- **Reduction of Greenhouse Gas Emissions:** Turkey has committed to reducing greenhouse gas emissions by 21% by 2030. Additionally, it has stated that with additional financial support and technology transfer, this reduction rate could be increased to 37%.
- **Renewable Energy:** According to Turkey's NDC (National Determined Contribution), the country aims to increase its renewable energy capacity to 120 GW by 2023. This goal includes investments in renewable energy sources such as wind, solar, hydroelectric, and biomass.
- **Energy Efficiency:** Turkey aims to achieve a 14% improvement in energy efficiency by 2023 according to its NDC. This goal involves improving energy efficiency in industrial facilities, implementing energy-saving measures in buildings, and using more efficient systems in transportation.
- **Conservation of Forests:** Turkey aims to conserve and increase its forest assets. This includes making forestry practices more sustainable, preventing forest fires, and combating erosion.
- **Climate Change Adaptation:** Turkey aims to adapt to climate change and increase its resilience capacity. This includes adaptation efforts in agriculture, water management, health, infrastructure, and ecosystems.

These goals represent Turkey's commitments under the Paris Agreement and outline the country's roadmap in combating climate change. Various policies, projects, and collaborations are being implemented to achieve these objectives.

The Kyoto Protocol was adopted in Kyoto, Japan, in 1997 under the United Nations Framework Convention on Climate Change (UNFCCC). It stands as the first international agreement aimed at reducing greenhouse gas emissions. Under the Kyoto Protocol, industrialized countries and economies were expected to reduce their greenhouse gas emissions with specific targets. These targets are mostly based on emissions levels from the year 1990 and are usually expressed in percentage terms. The Protocol primarily targeted the reduction of greenhouse gases such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (NO_x).

The Kyoto Protocol includes flexible mechanisms like emissions trading (cap and trade), Clean Development Mechanism (CDM), and carbon credits. These mechanisms encourage trade and cooperation among countries to achieve emission reduction targets in a cost-effective manner. The Protocol targeted industrialized and emission-responsible countries, including major economies like the European Union, the United States, Japan, Canada, and Australia.

The Protocol organized emission reduction commitments into specific periods. The first period covered the years 2008-2012, while the second period covered 2013-2020. The Protocol conducts regular reviews and evaluations to monitor member countries' commitments and progress.

Turkey signed the Kyoto Protocol but did not complete the ratification or commitment process. Therefore, Turkey is not officially a party to the Kyoto Protocol and has not undertaken the emission reduction targets set under this protocol. Later on, Turkey became a party to a more comprehensive climate change agreement like the Paris Agreement.

TCFD stands for Task Force on Climate-related Financial Disclosures. It is a global initiative established by the Financial Stability Board (FSB), an international organization that monitors and provides recommendations for the global financial system. TCFD aims to guide companies in providing consistent disclosures of climate-related financial risks to investors, lenders, insurers, and other stakeholders. It was launched in December 2015 as a voluntary framework. The TCFD framework aims to enhance transparency and enable investors, lenders, insurers, and other stakeholders to make more informed decisions regarding climate-related risks and opportunities. It has had a significant global impact, with many companies and financial institutions adopting TCFD recommendations in their reporting practices to demonstrate their commitment to climate-related financial disclosure and transparency.

The IPCC (Intergovernmental Panel on Climate Change) is a scientific organization established jointly by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988. Its purpose is to assess and share scientific information related to climate change with policymakers.

The IPCC evaluates and synthesizes current scientific data on climate change contributed by thousands of scientists worldwide. IPCC reports include assessments of the causes, impacts, possible scenarios, and solutions related to climate change. These reports serve as guidance for policymakers and other stakeholders globally. The IPCC's scientific assessments play a significant role in shaping and implementing climate change policies for governments and international organizations.By disseminating scientific data, findings, and recommendations, the IPCC educates governments, media, academic institutions, and the public, raising awareness about climate change.

Table 10.49 Summary of Air Quality Assessments

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource/Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Local Communities	Land preparation and construction	Increase in PM_{10} concentration	Adverse	Local	Medium	Low (0-25 % exceedance of air quality standard)	Short term reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)	• Dust should be minimized from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house filters or cyclones) • Dust should be minimized from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content • Speed limitations will be defined and obeyed for construction vehicles. • Well and adequate maintained vehicles shall be used. Regular maintenance of machinery and equipments will be ensured. • The drop height of potentially dust generating materials will be kept as low as possible. • Construction vehicles will not be permitted to keep engines running while waiting to enter the site or waiting on-site. • Dust suppression methods (i.e. watering with water trucks, applying non-toxic chemicals, speed limits for mobile vehicles, use of well-maintained vehicles/machinery) will be applied at road construction sites, service roads and quarry/material borrow/storage sites to mitigate Project-related dust emissions. In this respect, upper layers of the work sites/materials will be kept at a humidity level of about 10%. Watering will be applied at any time necessary including night time, weekends or off-days by using pressurized distribution or spraying systems that would ensure even distribution of water. • If there is traffic flow on the existing roads near the work sites, dust suppression measures will be continuously applied to ensure traffic safety. If there is no traffic existing in the local roads, dust suppression measures will be applied only at local residential and business areas. • All the dust-emitting components of the crushing-screening plants will be put in closed spaces and equipped with dust suppression systems. • Loading and unloading operations will be performed without throwing/scattering. • During transportation, excavated materials will be covered with nylon canvas or materials with grain size larger than 10 mm. • In the supply of construction materials, local licensed quarries (existing or new) will be preferred to reduce transportation distance to minimize associated impacts and costs. • Wind shields/barriers will be placed at work sites such as material storage areas to prevent dust dispersion where necessary. • Relevant provisions of the Regulation on Air Pollution Control Sourced from Industry and Regulation on the Assessment and Management of Air Quality will be complied with to minimize air emissions sourced from construction machinery and trucks. • Blasting operations will be conducted in line with the legislation in force and good industry practices/modern techniques. • Roads to be used for access to quarry sites will be upgraded by the Project Sponsors to minimize dust emissions during transport. These roads will have sufficient width. • Driving through settlements will be avoided wherever alternative roads are present. • Damage will be compensated when dust emission caused by insufficient watering is proved by methods such as measurement/observation.	Low
						Medium (25-50 % exceedance of air quality standard)			Moderate (B)	High (3)	High (B3)		Medium
						High(>50 % exceedance of air quality standard)			Major (A)	High (3)	High (A3)		Medium
Ecologically Sensitive Areas			Adverse	Local	Medium	Low (0-25 % exceedance of air quality standard)	Short term reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)		Low
						Medium (25-50 % exceedance of air quality standard)			Moderate (B)	High (3)	High (B3)		Medium
						High (>50 % exceedance of air quality standard)			Major (A)	Medium (2)	High (A2)		Medium
Local Communities	Operation	Increase in concentrations of gasous pollutants	Adverse	Local	Long	Low (0-25 % exceedance of air quality standard)	Irreversible	Continuos	Moderate (B)	Medium (2)	Medium (B2)	• At the service areas, a green buffer strip will be formed between the outer lane of the Motorway and the facilities. This strip will be properly planted (e.g. with shrubs that start growing from the base and are resistant to dust and gaseous emissions) to form a barrier against dust to be sourced from the motorway traffic. • The application of automatic toll systems along the motorway will contribute to an optimization of traffic flows and thus lower emissions.	Low
						Low (0-25 % exceedance of air quality standard)			Moderate (B)	High (3)	High (B3)		Medium
Ecologically Sensitive			Adverse	Local	Long	Low (0-25 % exceedance	Irreversible	Continuos	Moderate	Medium (2)	Medium (B2)		Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource/Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Areas						of air quality standard)			(B)				
			Adverse	Local	Long	Low (0-25 % exceedance of air quality standard)	Irreversible	Continuos	Moderate (B)	High (3)	High (B3)		Medium

CHAPTER 11

NOISE AND VIBRATION

11. CHAPTER – NOISE AND VIBRATION

This chapter assesses the likely impacts of the motorway project with respect to noise. Within this scope, construction and operation phases of the motorway are taken into consideration and impacts are evaluated accordingly. This chapter includes the following:

- Legislative framework for environmental noise assessment
- Baseline environmental noise measurements
- Assessment and quantification of potential project emissions
- Noise modeling with SoundPlan V 9.0 software for project land preparation and construction and operation phases
- Assessment of potential noise impacts
- Mitigation measures regarding noise impacts
- Residual impacts regarding noise impacts
- Assessment of potential impacts regarding vibration and relevant mitigation measures

11.1 Noise

Noise is defined as undesired sound that is loud or unpleasant or that causes disturbance. Sound consists of vibrations transmitted to the ear as rapid variations in air pressure. In other words, sound is a disturbance propagated through the air as a pressure wave. The fluctuations in atmospheric pressure are sensed by the ear. Frequency is the number of pressure fluctuations per second and is expressed in Hertz (Hz). In other words, the frequency of sound is the rate at which a sound wave oscillates, measured in number of cycles per second. The human ear is more sensitive to frequencies important for voice communication and hearing sensitivity decreases markedly at frequencies below about 250 Hz. The upper frequency limit of audibility is around 20 kHz. The frequency of the pressure wave is converted to pitch and its amplitude to loudness. Human ear can respond to a wide range of amplitudes and frequencies of sound.

The response of the hearing system to the amplitude of sound pressure is non-linear and can be characterized by a logarithmic relationship. The relationship is also frequency dependent and an adjustment or weighting is applied to the response of a microphone to different frequency components of a sound in order to produce a scale that better reflects the hearing system. In addition, in order to characterize sounds that fluctuate in intensity, it is necessary to derive a statistic that applies over a period of time.

Sound pressures are measured in units of Pascal (Pa). In order to cope with such a range of sound pressure values it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as sound pressure levels in decibels (dB).

Several different weightings have been proposed to convert measured sound pressure to a measure that correlates with perceived loudness in different circumstances. The ‘A’ weighting can be accepted as the most commonly used and correlates well with the perceived noisiness of road vehicles.

Traffic noise is a general term used to define the noise from traffic using the road network. A broad indication of typical traffic noise levels likely to be encountered at various distances from the road for two different traffic conditions is presented in Figure 11.1. The first is representative of a heavily trafficked road (about 150,000 vehicles per day) and the second a lighter trafficked road (about 50,000 vehicles per day).

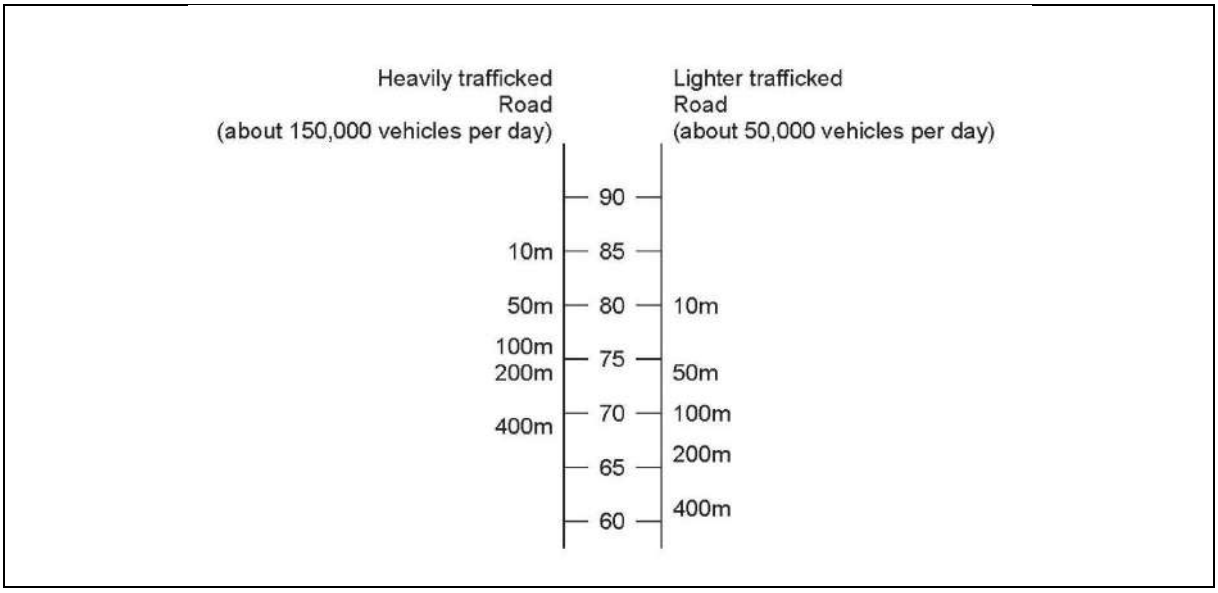


Figure 11.1 Example of Typical Traffic Noise Levels *(UK Highways Agency, 2011)*

11.1.1 Assessment Methodology and Data Sources

11.1.1.1 Legal Framework

Turkish Legal Requirements

Regulation on Environmental Noise Control (RENC)

Environmental noise in Turkey is regulated by the Regulation on Environmental Noise Control (RENC) published on 30.11.2022 in Official Gazette No 32029. This regulation is intended to ensure that precautions are taken to prevent disturbance to peace and tranquility and to ensure the physical and mental health of persons potentially exposed to environmental noise. For this purpose, the regulation sets out requirements regarding noise mapping, acoustic reporting, environmental noise assessment to determine noise exposure levels, and preparation and application of action plans to prevent or mitigate the negative impacts of noise exposure on human beings and the environment.

According to the Regulation on Environmental Noise Control, noise limit values defined to prevent noise from road projects are defined in Annex II, Table 1. Environmental noise limits are described in the regulation for existing and new roads and presented in Table 11.1

Table 11.1 Limit values for environmental noise levels

Noise Source	Measured Parameter	Environmental Noise Level		
		Day	Evening	Night
Industrial facilities, transport resources	$LA_{eq,5min.}$	65 dB(A)	60 dB(A)	55 dB(A)
Workplaces broadcasting music (1)	$LA_{eq\ 63\text{-}250\ Hz}$	60 dB(A)	55 dB(A)	50 dB(A)
Workplaces (2)	$LA_{eq,5min.}$	Arka plan + 5 dB(A)		Arka plan + 3 dB(A)
In case of more than one workplace (3)	$LA_{eq,5min.}$	Arka plan + 7 dB(A)		Arka plan + 5 dB(A)
All sources	LCmax	100 dB(C)		

(1): These limit values are valid as of 31.12.2023. These limit values are provided in each 1/3 octave band of the specified frequency range. In the acoustic reports prepared until this date; environmental noise measurement results and measures determined as a result of the measurement results taken are included.

(2): Workplaces broadcasting music and sea vessels are included.

(3): Each workplace that contributes to the background noise level is equally responsible for ensuring this limit value. Each workplace takes the necessary measures according to their contribution to noise.

In Annex-2 Article 10 of RENC It is stated that "The working hours of the construction activities of projects such as dams, bridges, tunnels, motorways, urban highways, mass housing which require public benefit and construction activities that will prevent daytime traffic in the city are determined by the decision of the Provincial Local Environmental Board." In this context, the permitted time zones for outdoor activities that cause environmental noise are given in Table 11.2.

Table 11.2 Permitted time frame for outdoor activities in residential areas

Name of the Activity	Activity Hours
Construction site activities	10.00-22.00
Outdoor activities that cause environmental noise	10.00-01.00
Use of fireworks	20.00-22.00
Blasting activities in mines, quarries and other areas	10.00-20.00

IFC Standards

Noise limit levels are described under Environmental, Health and Safety (EHS) Guidelines, General EHS Guidelines: Environmental, Noise. The noise limit values are based on World Health Organization Guidelines for Community Noise. Noise levels defined by IFC are presented in Table 11.3.

Table 11.3 Noise Level Guidelines of IFC

Receptor	One Hour LAeq (dBA)	
	Daytime 7:00 – 22:00	Nighttime 22:00 – 07:00
Residential, institutional, educational	55	45
Industrial, commercial	70	70

IFC requires that noise impacts should not exceed the levels presented in Table 11.3, or result in a maximum increase in background noise levels of 3 dB at the nearest receptor location off-site.

The IFC EHS Guideline also presents examples of noise reduction options that should be considered where noise levels exceed these guideline values, along with recommendations for noise monitoring to be carried out either to establish existing ambient noise levels or to verify operational noise levels.

In addition to IFC General EHS Guideline, IFC EHS Guideline for Toll Roads gives guidance on noise for road projects. It provides management practices to prevent, minimize and control noise, however, does not define noise limit values. The guidance on noise levels in this document is limited to an example from America and was found to have limited applicability to this project.

When European Directives are reviewed, Directive 2002/49/EC namely, the Environmental Noise Directive states that “Member States shall designate at the appropriate levels the competent authorities and bodies responsible for implementing this directive: (a) making and, where relevant, approving noise maps and action plans for agglomerations, major roads, major railways and major airports; (b) collecting noise maps and action plans. EU Environmental Noise Directive does not prescribe noise limits for new roads, such standards are foreseen to be set at national level (for member states). This directive requires that the Member States apply the noise indicators L_{den} and L_{night} for noise assessment.

To sum up, Turkish noise limits and IFC guidelines were used to assess the impacts of the project on environmental noise levels.

Significance Criteria

The significance criteria for the impacts regarding noise will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impacts, while sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 11.4.

Table 11.4 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	**Medium (2)**	**Low (1)**
Human Receptors	Educational, cultural, health facilities, places densely populated with summer houses and camping areas and/or areas densely populated with residences	Areas with dense work places/ industrial areas and areas not densely populated with residences	Industrial areas

Evaluation of the magnitude of impacts was based on the increase in baseline noise levels measured in settlements close to the motorway. The magnitude of impact is defined as low, medium and high when the result of the modeling study increases baseline noise levels of a specified location 3-6 dB(A), 6-9 dB(A) and more than 9 dB(A), respectively (see Table 11.5). In addition, regardless of the increase in baseline noise level, the magnitude of impact is classified as high when the results of the noise modeling study indicate an exceedance in noise limit values. According to IFC EHS Guideline impacts related to noise can result in a maximum increase in background noise levels of 3 dB at the nearest receptor location off-site. Therefore, it is accepted that increases in noise levels of a specified location up to 3 dB are acceptable (impact magnitude is defined as negligible).

Table 11.5 Impact Magnitude Criteria

Magnitude of Impact	Increase in Baseline Noise Level (L_{den} dBA)
Low	3-6 dBA
Medium	6-9 dBA
High	>9 dBA or noise modeling study indicates exceedance of noise limit values

11.1.2 Baseline Conditions

In order to assess baseline noise levels along the planned motorway route, baseline noise measurements were conducted, in September, 2023. Within this scope, 24-hour noise measurements were conducted at 5 measurement points for South Alternative as can be seen in Figure 11.2

The results of noise measurements are summarized in Table 11.6.

Table 11.6 Noise Measurement Results (September, 2023)

Districts	Coordinates (UTMWGS84 Zone 35)	According to the Classification Made in RENC Annex-II Table 1			According to the Classification Made in IFC Table 1.7.1	
		Leq Day (7:00–19:00)	Leq Evening (19:00-23:00)	Leq Night (23:00-07:00)	Leq Day (07:00-22:00)	Leq Night (22:00-07:00)
		dBA	dBA	dBA	dBA	dBA
Yenipazar	605505 / 4186287	50.7	50.1	44.4	50.8	44.2
Dereköy	601492 / 4184590	46.0	45.3	40.4	46.1	40.1
Alanlı-2	597914 / 4183834	51.0	50.3	44.7	51.1	44.6
Dalama-2	593238 / 4182857	48.1	46.9	41.4	48.1	41.2
Dereköy (Merkez)	591203 / 4183693	51.3	50.3	44.9	51.3	44.7

When the measurement results given above are evaluated for the RENC and IFC limit values, it is seen that the measurement results are well below the limit values in daytime, evening, and nighttime periods.

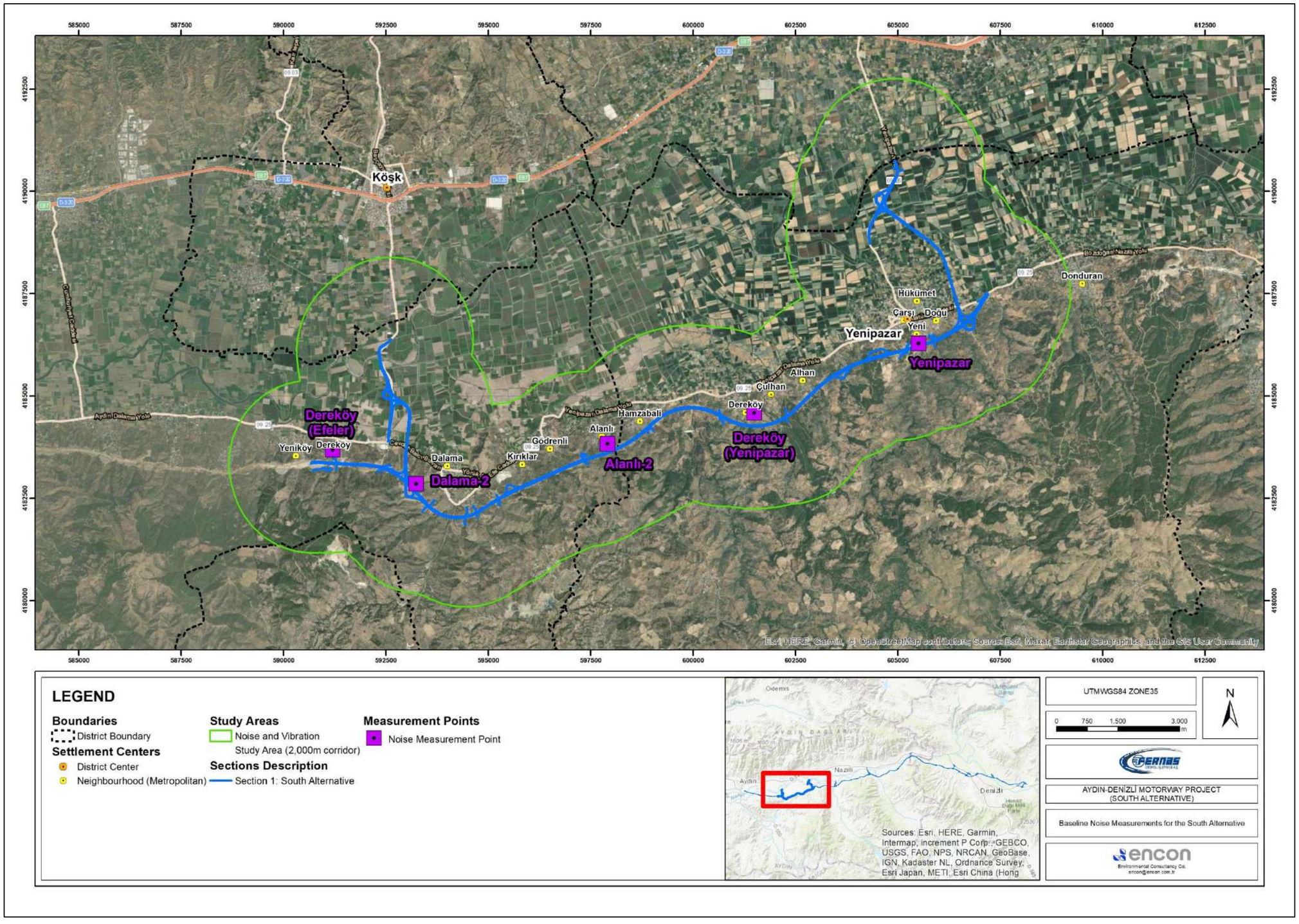


Figure 11.2 Baseline Noise Measurements for the South Alternative

11.1.3 Potential Impacts

Project land preparation and construction activities followed by the operation of the motorway are expected to result in increases in noise levels in the vicinity of the motorway route.

In order to predict the increase in noise levels in neighborhoods along the motorway route noise modeling was performed. For this purpose SoundPLAN V 9.0 (64 Bit) software was used. The modeling study aims the following:

- To predict noise levels due to construction activities of the project and preparation of noise maps.
- To predict noise levels during operation of the motorway and preparation of noise maps.
- To determine whether noise levels at a specified location exceed limit values defined in regulation and guidelines.
- Define mitigation measures to be used to decrease noise levels under acceptable values at specified locations.

Noise emissions for motorway were calculated with data provided in “Guide du bruit des transports terrestres, fascicule prevision des niveaux sonores CETUR 1980” which is a guidance suggested in RENC and EU Environmental Noise Directive and French standard -NMPB Road 96 - XPS31-133.

Noise mapping and calculations were carried out in accordance with the RENC Annex-III Guidelines for Strategic Noise Maps. The modeling results were evaluated according to the noise limit values for Industrial facilities, transport resources in the RENC (see Table 11.1) and the IFC noise limit value of 45 dB(A) at night (see Table 11.3).

11.1.3.1 Land Preparation and Construction Phase

Noise modeling for construction phase was carried out by modeling noise levels of construction machinery and equipment used during construction of the motorway. To be on the safe side and represent the worst case scenario, maximum number of construction machinery and equipment were taken into account. Noise intensity levels for the equipment are obtained from the database of SoundPlan software. In scope of the worst case scenario, it is assumed that all equipment operates simultaneously with 50% efficiency. Machines will work during the day, not at night.

Noise modeling for construction phase was performed with SoundPlan software at 4 meters height with 10*10 meter grids (see Noise Modeling and Assessment Report, Annex-8). Noise levels observed in nearest receptors which are all classified with high sensitivities are presented in Table 11.7

Table 11.7 Noise Modeling Results for Construction

	Measured			Measured		Calculated		Difference	
Measurement Point	**LEq Day (07:00-19:00)**	**LEq Evening (19:00-23:00)**	**LEq Night (23:00-07:00)**	**LEq Day (07:00-22:00)**	**LEq Night (22:00-07:00)**	**LEq Day (07:00-19:00)**	**LEq Day (07:00-22:00)**	**LEq Day (07:00-19:00)**	**LEq Day (07:00-22:00)**
Yenipazar	50.7	50.1	44.4	50.8	44.2	59.8	58.8	9.1	8
Dereköy	46.0	45.3	40.4	46.1	40.1	50.1	49.1	4.1	3
Alanlı-2	51.0	50.3	44.7	51.1	44.6	52.4	51.4	1.4	0.3
Dalama-2	48.1	46.9	41.4	48.1	41.2	63.5	62.6	15.4	14.5
Dereköy (Merkez)	51.3	50.3	44.9	51.3	44.7	49.0	48.0	-2.3	-3.3

When the table is examined, it is seen that the noise level of 65 dB(A), which is the limit value defined in Table 5.4.1, and 55 dB(A), which is the limit value defined in IFC, are not exceeded in the daytime at RENC. From the difference calculations, it is understood that the regions where background noise exceeds 5 dB(A) are Yenipazar and Dalama-2.

Noise assessment is carried out according to the worst case scenario where construction equipment and machinery are assumed to be working simultaneously with 50% efficiency at construction sites. Machines will work during the day in general. It is possible that the night-shift (with less capacity than day-shift) might be performed at the site. The noise emissions sourced from night-shift construction activities is expected to be in line with the regulation limit values.

Furthermore, the case in which all construction equipment are working simultaneously at the same locations with maximum noise intensity levels is not likely to occur in reality. In addition to this, atmospheric absorption will result in a decrease in noise levels with distance as construction activities will be conducted outdoors. Similarly, topographic conditions and vegetation are other factors that decrease noise. Still, under the worst case conditions, noise levels in the settlements caused by the construction phase of the project are below regulatory limit values. It can be foreseen that, when these factors are considered, the effect caused by construction activities of the project on nearby settlements will be lower.

11.1.3.2 Operation Phase

Noise modeling for operation phase of the motorway project was performed for the traffic projections for 2034.

Traffic flow data was distributed as day, evening and night presented in Table 11.8 and Table 11.9.

Table 11.8 Estimated light vehicle traffic data for 2034

Estimated light vehicle traffic data	Description	Number of Vehicles (Daily)		
		Day	Evening	Night
Daily	Aydın- Kuyucak	7,260	2,220	1,244
Hourly		605	555	155

Table 11.9 Estimated heavy vehicle traffic data for 2034

Estimated light vehicle traffic data	Description	Number of Vehicles (Daily)		
		Day	Evening	Night
Daily	Aydın- Kuyucak	2,083	824	754
Hourly		174	206	94

Assessment of noise impacts was performed by taking into account building use types along the motorway route and day, evening, and night noise levels were compared with limit values defined in RENC. Results of the modeling study and baseline noise measurements were evaluated and compared with limit values defined in RENC and mitigation measures were determined. Noise modeling was carried out within a 2000 m study corridor (1000 m at each side of the motorway's axis) and the study area was split into sections for noise mapping.

According to noise model results action plans and mitigation measures for areas where noise levels are above 55 dB(A). In Table 11.10, the measured background noise values and the noise values to be generated by the number of vehicles predicted for the year 2034 are given.

Table 11.10 Results of Noise Modeling for Operation

Measurement Point	Calculated			Calculated		Measured			Measured		Difference	Difference
	LEq Day (07:00-19:00)	LEq Evening (19:00-23:00)	LEq Night (23:00-07:00)	LEq Day (07:00-22:00)	LEq Night (22:00-07:00)	LEq Day (07:00-19:00)	LEq Evening (19:00-23:00)	LEq Night (23:00-07:00)	LEq Day (07:00-22:00)	LEq Night (22:00-07:00)	LEq Night (23:00-07:00) Difference	LEq Night (22:00-07:00) Difference
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
Yenipazar	53.6	55.0	51.8	53.9	52.3	50.7	50.1	44.4	50.8	44.2	7.4	8.1
Dereköy	57.4	57.9	54.1	57.5	54.7	46.0	45.3	40.4	46.1	40.1	13.7	14.6
Alanlı-2	59.9	61.3	58.2	60.2	58.7	51.0	50.3	44.7	51.1	44.6	13.5	14.1
Dalama-2	63.0	63.9	60.3	63.2	60.9	48.1	46.9	41.4	48.1	41.2	18.9	19.7
Dereköy (Merkez)	54.6	55.9	52.7	54.9	53.2	51.3	50.3	44.9	51.3	44.7	7.8	8.5

As shown in Table 11.10, the noise level was below the limit value of 55 dB(A) during the night in all regions.

According to the IFM regulation, the noise levels of 45 dB(A), which is the limit value defined during the night period, and 55 dB(A), which is the limit value defined during the day, are below the limit values in all regions.

As a result of noise modeling, when the number of vehicles in 2034 is reached, the regions that are predicted to exceed the defined noise levels in RENC (55 dBA) in the night time period are Yenipazar and Dereköy.

As a result of the noise modeling, it is seen that when the number of vehicles in 2034 is reached, the noise levels defined during the night time period in IFC will exceed the limit value (45 dBA) in all regions.

It is seen that the noise level of 60 dB(A), which is the limit value defined in the RENC in the evening time period, meets the limit values in all regions.

It is seen that the noise levels of 55 dB(A), which is the limit value defined in RENC for the nighttime period, and 45 dB(A), which is the limit value specified in IFC, are met in all areas. From the difference calculations, it is understood that the background noise level is exceeded by 5 dB(A) in all areas.

11.1.4 Mitigation Measures

11.1.4.1 Land Preparation and Construction Phase

In order to keep noise levels below acceptable national standards at the closest sensitive receptors to the source of noise, the following mitigation measures will be applied:

- Equipment and machinery with lower sound power levels and sound reduced models will be preferred.
- New vehicles, machinery and equipment will be used.
- Maintenance of construction machinery and equipment will be carried out regularly.
- Silencers will be installed on exhausts of vehicles and other equipment such as mechanical plants
- Portable barriers and acoustic enclosures will be used where appropriate (such as around equipment like generators)
- Speed limitations will be defined and obeyed for construction vehicles, particularly near sensitive use areas
- Traffic through residential areas will be avoided wherever possible and dedicated site access roads will be used to approach camp sites and quarries
- Construction of new access roads will be evaluated where required to avoid disturbance in residential areas.
- According to the environmental monitoring plan (see Chapter 20 “Environmental and Social Management System”), noise monitoring will be conducted during the construction phase and the effect of noise in near neighborhoods will be controlled regularly. In case of any inconsistencies with regulation limits, measures will be immediately taken to diminish the noise levels and to satisfy the standards.
- Potentially affected buildings which are sensitive to night time disturbance will be identified prior to construction works in the vicinity and night construction works will be limited accordingly.
- A community consultation program to inform the nearby residences, businesses and the local community will be undertaken when noise impacts are planned to occur.
- If any complaint related with noise is received through Project’s Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.

- Construction vehicles will not be permitted to keep engines running while waiting to enter the site or waiting on-site.
- Ancillary components in camp sites such as generators will be established by taking into account potential noise disturbances
- Motorway alignment will be used for transportation whenever possible
- Roads used during construction of the motorway will be well maintained.
- Site personnel will be trained to undertake construction activities using methods to reduce noise.

11.1.4.2 Operation Phase

- At the service areas, a green buffer strip will be formed between the outer lane of the Motorway and the facilities. This strip will be properly planted (e.g. with shrubs that start growing from the base and are resistant to dust and gaseous emissions as well as noise) to form a barrier against noise to be sourced from the Motorway traffic.
- During design phase of the project advantage will be taken from natural topography as a noise buffer.
- Route of motorway through residential areas will be prevented as much as possible.
- Application of action plans near suggested locations as a result of noise modeling study will be evaluated during further stages of project development. In addition, noise barrier establishment will be considered according to results of noise monitoring at specified locations after the approval of KGM as detailed in Environmental and Social Monitoring Plan (see Chapter 20).
- Action plans in accordance with Technical Specifications of KGM will be applied where applicable.
- If any complaint related with noise is received through Project's Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.
- Annual noise measurements will be done at critical receptors determined by noise modeling during the whole operation phase and the noise barriers would be provided in case the measurements would approach to the thresholds specified in RENC. If noise barriers, that will be constructed after the KGM approval, are insufficient for reducing the noise level at those areas additional measures such as landscaping will be implemented. Therefore, noise modeling and critical receptors will be revised based on design changes or other mitigation measures applicable at critical locations.

11.1.5 Summary of Assessment and Residual Impact

Although land preparation and construction phase have the potential to result in noise impacts, it is considered that implementation of above mitigation measures would ensure that noise limits defined in RENC would not be exceeded at noise sensitive receptors.

Regarding the operation of the motorway, after determination of receptors where noise levels exceed regulatory limits, further arrangements will be carried out for the application of action plans near suggested locations. For this purpose, for the implementation of noise barrier and other measures, background noise measurements should be made in sensitive receptors during the construction and operation phases and in cases where the results exceed the environmental noise limit values (specified in RENC), necessary measures should be carried out. In this respect, it is recommended that the process of taking measures will be determined after monitoring.

Summary of noise assessments are presented in Table 11.18. Significance of residual impacts is evaluated as "medium" to "low" for construction and "medium" for operation phases.

11.2 Vibration

Vibration is a low frequency disturbance producing physical movement in buildings and residents. Vibration can be measured in terms of Peak Particle Velocity, or PPV (i.e. the maximum speed of movement of a point in the ground during the passage of a source of vibration).

Construction activities can result in varying degrees of vibration depending on the equipment and methods used. Vibration from construction spreads through the ground and diminishes in strength with distance. Vibration can result in disturbance in settlements close to the point of operation and may result in risk of damage to structures in close vicinity. However, ground vibrations from construction activities rarely reach the levels that can damage structures but can achieve audible ranges in buildings close to site. Construction activities which typically generate the most severe vibrations are blasting and piling operations.

Construction of the motorway has the potential to cause vibration impacts as a result of activities such as piling, operation of vibratory equipment and blasting.

Operation of the motorway has the potential to cause nuisance through vibration. Vibration arising from motorway operation can be transmitted through air or through ground. Air vibration is generated by engines or exhaust of vehicles with frequencies of 50-100 Hz, while ground vibration is produced by interaction between vehicle wheels and road surface, observed in 8-20 Hz frequency range (UK Highways Agency, 2011).

11.2.1 Assessment Methodology and Data Sources

11.2.1.1 Legal Framework

Regulation on Environmental Noise Control

According to RENC Annex-2 Article 12, vibration standards defined in Table 3 for the limit values of ground vibrations caused by blasting in mines, quarries and similar areas cannot be exceeded. Table 4 of RENC Annex-2 presents the maximum permissible values of ground vibrations generated by railway and road transport vehicles, workplaces, and industrial facilities in the nearest structure and ground vibrations generated by machinery and equipment inside the building. According to Article 14 of RENC Annex-2, the limit values of ground vibrations caused by pile driving and similar vibration-generating operations in construction and construction machinery outside the nearest structure should meet the limit values in Table 5.

Maximum permissible vibration for sensitive and highly sensitive areas due to blasting in mines, quarries, etc. is presented in Table 11.11. The maximum permissible values of ground vibrations caused by railway and road transport vehicles, workplaces and industrial facilities in the nearest building and ground vibrations caused by machinery and equipment inside the building are presented in Table 11.12. The maximum permissible vibration for sensitive and highly sensitive areas caused by pile driving and other vibration-inducing activities and heavy construction vehicles during construction is presented in Table 11.13.

Table 11.11 Vibration Limits for Quarries

Structure Type		Maximum Vibration Velocity at the Foundation of Buildings, (mm/s) (according to frequency, f=Hz)			On the top floor[(2)] slab for all frequencies
		f= 1-10	f=10-50	f=50-100[(1)]	
1	Industrial buildings	20	40	50	40
2	Durable structures such as houses, bricks, and concrete	5	15	20	15
3	Buildings, historical and natural structures that are sensitive to vibration and are not included in items 1 and 2 [(3)]	2	8	10	8

(1) For frequencies greater than 100 cycles/sec, a large vibration level is permissible.

(2) For buildings with more than one floor, measurements should be taken both at the foundation of the building and at the slab of the top floor.

(3) These limit values determined for historical and natural structures may be restricted by precise, comprehensive vibration measurements and scientific studies to be carried out on-site.

Table 11.12 Vibration Limits for Ground Vibrations Caused by Road Transport Vehicles, Workplaces and Industrial Facilities in The Nearest Structure

	Frequency of Vibration (Hz)	Maximum Allowed Vibration Speed (rms value (mm/s))
Residential buildings	1[(1)]	1.5
	8-100	0.3
In the offices	1[(2)]	3.5
	8-100	0.6
Historical and natural structures [(4)]	1[(3)]	0.8
	8-100	0.1

(1): The maximum permissible vibration speed is determined according to the vibration frequency in the graph drawn logarithmically with the specified values.

For example, between 1 Hz-8 Hz, it decreases linearly from 1.5 mm/sec to 0.3 mm/sec in the logarithmic graph.

(2): The highest permissible vibration speed is determined according to the vibration frequency in the graph drawn logarithmically with the specified values.

For example, between 1 Hz-8 Hz, it decreases linearly from 3.5 mm/sec to 0.6 mm/sec in the logarithmic graph.

(3): The highest permissible vibration speed is determined according to the vibration frequency in the graph drawn logarithmically with the specified values.

For example, between 1 Hz-8 Hz, it decreases linearly from 0.8 mm/sec to 0.1 mm/sec in the logarithmic graph.

(4): These limit values determined for historical and natural structures can be limited by precise, comprehensive vibration measurements and related scientific studies to be carried out on site.

Table 11.13 Vibration Limits for Construction

Area/Receptor	Maximum Allowed Vibration (Peak Particle Velocity in-mm/s)*	
	Continuous Vibration	Discontinuous Vibration
Residential Areas	5	10
Commercial Areas	15	30
Historical and Natural Structures[(1)]	2	5

(1): These limit values determined for historical and natural structures may be limited by precise, comprehensive vibration measurements and scientific studies to be carried out on-site.

**Frequency: 1-80 Hz*

IFC Standards

IFC Environmental, Health and Safety Guideline for Construction Materials Extraction states that the most significant vibration emissions are usually associated with blasting during material extraction and suggests techniques to minimize and control vibration impacts. IFC guidelines do not define any standards for vibration.

Significance Criteria

The significance criteria for the impacts regarding vibration will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impacts, while sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 11.14.

Table 11.14 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	Medium (2)	Low (1)
Residential Areas	Neighborhood/village part of it (>20)	More than few number (10-20) of residential buildings	Few (1-10) residential buildings

11.2.2 Baseline Conditions

Baseline conditions regarding vibration indicate that, currently, no significant source was identified to cause vibration for South Alternative.

11.2.3 Potential Impacts

11.2.3.1 Land Preparation and Construction Phase

Land preparation and construction of the motorway has the potential to cause vibration impacts as a result of activities such as piling, operation of vibratory equipment, and blasting.

Construction of the motorway with operation of heavy vehicles is likely to affect a particular location for a relatively short term. Primary concern with regard to construction vibration is building damage. In addition to building damage, nuisance to residents in close vicinity is also a concern.

The Construction Noise and Vibration Guideline (NSW Government, Transport, Roads and Maritime Services, 2016) recommends minimum working distances for vibratory construction equipment from sensitive receptors (see Table 11.15). The minimum working distances vary according to particular equipment types and also local geotechnical conditions. It is observed that maximum 100 meter distance should be left to prevent human nuisance while building damages are generally likely to be observed in smaller distances.

Table 11.15 Recommended Minimum Working Distances for Vibratory Equipment from Sensitive Receptor

Equipment	Description	Minimum Working Distance	
		Cosmetic Damage	Human Response
Vibratory Roller	<50 kN (typically 1-2 tons)	5 m	15 m to 20 m
	<100 kN (typically 2-4 tons)	6 m	20 m
	<200 kN (typically 4-6 tons)	12 m	40 m
	<300 kN (typically 7-13 tons)	15 m	100 m
	<300 kN (typically 13-18 tons)	20 m	100 m
	<300 kN (>18 tons)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m	4 m
Jackhammer	Hand held	1 m	2 m

In order to evaluate the potential impacts with respect to vibration, buildings within 400 m buffer (200 m from each side of motorway's axis to be on the safe side for assessment) are determined with Google Earth analysis. Sensitivity levels for each settlement are determined and presented in Table 11.16. Sensitivities of the receptors are classified according to the density of buildings located within 400 m buffer.

Table 11.16 Sensitivity of Settlements to Vibration along the Motorway Route

Receptor / Location	Sensitivity of the Receptor
Yeniköy / Efeler	Low(1)
Dereköy / Efeler	High (3)
Dalama / Efeler	High(3)
Kırıklar / Efeler	Low(1)
Gödrenli / Efeler	Low (1)
Alanlı / Efeler	High(3)
Hamzabali / Yenipazar	High(3)
Dereköy / Yenipazar	High(3)
Çulhan / Yenipazar	Low (1)
Alhan / Yenipazar	Medium(2)
Yeni / Yenipazar	High(3)
Çarşı / Yenipazar	Low(1)
Doğu / Yenipazar	High(3)
Hükümet / Yenipazar	High(3)
Donduran / Yenipazar	Low(1)

In the absence of mitigation measures, vibration damage and nuisance is possible, based on the worst case estimation of vibration at the building located very close to motorway construction areas. However, it should be noted that all impacts related with land preparation and construction phase will be intermittent and temporary (short-term reversible) impacts for at most 3 years.

11.2.3.2 Operation Phase

Vibration perceived in a building structure close to a road with heavy traffic load is generally below 1 mm/s and found to rarely exceed 2 mm/s. This corresponds to normal levels of vibration generated during normal use of a building (example, walking and closing doors). It is known that, structural damage caused by vibration to buildings can occur above 10 mm/s levels which correspond to 10 times higher vibration levels expected from roads. (UK Highways Agency, 2011) So, operation of a motorway is unlikely to cause significant vibration impacts on properties located in the vicinity.

Table 11.17 shows human response levels to continuous vibration from traffic. With vibration levels of 1-2 mm/s observed in heavy traffic roads, human response to vibration will be kept at perceptible levels and not reach annoying levels.

Table 11.17 Human Response to Continuous Vibration from Traffic *(Jones & Stokes, 2004)*

Vibration (PPV – mm/sec)	Human Response
10.16-15.24	Unpleasant
5.08	Annoying
2.54	Begins to annoy
2.03	Readily perceptible
0.15-0.48	Threshold of perception

11.2.4 Mitigation Measures

11.2.4.1 Land Preparation and Construction Phase

Blasting operations to be conducted at the Dalama 2 quarry will result in intermittent vibration impact. Following measures will be taken to avoid and/or minimize relevant impacts on the local people:

- Prior to the blasting operations, sensitivity of nearby settlements/buildings against noise and vibration will be assessed. Aboveground blasting operations will not be conducted in close vicinity (within a 100 meter radius area) of the residential areas/neighborhoods if construction with other methods is feasible at that location.
- Accordingly, explosive charges will be optimized. Relevant records will be kept during the blasting operations and blasting related impacts will be monitored.
- Vibration due to blasting will be minimized by applying modern blasting techniques. Blasting operations will be conducted using millisecond delays with low charge weight to be determined based on the geological formation and rock density.
- Number of holes to be blasted at one shot and total charge amounts per shot will be optimized to ensure compliance with the regulatory limit values and minimize flyrock incidents. All blast vibrations will be monitored by using vibrometers to be placed at suitable locations and records on charge amounts, delays provided, distance to blasting locations and relevant vibration levels will be kept.
- During the blasting activities, limit values described in the Regulation on Environmental Noise Control for ground vibrations will be complied with. Records on air shock and vibration measurements will be kept and compliance with regulatory limit values will be checked to minimize impacts on local people.
- Vibration due to blasting operations will be monitored and grievance mechanism will be active for any complaints related to vibration impacts. If any complaints related with vibration are received through Project's Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.
- Construction works will be designed and scheduled to reduce vibration and adverse effects.
- Blasting will be carried out at dedicated times in order to prevent nuisance.
- Construction machinery and equipment will be operated by taking into account the recommended minimum working distances presented in Table 11.15.

11.2.4.2 Operation Phase

If any complaint related with vibration is received through Project's Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.

11.2.5 Summary of Assessment and Residual Impact

Main sources of vibration during construction can be listed as piling, operation of vibratory equipment and blasting. As a result of the assessment, vibration arising from project construction activities is likely to result in short term disturbance at close settlements with different sensitivities which can be avoided by mitigation measures suggested above. Table 11.18 provides a summary on the vibration assessments. Residual impacts regarding vibration vary from medium to low for construction depending on the sensitivity of the receptor and type of activity.

Table 11.18 Summary of Noise and Vibration Assessments

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/Value of Resource/Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Local Communities	Land preparation and construction	Increase in noise levels	Adverse	Local	Medium	Low	Short term reversible	Intermittent	Moderate (B)	High (3) Yenipazar	High (B3)	• Equipment and machinery with lower sound power levels and sound reduced models will be preferred. • New vehicles, machinery and equipment will be used. • Maintenance of construction machinery and equipment will be carried out regularly. • Silencers will be installed on exhausts of vehicles and other equipment such as mechanical plants • Portable barriers and acoustic enclosures will be used where appropriate (such as around equipment like generators) • Speed limitations will be defined and obeyed for construction vehicles, particularly near sensitive use areas • Traffic through residential areas will be avoided wherever possible and dedicated site access roads will be used to approach camp sites and, quarries. Construction of new access roads will be evaluated where required to avoid disturbance in residential areas. • According to the environmental monitoring plan under Project ESMS, noise monitoring will be conducted during the construction phase and the effect of noise in near neighborhoods will be controlled regularly. In case of any inconsistencies with regulation limits, measures will be immediately taken to diminish the noise levels and to satisfy the standards. • Potentially affected buildings, which are sensitive to night time disturbance, will be identified prior to construction works in the vicinity and night construction works will be limited accordingly. • Construction vehicles will not be permitted to keep engines running while waiting to enter the site or waiting on-site. • Ancillary components in camp sites such as generators will be established by taking into account potential noise disturbances • Motorway alignment will be used for transportation whenever possible • Roads used during construction of the motorway will be well maintained. • Site personnel will be trained to undertake construction activities using methods to reduce noise.	Medium
										Medium (2) Alanlı-2, Dalama-2, Dereköy, Dereköy(Merkez)	Medium (B2)		Low
		Vibration	Adverse	Restricted	Medium	High (3) Vibration due to blasting to be conducted in quarries	Short term irreversible	Intermittent	Major (A)	High (3)	High (A2)	• Prior to the blasting operations, sensitivity of nearby settlements/buildings against noise and vibration will be assessed. Aboveground blasting operations will not be conducted in close vicinity (within a 100 meter radius area) of the residential areas/neighborhoods if construction with other methods is feasible at that location. • Accordingly, explosive charges will be optimized. Relevant records will be kept during the blasting operations and blasting related impacts will be monitored. • Vibration due to blasting will be minimized by applying modern blasting techniques. Blasting operations will be conducted using millisecond delays with low charge weight to be determined based on the geological formation and rock density. • Number of holes to be blasted at one shot and total charge amounts per shot will be optimized to ensure compliance with the regulatory limit values and minimize flyrock incidents. All blast vibrations will be monitored by using vibrometers to be placed at suitable locations and records on charge amounts, delays provided, distance to blasting locations and relevant vibration levels will be kept. • During the blasting activities, limit values described in the Regulation on Environmental Noise Control for ground vibrations will be complied with. Records on air shock and vibration measurements will be kept and compliance with regulatory limit values will be checked to minimize impacts on local people. • Vibration due to blasting operations will be monitored and	Medium
						Medium (2) Vibration due to blasting to be conducted for motorway excavation		One-off	Moderate (B)	Medium (2)	Medium (B2)		Low
										Low (1)	Low (B1)		Low
						Low (1) Vibration due to operation of heavy construction vehicles		One off	Minor (C)	High (3)	Medium (C3)		Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/Value of Resource/Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
										Medium (2)	Low (C2)	grievance mechanism will be active for any complaints related to vibration impacts. If any complaints related with vibration are received through Project's Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented. • Construction works will be designed and scheduled to reduce vibration and adverse effects. • Blasting will be carried out at dedicated times in order to prevent nuisance. • Construction machinery and equipment will be operated by taking into account the recommended minimum working distances presented in Table 11.14.	Low
										Low (1)	Low (C1)		Low
	Operation	Increase in noise levels	Adverse	Local	Long	High	Irreversible	Continuous	Major (A)	High (3) Dereköy, Alanlı-2, Dalama-2	High (A3)	• At the service areas, a green buffer strip will be formed between the outer lane of the Motorway and the facilities. This strip will be properly planted (e.g. with shrubs that start growing from the base and are resistant to dust and gaseous emissions as well as noise) to form a barrier against noise to be sourced from the Motorway traffic. • During design phase of the project advantage will be taken from natural topography as a noise buffer • Route of motorway through residential areas will be prevented as much as possible • Usage of road surface material generating less noise will be used as appropriate. • Application of action plans near suggested locations as a result of noise modeling study will be evaluated during further stages of project development. In addition, noise barrier establishment will be considered according to results of noise monitoring at specified locations after the KGM approval as detailed in Environmental and Social Monitoring Plan (see Chapter 20). For this purpose, the measurements will be carried out at subject locations at the operation stage and in case the results are exceeding the limits and thresholds specified in RENC, the construction of the noise barriers will be subject to be implemented after the KGM approval. • Action plans in accordance with Technical Specifications of KGM will be applied where applicable. • If any complaint related with noise is received through Project's Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.	Medium
						Medium			Moderate (B)	High (3) Yenipazar, Dereköy(Merkez)	High (B3)		Medium
		Vibration	Adverse	Restricted	Long	Low	Irreversible	Intermittent	Moderate (B)	High (3)	High (B3)	• If any complaint related with vibration is received through Project's Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.	Medium
										Medium (2)	Medium (B2)		Low
										Low (1)	Low (B1)		Low

CHAPTER 12

PROTECTED AREAS LANDSCAPE AND VISUAL ENVIRONMENT

12. CHAPTER – PROTECTED AREAS, LANDSCAPE AND VISUAL ENVIRONMENT

12.1 Protected Areas

In order to identify and evaluate the protected areas within the South Alternative Route and its immediate vicinity, desktop studies and literature researches are carried out within the scope of the project. For this purpose, sensitive area list available in Annex-5 of EIA Regulation (issued in Official Gazette No:31907 dated July 29, 2022) is used as reference. This list covers areas that need to be protected in accordance with international conventions that Türkiye is contracting party and nationally declared protected areas.

Utilized data sources within the scope of the desktop studies are listed below:

- Database of Ministry of Agriculture and Forestry General Directorate of Nature Conservation and National Parks (https://www.tarimorman.gov.tr/DKMP) (https://saybis.tarimorman.gov.tr/)
- Map of Prohibited and Open Hunting Areas in Aydın for years 2022-2023 (https://avlakharitalari.tarimorman.gov.tr/)
- Database of Ministry of Culture and Tourism
- Database of General Directorate of Cultural Heritage and Museums
- Official letters and files that were obtained from relevant authorities
- kml / kmz files of the South Alternative Route and Google Earth Software

Protected Areas around the South Alternative Route are determined from above mentioned sources. The land use characteristics of the section were identified in the study area/corridor (having a total width of 400 meters being 200 meters on each side of the motorway axis) and protected areas in this corridor are presented with detailed information. Other protected areas in Aydın province are presented with their locations and distances to the South Alternative Route.

12.1.1 Baseline Conditions

As mentioned above, sensitive area list available in Annex-5 of the EIA Regulation was used as reference to identify the Protected Areas around the South Alternative Route. Identified Protected Areas in accordance with sensitive area list are described below.

Areas under protection in accordance with International Conventions that Turkey is a Contracting Party

Some relevant conventions in this context can be listed as follows:

- Convention on the Conservation of European Wildlife and Natural Habitats" (Bern Convention)
- The Convention for the Protection of the Mediterranean Sea Against Pollution" (Barcelona Convention)
- Protocol Concerning Specially Protected Areas in the Mediterranean
- 100 Historic Sites of Common Mediterranean Interest announced by United Nation Environment Programme and selected in accordance with the Geneva Declaration
- World Cultural and Natural Heritage Convention
- The Convention on the Protection of Wetlands of International Importance as Waterfowl Habitat (RAMSAR Convention)
- European Landscape Convention

There are no protection areas in the South Alternative Route identified by any international convention/agreement, including the ones listed above, that Türkiye is signatory.

Protected Areas in accordance with National Legislation

a) “National Parks”, “Nature Parks”, “Nature Monuments” and “Nature Conservation Areas” identified in accordance with the second and third articles of National Parks Law

There are five parks in total in Aydın, including one national park and four nature parks. The list of these national and nature parks is given in Table 12.1 below. Şarlan Nature Park is closest one among all others to the South Alternative Route and it is located approximately 14.9 km south of South Alternative. Distances of the national / nature parks to the relevant sections of the route are also given in Table 12.1.

Table 12.1 List of National Parks and Nature Parks in the South Alternative Route

Name of National Park / Nature Park	Approximate Distance to the closest Project Unit	Direction with respect to the closest Project Unit
Aydın		
Dilek Peninsula - Büyük Menderes Delta National Park	69.9 km (Km:15+856)	Southwest
Bafa Lake Nature Park	53.7 km (Km:15+856)	Southwest
Çağlayan Nature Park	25.5 km (Km:34+630)	East
Şarlan Nature Park	14.9 km (Km:28+100)	South
Tavşanburnu Nature Park	82.2 km (Km:15+856)	Southwest

There are no nature monuments in Aydın province.

There is no nature conservation area in Aydın province.

b) “Wildlife Protection Areas, Wildlife Development Areas and Wild Animal Settlement Areas” identified in accordance with the Land Hunting Law

There is no wildlife development area in Aydın province. There are two wild animal settlement areas in Aydın province. Details on these areas are presented in Table 12.2.

Table 12.2 List of Wild Animal Settlement Areas in Aydın Province

Province	Wild Animal Settlement Area
Aydın	Çine District
	Karacasu District

Map of Prohibited and Open Hunting Areas in Aydın Province is presented in Figure 12.1.

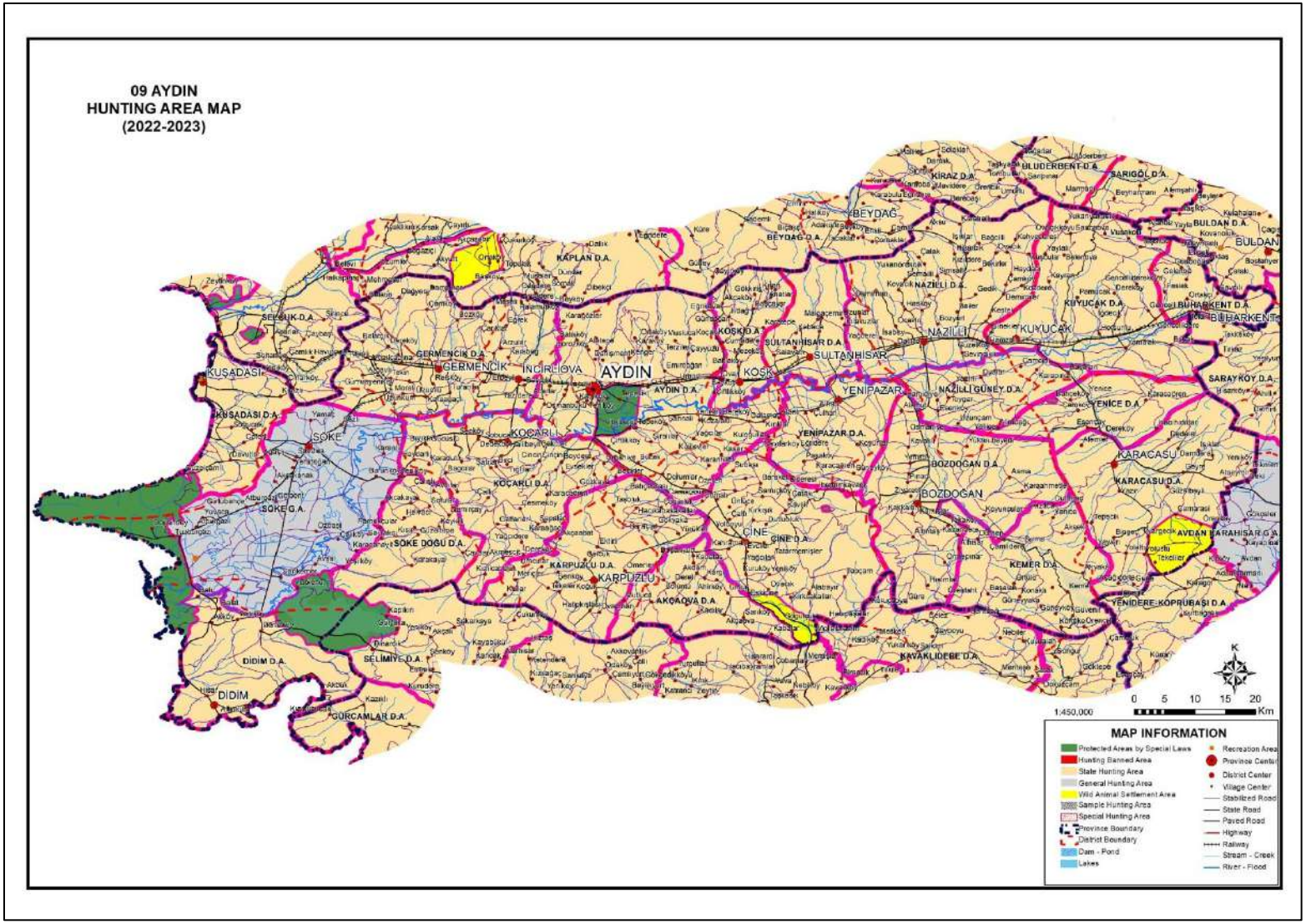


Figure 12.1 2022-2023 Map of Prohibited and Open Hunting Areas in Aydın Province

c) Areas defined as “Cultural Property”, “Natural Property”, “Protected Site” and “Protected Area” according to 2863 numbered Law on Protection of Cultural and Natural Properties dated July 21 1983, Article 3, Paragraph 1, Clause (a) (Definitions); Sub-clauses 1, 2, 3 and 5; and areas identified and registered in the same Law and amendments

A route walking was organized by the Project Sponsor together with the Aydın Board for Conservation of Cultural Assets in order to understand the archeological background on the South Alternative Route. As a result of this walk, registered, at the registration stage and unregistered cultural assets were identified within the impact area of the South Alternative Route. Based on the location and status of the findings, necessary measures have been taken in terms of wall construction, construction technique revision, and re-location of the route.

Further detailed assessment about Cultural Heritage regarding the South Alternative and potential impact area is presented in Chapter 13 (“Archaeological and Immovable Cultural Heritage”).

d) Aquaculture Production and Breeding Sites within the scope of Aquaculture Law

Annex-5 of 4/2 Numbered Communique that Regulates Amateur Water Aquaculture Hunting (Communique No: 2016/36) lists the inland water bodies hunting is completely forbidden and this listed. In the communique, there is no inland water for Aydın province where hunting is completely prohibited.

Inland water bodies where hunting is completely forbidden by the 4/1 Numbered Communique that Regulates Commercial Aquaculture Hunting (Communique No: 2016/35) is provided in Table 12.3 below.

Table 12.3 Inland Water Bodies of Aydın where Hunting is completely forbidden

Province	Name of Inland Water
Aydın	Azap Lake
	Çine Dam
	İkizdere Dam
	Karacasu Dam

e) Areas in accordance with the 17th, 18th, 19th and 20th Articles in the Water Pollution Control Regulation

Since the 17th, 18th, 19th and 20th Articles in Water Pollution Control Regulation were repealed; the Regulation on the Protection of Drinking-Potable Water Basins was taken as a reference in order to determine the basin protection limits for drinking water reservoirs. Drinking water dams of Aydın province are listed in Table 12.4.

Table 12.4 Drinking Water Reservoirs in Aydın Province and Their Distances to the South Alternative Route

Name of Dam / Pond	Approximate Distance to the closest Project Unit	Direction with respect to the closest Project Unit
Aydın		
İkizdere Dam	24.4 km (Km:15+856)	Northwest
Karacasu Dam	33.2 km (Km:34+630)	Southeast

f) Areas in accordance with the scope of Air Quality Assessment and Management Regulation

According to the 7th Article of Air Quality Assessment and Management Regulation, zones and sub-zones for air quality identification are listed in Annex-I of Memorandum 2013/37. This memorandum divides Türkiye into various zones and sub-zones to identify pollution profiles of provinces by the Ministry of Environment, Urbanization and Climate Change. According to the evaluations made by the Ministry in this extent in Annex-III, Aydın is included in the “high pollution potential provinces” list.

g) Areas determined and declared as "Specially Protected Environment Area" by the Council of Ministers in accordance with Article 9 of the Environment Law

Pamukkale Special Environmental Protection Area is closest to the South Alternative Route and it is located approximately 74.4 km northeast of the South Alternative.

h) There are no protected areas within the scope of Bosporus Law, no areas subject to construction ban in accordance with the Coastal Law, no areas designated in accordance with Law on Improvement of Olive Cultivation and Grafting of Wild Species in the South Alternative Route.

i) Areas designated in accordance with the Regulation on the Protection of Wetlands

There is one wetland in Aydın province according to the List of Wetlands of International Importance of Turkey. This wetland is Azap Lake in Aydın. Azap Lake Nationally Important Wetland is closest to the South Alternative Route and it is located approximately 55.4 km southwest of the South Alternative.

j) Areas where construction is prohibited in accordance with Approved Environmental Plans (to protect existing characteristics such as, biogenetic reserve area, geothermal site etc.)

According to the approved 1/100.000 Scale Environmental Plan of Aydın-Muğla-Denizli, such areas include; important areas for environmental sustainability, basin rehabilitation areas, and areas that are not suitable for settlement (construction of buildings) due to geological conditions.

There is a forest area, which is classified as an important area for environmental sustainability in the close vicinity of the South Alternative Route.

Map of Protected Areas around the motorway route for South Alternative is presented in Figure 12.2.

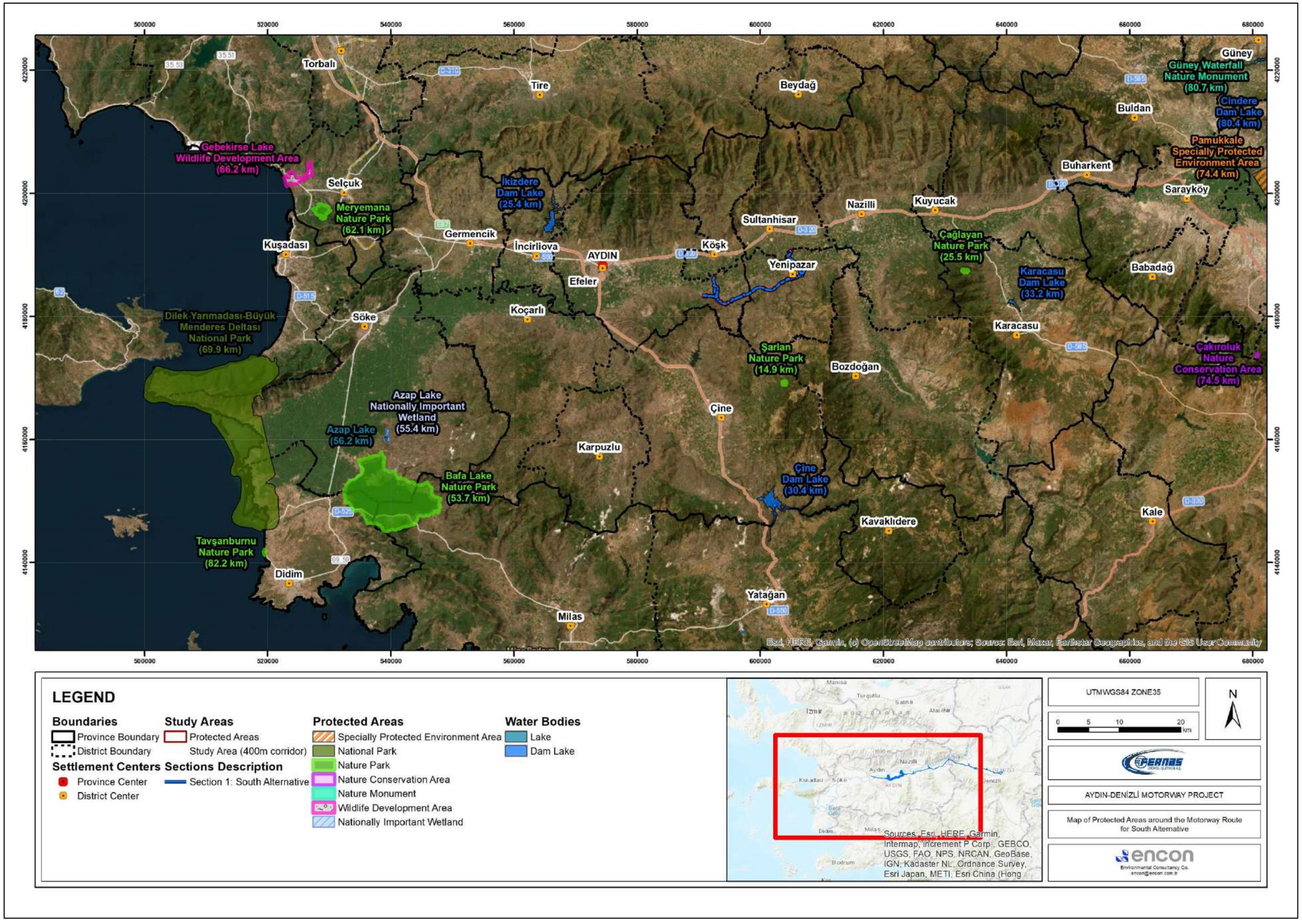


Figure 12.2 Map of Protected Areas around the Motorway Route for South Alternative

12.1.2 Potential Impacts and Mitigation Measures

The primary aim in South Alternative development is not to have any significant impact on any protection area or area of environmental, social and cultural importance. In this regard, potential direct impacts on protected areas described in the previous chapter are assessed by GIS techniques. The potential impacts of the South Alternative on any of the identified protection areas have been mitigated through changing the route of the motorway and through design changes In this regard, potential impacts would be on the protected areas and farmlands. The protection of these areas was the main criteria considered in the route selection process.

Based on the findings of the ongoing studies, including the ESIA study, changes have been made in the route of the South Alternative as mitigation for protecting the protected areas and farmlands in the region.

Detailed information about further optimization studies in this area is provided in Chapter 18 ("Analysis of Alternatives").

By the above mentioned revisions and adjustments the potential significant impacts on the protected areas and farmlands are avoided or mitigated to acceptable levels.

12.2 Landscape and Visual Environment

Motorway itself and its large components such as viaducts, toll plazas, and service areas will be a source of change in the existing visual environment. Because of the experiential nature of visual resources, the human response to visual changes in the landscape cannot be quantified, even though the visual changes associated with a development can be described. The areas having unique or high landscape value, such as national parks, nature parks or natural forests, recreational areas, etc., are generally the ones that are most important with regard to potential visual effects of the motorway and its components. The South Alternative Route selection has been done in due consideration of the protected areas, where a significant distance has been maintained with the motorway components and the protected areas.

12.2.1 Assessment Methodology and Data Sources

The project information including route maps, locations of structures were reviewed together with the available literature regarding the conditions in the area.

The assessment addresses the whole project components including the motorway route and related facilities. In this context, in addition to the route, the assessment will consider the following elements:

- Toll Plazas
- Interchanges and access roads
- Viaducts and bridges
- Quarries and Camp Sites

Based on the assessment, mitigation measures are recommended for the purpose of integrating the motorway into the wider landscape. The mitigation measures will be in the form of proposed motorway planting and will also serve to visually screen the motorway from nearby viewers, mainly residents of nearby neighborhoods.

Significance Criteria

The significance criteria for the impacts on landscape, visual aesthetic and protected areas will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impact on landscape, visual aesthetics and protected areas, while sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 12.5.

Table 12.5 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	**Medium (2)**	**Low (1)**
Landscape	Natural landscape character areas	Semi-natural landscape character areas (e.g. undeveloped rural settlement areas)	Unnatural and/or semi-natural landscape character areas (e.g. developed rural settlement areas, urban areas)
Visual Aesthetic (Residents of Settlements)	Settlements located at a distance between 0-400 meters from Motorway Axis and visual impact occurance according to topography, artificial and natural barriers	Settlements located at a distance between 400-700 meters from Motorway Axis and visual impact occurance according to topography, artificial and natural barriers	Settlements located at a distance between 700-1000 meters from Motorway Axis and visual impact occurance according to topography, artificial and natural barriers
Protected Areas	Unique protected areas (e.g. historical sites)	Protected areas that have some unique features	Areas that are not unique, however still considered as a protected area (e.g. nature parks that have recreational usage, drinking water dams)

12.2.2 Baseline Conditions

The landscape of the study area has been analyzed and described in terms of the key features and overall character via Google Earth. The landscape characters around the South Alternative Route is identified with reference to the Motorway KMs in Table 12.6 below.

Table 12.6 Landscape Character around the South Alternative Route

Km Chainage	Description
from Km:15+856 to Km:28+000	**Sloping Lands in Yeniköy, Dereköy, Dalama, Kırıklar, Gödrenli, Alanlı, Hamzabali and Dereköy Neighborhoods** In this part of the South Alternative Route, mostly sloping agricultural lands are located. In the region where Hamzabali and Dereköy neighborhoods are located, the slope is decreasing. There are some residences in Karahayıt Neighborhood.
K2 Yörük Ali Efe-1 / K3 Yörük Ali Efe-2 Km:18+267	**West Side of Dalama Neighborhood** Yörük Ali Efe Interchange starts from the west of Dalama Neighborhood and extends to the south of Köşk District. In this region, there are agricultural lands consisting entirely of plains. In addition, Büyük Menderes River also passes through the area.
from Km: 28+000 to Km: 32+000	**Sloping Lands in Çulhan and Alhan Neighborhoods** In this part of the motorway route, there are sloping forest lands and agricultural lands on the slopes of the hills to the north and south of the route.
from Km:32+000 to Km:34+630	**Sloping Lands in Yenipazar District and Donduran Neighborhood** In this part of the motorway route, there are sloping agricultural lands on the slopes of the hills to the north of the route, as well as agricultural lands on the plains between Yenipazar District and Donduran Neighborhood.
K4 Yenipazar-1 / K5 Yenipazar-2 Km:33+660	**East Side of Yenipazar District** Yenipazar Interchange starts from the east of Yenipazar District and extends to the southeast of sultanhisar District. In this region, there are agricultural lands consisting entirely of plains.

12.2.3 Visibility Analysis

In the visibility studies, 12 settlements within the socio-economic area of impact were taken into account, and the visible and nonvisible regions from these settlements were mapped via ArcGIS. These settlements are classified in Table 12.7 according to their motorway visibility levels in three categories as fully visible, partially visible and nonvisible. In the maps prepared with ArcGIS, there are no settlements in the category classified as nonvisible.

Table 12.7 Visibility of the South Alternative from each Settlement

Visibility Degree of the South Alternative from the Settlements	Settlements
Fully Visible	Dalama, Donduran.
Partially Visible	Alanlı, Alhan, Çulhan, Dereköy (Efeler), Dereköy (Yenipazar), Gödrenli, Hamzabali, Kırıklar, Yeniköy, Yenipazar.
Nonvisible	-

Example visibility maps for residential areas where the South Alternative is fully visible / partially visible are presented in Figure 12.3 and Figure 12.4 respectively. Visibility maps prepared for the remaining settlements are presented in Annex-10.

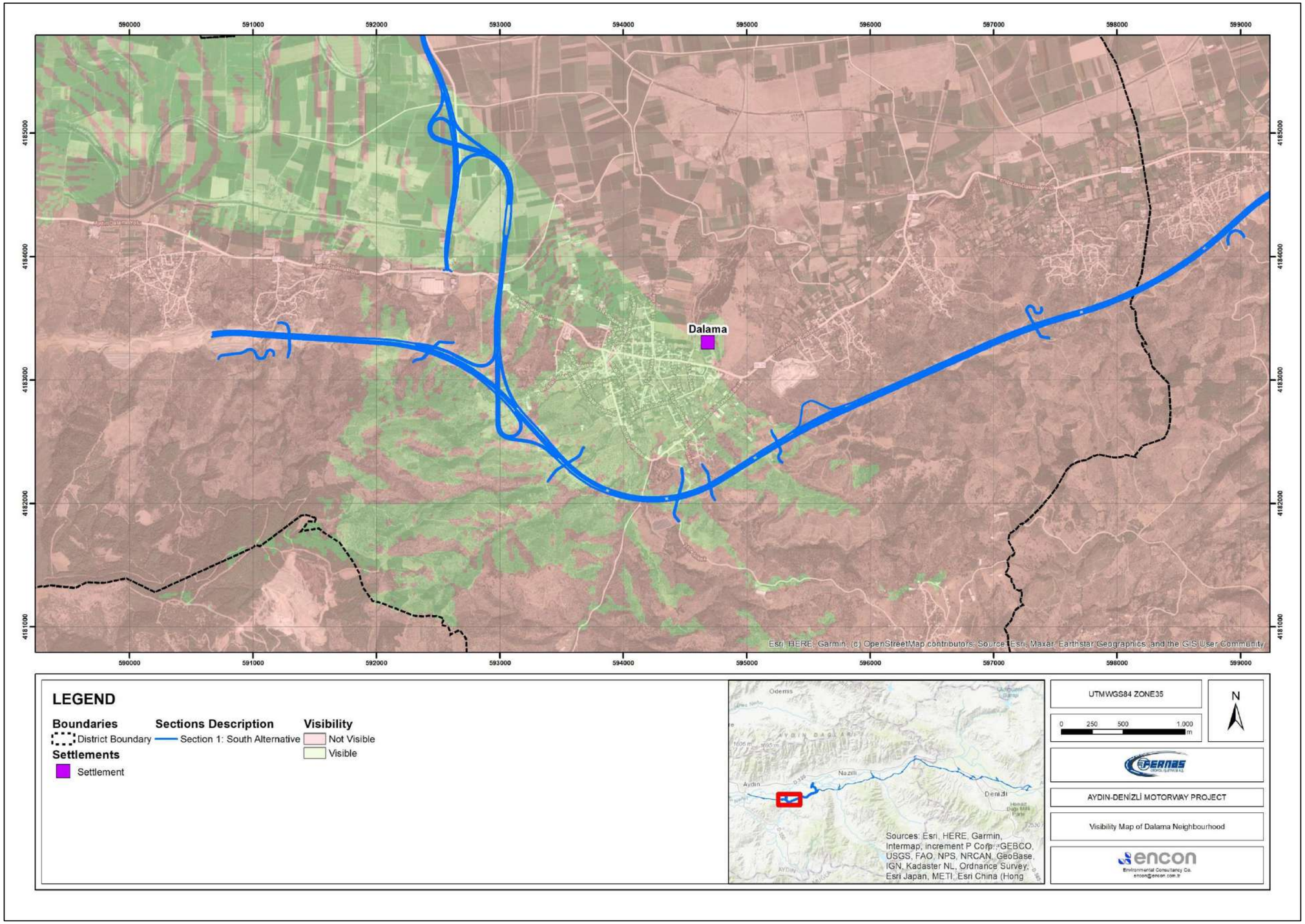


Figure 12.3 Example Visibility Map for a Residential Area where the South Alternative is Fully Visible

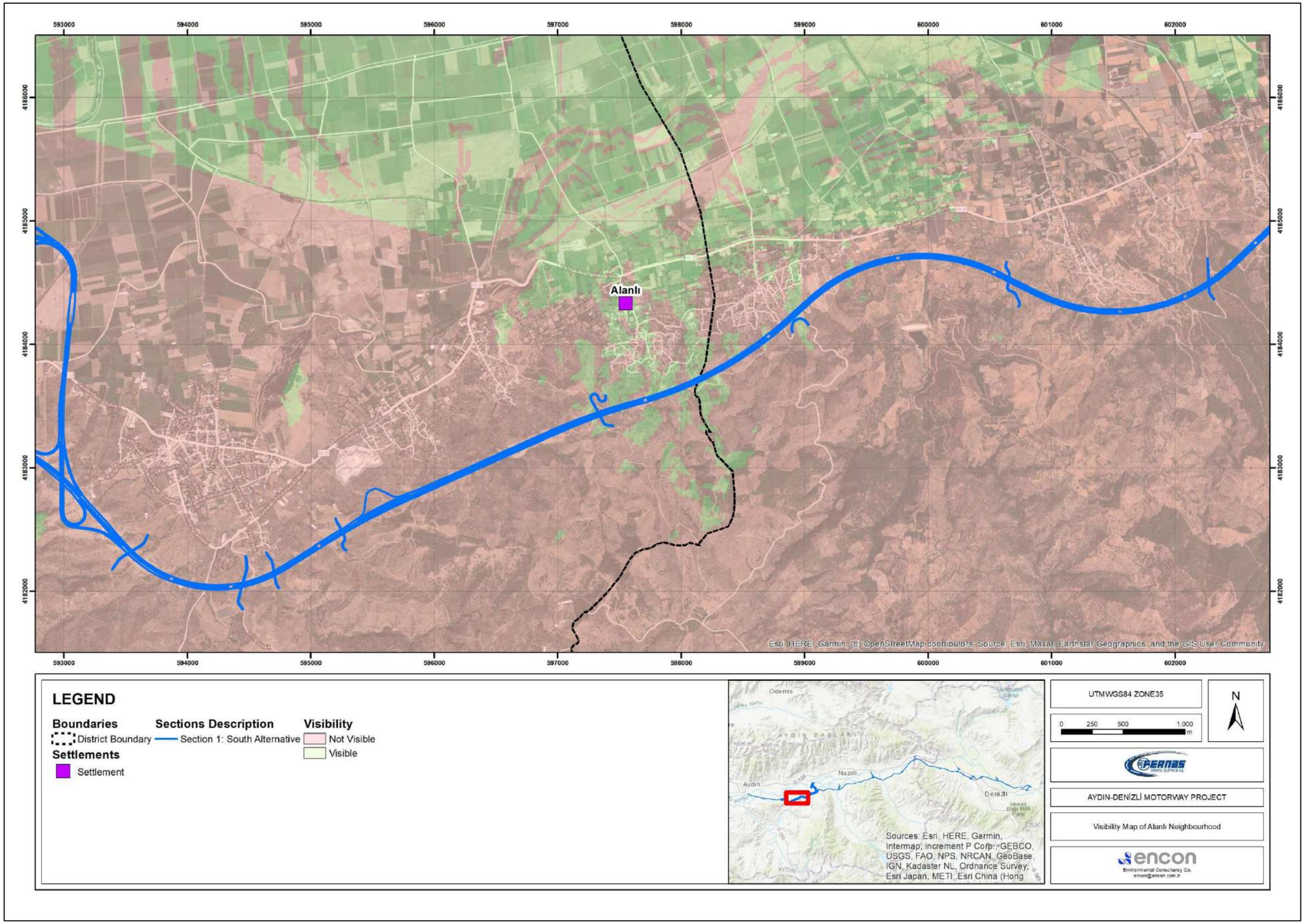


Figure 12.4 Example Visibility Map for a Residential Area where the South Alternative is Partially Visible

12.2.4 Potential Impacts and Mitigation Measures to be taken

Construction of the motorway and its components will result in the changes in the existing land use. Accordingly, landscape character of these areas will change permanently. South Alternative will have a length of 26 km, including the main carriageway and the access roads. The width of the expropriation corridor changes between 100 meters to 350 meters depending on the scale of excavation and fill requirements and footprints of the road structures such as interchanges, service areas, etc. Therefore, landscape in the mentioned area will be affected. In addition, quarries and camp sites will have potential impacts on landscape.

Land Preparation and Construction Phase

Potential Impacts

Construction activities of the ADMP will be completed in 3 years thus the changes in the landscape and visual impacts due to construction components such as Camp Sites, large earthmoving activities, construction machinery, etc. will be relatively temporary in nature. However, there will be disruption to the local landscapes in the immediate vicinity of the motorway route. These will mainly result from:

- Camp Sites
- Large earthmoving activities
- Construction machinery
- Quarry sites
- Construction works of bridge and viaduct
- Temporary fences around construction areas
- High visibility cones or concrete blocks
- Construction of toll plazas and associated buildings
- Construction of parking areas and the service areas

Mitigation Measures to be taken

Main aims of the mitigation measures regarding landscape and visual impacts are keeping the changes as small as possible and limiting the visibility of the adverse changes while ensuring the design and construction of the project in a manner that the project melts into the landscape. In this regard, protecting existing landscape features such as shrubs, trees, and natural topography and avoiding unnecessary earthmoving activities are the main components of mitigation strategy. During the period of construction, following measures will be taken to reduce impacts of the works on the landscape and on viewers:

- Existing vegetation to be protected will be fenced with temporary protective fencing before work commences on site, so that as much vegetation as possible could be protected to maintain the integrity of the landscape and the existing visual screening.
- Working areas will be kept as small as practicable. Visual barriers will be implemented if the area is subjected to high visual impacts.
- The construction sites will be kept tidy and workers will have necessary knowledge/training about the issue.
- Temporary fencing will be implemented to obstruct intense construction activity areas.

Operation Phase

Potential Impacts

Operational phase impact sources will be the motorway itself and the associated structures for operation of the motorway. The impacts during the early operation phase of the project will be the highest in terms of visual impacts since implementation of the mitigation measures, such as planting of trees, will be in the early stages. In the continuing years of operation the visual impacts would be further decreased. The components of the project that would cause impacts can be summarized as follows:

- Motorway alignment
- Interchanges
- Bridges
- Viaducts, culverts
- Service areas and parking areas
- Toll plazas
- Lighting around interchanges, service areas and toll plazas

Mitigation Measures to be taken

General Directorate of Highways (KGM) has technical specifications for landscaping works and a motorway maintenance handbook. These specifications cover project design, implementation and operation/maintenance phases. Therefore, all mitigation measures about landscaping have been provided in the technical attachments of the contract, and Project Sponsor is responsible to implement and keep these measures. According to KGM handbook, side slopes that wider than three meters should be afforested. In case side slope is narrower than three meters, side slope should be planted with groundcover species, shrub and tree clubmoss. Similarly, central reserves that wider than three meters should be planted with shrub and tree species.

In this regard, landscaping activities will be conducted along the South Alternative Route in order to minimize the potential impacts of the project on the natural environment, ensure slope stability, form a barrier against noise and gaseous emissions, avoid monotonous driving conditions and develop aesthetic appearance. In the scope of the activities, existing local soil conditions, natural vegetative structure, existing plant species on the cultivation areas and irrigation/watering requirements of the potential species to be planted are going to be considered. The following can be outlined as the major mitigation measures for the South Alternative:

- Planting will be implemented to restore or compensate for lost habitats.
- Planting mixes will be selected using native species and planting will be set out to establish new and enhance existing native habitats. The use of native species throughout the area is important in order that the motorway planting will, over time, become almost indistinguishable from the vegetation naturally occurring in the surrounding area.
- Planting will be implemented to reconnect hedgerows or areas of planting formerly severed as a result of the construction works in order to maintain wildlife corridors and reinstate local landscape character.
- Nonnative species will be used in locations where their presence is of local relevance. For example, in an urban area, nonnative or ornamental species will be used to match nonnative or ornamental planting in that urban area.
- Landscape design will be coherent with regional landscape identity to the extent possible.
- Planting treatments will be designed to visually screen road structures and earthworks from nearby housing and settlements.
- Planting treatments will be interrupted to open up key views and vistas which reinforce local identity and minimize driver monotony.

Residual Impacts

Temporary impacts of the construction phase can be mitigated to acceptable levels by means of proper rehabilitation of the construction sites. Therefore, residual visual and landscape impacts would be mostly low. Visual changes due to the motorway and permanent structures will cause a long-term impact on the landscape, either positive or negative, for different parts of the motorway. However, since the Motorway Projects are linear projects, visual impacts will occur in a narrow (1,000 meters of each side of the Motorway Axis) but long corridor. Thus, residual impacts for the operation will be medium.

Especially at the areas where rural landscape character is observed, the landscape character will change considerably at certain sections. Therefore, residual adverse impacts at these sections will be medium in construction phase. However, once landscape works are completed in operation phase (in 5-15 years), residual adverse impact at these areas will be low.

Summary of the landscape, visual aesthetics and protected areas assessments is presented in Table 12.8.

Table 12.8 Summary of the Landscape, Visual Aesthetics and Protected Areas Assessments

Affected Ecosystem Component		Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
					Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Landscape*		Land Preperation and Construction	Change of existing landscape	Adverse	Local	Medium	Medium	Irreversible	Continuous	Major (A)	Medium (2) to Low (1)	High (A2) to Medium (A1)	Existing vegetation to be protected will be fenced with temporary protective fencing before work commences on site, so that as much vegetation as possible could be protected to maintain the integrity of the landscape and the existing visual screening. Temporary fencing will be implemented to obstruct intense construction activity areas.	Medium
Landscape*		Operation	Change of existing landscape	Adverse	Local	Long	High	Irreversible	Continuous	Major (A)	Medium (2) to Low (1)	High (A2) to Medium (A1)	Planting will be implemented to reconnect hedgerows or areas of planting formerly severed as a result of the construction works in order to maintain wildlife corridors and reinstate local landscape character.	Medium
Visual Aesthetics	Fully Visible Settlements	Land Preperation and Construction	Change of visual aesthetics	Adverse	Local	Medium	High	Long term irreversible	Intermittent	Moderate (B)	High (3)	High (B3)	The construction sites will be kept tidy and workers will have necessary knowledge/training about the issue. Working areas will be kept as small as practicable. Visual barriers will be implemented if the area is subjected to high visual impacts.	Low
	Partially Visible Settlements			Adverse	Local	Medium	Medium	Long term irreversible	Intermittent	Minor (C)	High (3)	Medium (C3)		Low
Visual Aesthetics	Fully Visible Settlements	Operation	Change of visual aesthetics	Adverse	Local	Long	High	Long term irreversible	Continuous	Moderate (B)	High (3)	High (B3)	Planting will be implemented to restore or compensate for lost habitats. Native species will be used and planting will, over time, become almost indistinguishable from the vegetation naturally occurring in the surrounding area. Non native species will be used in locations where their presence is of local relevance. For example, in an urban area, non native or ornamental species will be used to match non native or ornamental planting in that urban area. Planting treatments will be designed to visually screen road structures and earthworks from nearby housings and settlements.	Low
	Partially Visible Settlements			Adverse	Local	Long	Medium	Long term irreversible	Continuous	Minor (C)	High (3)	Medium (C3)		Low
Protected Areas*		Land Preperation and Construction	Impacts (e.g. dust / noise emission) on flora and fauna elements in the protected area	Adverse	Wide	Medium	Medium	Short term reversible	Intermittent	Moderate (B)	Low (1)	Low (B1)	Mitigation measures for emissions Restriction of construction/working areas	Low
Protected Areas*	Charity Cube	Operation	Intersection with Protected Areas	Adverse	Restricted	Long	Low	Irreversible	One-off	Moderate (B)	Medium (2)	Medium (B2)	Charity Cube is located at Km 18+000 on the access road of Yörük Ali Efe Interchange. It is planned to be moved within the boundaries of the expropriation area to eliminate a possible physical impact of the South Alternative Route.	Low
	Aqueducts			Adverse	Restricted	Long	Low	Reversible	Intermittent	Moderate (B)	Low (1)	Medium (B1)	The aqueducts are located at the south of the motorway with a distance of 5 m to the expropriation boundary. According to the results of the examination, the decision of "... passing the relevant area by filling method in order not to damage the existing structures" has been notified to the Project Sponsor.	Low
	Martyrdom and Prayer Room			Adverse	Restricted	Long	Low	Reversible	Intermittent	Moderate (B)	Low (1)	Medium (B1)	The rectangular footprint of Martyrdom and Prayer Room, which belongs to the Ottoman period and registered by the Board for Conservation of Cultural Assets, is partially in the viaduct area.	Low
	Archaeological Items			Adverse	Restricted	Long	Low	Reversible	Intermittent	Moderate (B)	Low (1)	Medium (B1)	During on-site examination carried out by the Board for Conservation of Cultural Assets, some ceramic remains were found.	Low
	Aqueducts			Adverse	Restricted	Long	Low	Reversible	Intermittent	Moderate (B)	Low (1)	Medium (B1)	Two aqueducts were identified by the Board for Conservation of Cultural Assets during on-site examination. Retaining wall project prepared for the area and was submitted to the Board for Conservation of Cultural Assets and the relevant study was approved.	Low

Affected Ecosystem Component		Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
					Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
	3rd Degree Archaeological Site			Adverse	Restricted	Long	Low	Reversible	Intermittent	Moderate (B)	Low (1)	Medium (B1)	Following the on-site examination carried out by the Board for Conservation of Cultural Assets, some ceramic remains were found during the excavation works of the viaduct.	Low
	Archaeological Site and Structural Elements			Adverse	Restricted	Long	Low	Reversible	Intermittent	Moderate (B)	Low (1)	Medium (B1)	During the on-site examination carried out by the Board for Conservation of Cultural Assets, archaeological remains and structural elements were found. After evaluations, the area is declared to be Degree 1 Archaeological Site and expropriation corridor was narrowed according to the decree of the Board for Conservation of Cultural Assets dated 27.04.2021, No: 13548.	Low
	Orthasia Ancient City			Adverse	Restricted	Long	Low	Reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)	Route revisions was conducted at Km 33+150, where Orthasia Ancient City was located. The motorway route was revised to eliminate a possible physical impact of the South Alternative on the ancient site.	Low

**Sensitivities of these ecosystem components are designated with considering their existence in overall South Alternative Route*

CHAPTER 13

ARCHAEOLOGICAL AND IMMOVABLE CULTURAL HERITAGE

13. CHAPTER – ARCHAEOLOGİCAL AND IMMOVABLE CULTURAL HERITAGE

This Chapter identifies the current status of archaeological and immovable cultural heritage that may be relevant to the South Alternative and defines potential influences of the project activities on the archaeological assets and immovable cultural heritage located within the project's area of influence.

13.1 Assessment Methodology and Data Sources

The institutional and legal framework regarding the conservation of movable and immovable cultural and natural assets in Türkiye has been previously provided in Chapter 2 ("Institutional and Legal Framework"). In the scope of the cultural heritage assessments, mainly the Law on the Conservation of Cultural and Natural Heritage (Law No: 2863; amended by law numbered 4629) and the Principle Decision (No: 648) that govern the principles regarding the classification and protection of archaeological sites according to their significant features have been taken into consideration together with other relevant regulations. In addition to national legislation, the following international guidelines have been taken into consideration during the study:

- IFC, PS 8
- Department for Transport of United Kingdom, Design Manual for Roads and Bridges; Part 2 HA 208/07 Cultural Heritage
- Guidance on Heritage Impact Assessments for Cultural World Heritage Properties. ICOMOS, Paris 2010.

The study area for the archaeological and immovable cultural heritage assessments has been identified as 400 m corridor (200 m from each side of the Motorway axis). The methodology followed in the scope of the studies has consisted of the following three phases.

- Desktop Studies
- Field Surveys
- Reporting

As evidenced by archaeological studies, traces of mankind in the Anatolia dates to 600,000 years and the first early settlements were established about 11,000 years ago. The area was inhabited by many cultures which dominated the region at different periods of history.

Since early 20th century, archaeological studies revealed many archaeological assets. However, archaeological inventory of Türkiye is still far from being complete. Especially regarding the motorway route, information about the status of archaeological and immovable cultural assets is missing to a great extent and an inventory on those is not available. (ESIA Report, Encon, April 2022)

Due to reasons stated above, the "archaeological and immovable cultural assets" are regarded as one of the most important high risk group which might be adversely affected by South Alternative. The risk is not only attributed to the construction activities but other negative effects such as vibration due to traffic during the operation phase.

Considering the risks during the construction and the operation period, movable and immovable archaeological heritage constitutes the focus of the survey studies. The methodology of archaeological survey has three phases as listed below:

- Pre- Field Work and Desktop Studies
- Field Work
- Reporting

ESIA studies may identify any additional potential site and inform the project so that alternatives can be explored to avoid any probable significant impact. With effective implementation of Chance Finds Procedure by trained construction workforce, it is possible to avoid significant impacts to the cultural heritage. It should be noted that as construction works progress very rapidly, implementation of the Chance Finds Procedure with assignment of designated personnel and training the related construction personnel is a priority action to avoid irreversible impacts on the currently undiscovered assets.

When a proper cultural heritage management system is established and implemented, the project ESIA will shed light on the still less known past of the region within the framework of interdisciplinary archaeological studies by implementing appropriate techniques and methods so that the project will be a benefit contributing to the cultural and archaeological inventory of the country.

On the other hand, the project may bring benefits if there are cultural heritage sites that were previously located in remote areas and could gain increased access through the operation of the motorway.

13.2 Baseline Conditions

Baseline conditions along the South Alternative's route and its vicinity have been characterized based on desk based information obtained through literature review and findings of the field surveys conducted by the Project Sponsor.

The "kmz data" of the project's route was analyzed in order to determine the archaeological and immovable cultural heritage sites located within the construction area and impact area of the South Alternative. Synchronously, the preliminary literature survey and archive researches were conducted about the regions of importance along the project route.

With the participation of the relevant Museum Directorate, a field walking had been organized by Project Sponsor to understand the archeological background of project RoW. In this context, the existing and new sites and tangible assets were classified and relevant mitigation measures have been taken. The following section summarizes the findings and the relevant measure to be taken.

Table 13.1 explains the characteristics of the cultural heritage and archaeological sites found in the light of the studies.

Table 13.1 Summary of the Findings, Cultural Heritage

No	Explanation	Photo
1	**Km 18+000 Charity Cube** Charity Cube, which is located on the access road of Yörük Ali Efe Interchange, was registered by the Board for Conservation of Cultural Assets in 2011 and remains under a fill section of the motorway. The decree of the Board for Conservation of Cultural Assets dated 22.11.2022, No: 14416 The survey and relocation project prepared for the relocation of the building was submitted to the Board for Conservation of Cultural Assets and the relevant study was approved. It is planned to be moved within the boundaries of expropriation area within the appropriate time.	

No	Explanation	Photo
2	**Km 19+500 Aqueducts** The aqueducts are located at the south of the motorway with a distance of 5 m to the expropriation boundary. An on-site examination was carried out for the aqueducts by the Board for Conservation of Cultural Assets. According to the results of the examination, the decision of "... passing the relevant area by filling method in order not to damage the existing structures" has been notified to the Project Sponsor. The decree of the Board for Conservation of Cultural Assets dated 27.04.2021, No: 13548	
3	**Km 19+700 Martyrdom and Prayer Room** The rectangular footprint of Martyrdom and Prayer Room, which belongs to the Ottoman period and registered by the Board for Conservation of Cultural Assets, is partially in the viaduct area. The decree of the Board for Conservation of Cultural Assets dated 27.04.2021, No: 13548.	
4	**Km 23+500 Archaeological Items** During on-site examination carried out by the Board for Conservation of Cultural Assets, some ceramic remains were found. The decree of the Board for Conservation of Cultural Assets dated 27.04.2021, No: 13548.	
5	**Km 23+700 Aqueducts** Two aqueducts were identified by the Board for Conservation of Cultural Assets during on-site examination. Retaining wall project prepared for the area and was submitted to the Board for Conservation of Cultural Assets and the relevant study was approved. The decree of the Board for Conservation of Cultural Assets dated 27.04.2021, No: 13548.	
6	**Km 26+000 3rd Degree Archaeological Site** Following the on-site examination carried out by the Board for Conservation of Cultural Assets, some ceramic remains were found during the excavation works of the viaduct. The decree of the Board for Conservation of Cultural Assets dated 27.04.2021, No: 13548.	

No	Explanation	Photo
7	**Km 31+000 Archaeological Site and Structural Elements** During the on-site examination carried out by the Board for Conservation of Cultural Assets, archaeological remains and structural elements were found. After evaluations, the area is declared to be Degree 1 Archaeological Site and expropriation corridor was narrowed according to the decree of the Board for Conservation of Cultural Assets dated 27.04.2021, No: 13548.	
8	**Km 33+150 Orthosia Ancient City** The ancient city is declared to be Degree 1 and 3 Archaeological Site according to the decree of the Board for Conservation of Cultural Assets dated 28.04.2023, No: 15201.	

13.3 Chance Finds Procedure

Any chance finds may be encountered during different stages of the project. In case of any chance finds the procedure to be followed which had been reviewed in this report is given in Table 13.2 and Table 13.3, respectively.

Table 13.2 Chance Finds Procedure (Reviewed for South Alternative)

<table>
<tr><td colspan="2">STEP 1 – After the discovery of a chance find

• All work must cease at the location where discovery is made.
• A temporary buffer zone should be created around the chance find.
• Environmental and Social Interaction Manager should be on site during all construction or ground disturbance activities.
• Environmental and Social Interaction Manager contacts site management and Cultural Heritage Chief immediately.
• Following the guidance provided by Cultural Heritage Chief, Environmental and Social Interaction Manager properly secures chance find site (flagging, no-entry signs etc.)
• For protection of the discovery location, Chance Find should not be moved, removed or further disturbed.</td></tr>
<tr><td colspan="2">STEP 2 – Recording

• Environmental and Social Interaction Manager fills out Chance Find Form Part A and send a copy to Project Manager within 24 hours.
• Environmental and Social Interaction Manager retains a copy of Chance Find Form for record.</td></tr>
<tr><td colspan="2">STEP 3 – Contact with local authority
• Environmental and Social Interaction Manager notifies Aydın Archaeological Museum’s Directorate for the Chance Find.</td></tr>
<tr><td colspan="2">STEP 4 – Authority’s decision

• Aydın Archaeology Museum’s archaeologist decides on further actions for the Chance Find Area.</td></tr>
<tr><td>STEP 4 A – No significance to site or finding

• The museum archaeologist declares that the site/finding is considered to be of no significance.
• Environmental and Social Interaction Manager informs relevant managers.
• Environmental and Social Interaction Manager records the decision on Chance Find Form Part B and sends a copy to project management within 24 hours.
• Environmental and Social Interaction Manager retains a copy of Chance Find Form for record.
• No further actions required. This step closes out the Chance Find Procedure</td><td>STEP 4 B – Significance to site or finding

• Related Archaeology Museum’s archaeologist declares that the site/findings is considered to be of significance
• Related Archaeology Museum’s archaeologist decides on further actions and informs Environmental and Social Interaction Manager.
• Environmental and Social Interaction Manager informs relevant managers.
• Environmental and Social Interaction Manager records the decision on Chance Find Form Part B.
• Proceed to Step 5</td></tr>
</table>

• ***Construction activities may resume***		
STEP 5 – Site Investigation • Project personnel follow the Related Archaeology Museum's archaeologist's instructions.		
• After field investigation, Museum archaeologist declares **the site/findings have MINOR significance.** • Environmental and Social Interaction Manager informs their managers. • Environmental and Social Interaction Manager records the decision on **Chance Find Form Part C** and sends a copy to project management within 24 hours. • Environmental and Social Interaction Manager retains a copy of **Chance Find Form** for records. • No further actions required. This step closes out the Chance Find Procedure. • ***Construction activities may resume.***	• After field investigation, Related Archaeology Museum's archaeologist declares the site has MODERATE significance. • Further studies such as test pit / salvage excavations or remote sensing investigation are to be completed. • Related Archaeology Museum's archaeologist provides instructions, and/or supervision for the studies. • Environmental and Social Interaction Manager informs their managers. • Under the supervision of the museum archaeologist, project management provides an archaeological work team. The team will be composed of qualified archaeologists other experts and workers. • Once the excavation is completed, the team provides a report to Related Archaeology Museum Directorate. • The museum directorate reports the study outcomes to the Regional Board for Conservation of Cultural Assets. • Regional Board for Conservation of Cultural Assets officially confirms completion of recovery and informs the project management. • Environmental and Social Interaction Manager records the decision on Chance Find Form Part C and sends a copy to project management within 24 hours. • Environmental and Social Interaction Manager retains a copy of Chance Find Form for record. • No further actions required. This step closes out the Chance Find Procedure. • Construction activities may resume.	• After field investigation, Museum archaeologist declares the site/findings have MAJOR significance. • Salvage excavation is to be completed. • Site is to be treated according to Turkish archaeological regulations "Law on the Conservation of Cultural and Natural Assets (2863) 21.07.1983. • Related Archaeology Museum's archaeologist provides instructions, and/or supervision for test pit/salvage archaeological excavation. • Environmental and Social Interaction Manager informs their managers. • Under the supervision of the museum archaeologist, project management provides a salvage excavation team. The team will be composed of qualified archaeologist and workers. • Once the excavation is completed, salvage excavation team provides a report to museum directorate. • Regional Board for Conservation of Cultural Assets officially confirms completion of recovery and informs the project management. • Site will be officially recorded and protected according to the Turkish regulations. • Environmental and Social Interaction Manager informs the related managers. • Environmental and Social Interaction Manager records the decision on Chance Find Form Part C and sends a copy to project management within 24 hours. • Environmental and Social Interaction Manager retains a copy of Chance Find Form for record. • No further actions required. This step closes out the Chance Find Procedure. • Construction activities may resume or further preventive actions are needed to be taken.

Table 13.3 Chance Finds Report Form

PART A *(BÖLÜM A)*			
Project Location/Unit/KM: *(Proje Sahası/Birimi/Km)*	**Province:** *(Şehir)* **District:** *(İlçe)* **Neighborhood/Village:** *(Mahalle/Köy)*	**Date:** *(Tarih)*	**Form No:**
Name of person reporting Chance Find: *(Tesadüfi Bulguyu rapor eden kişinin ismi)*			
Was work stopped in the immediate vicinity of the Chance Find? *(Tesadüfi Bulgunun tam çevresinde iş durduruldu mu?)*	☐ **Yes** *(Evet)*	☐ **No** *(Hayır)*	
Was a buffer zone created to protect the Chance Find? *(Tesadüfi Bulguyu korumak için tampon bölge oluşturuldu mu?)*	☐ **Yes** *(Evet)*	☐ **No** *(Hayır)*	
NOTIFICATION *(BİLDİRİM)*			
FOIAS Project Management contacted *(FOIAS Proje Yönetimi ile irtibata geçildi)*	☐ **Yes** *(Evet)*	☐ **No** *(Hayır)*	
CHANCE FIND DETAILS *(TESADÜFİ BULGU AYRINTILARI)*			
GPS Coordinates *(GPS Koordinatları)*	**Photo record** ☐ **Yes** ☐ **No** (HD quality – no cell phone photos) *(Fotoğraf kaydı) (Evet) (Hayır)* *(HD kalitesinde – cep telefonu fotoğrafı değil)* **If not, explain why:** *(Yoksa nedenini açıklayınız)* **Other records** ☐ **Yes** ☐ **No** Specify (drawings, HD quality videos, etc.): *(Diğer kayıtlar) (Evet) (Hayır)* *(Belirtin (çizimler, HD kalite videolar, vb.)*		
Description of the Chance Find: *(Tesadüfi Bulgunun tanımı)*			
Description of site/finding and other specifications of site/finding: (e.g. surface type, ground or distance to closest watercourse, etc.) *(Sahanın ve bitki örtüsünün tanımı: (örn. Yüzey türü, yüzey ya da en yakın suyoluna olan mesafe, vb.))*			

PART B
(BÖLÜM B)

NOTIFICATION OF RELATED ARCHAEOLOGY MUSEUM DIRECTORATE
(İLGİLİ MÜZE MÜDÜRLÜĞÜNE BİLDİRİM)

Environmental and Social Interaction Manager contacted museum directorate archaeologist ☐ **Yes** ☐ **No**
(Çevre ve Sosyal Etkileşim Müdürü, Müze Müdürlüğü arkeoloğu ile irtibata geçti) *(Evet)* *(Hayır)*

Date of Notification:
(Bildirim Tarihi)

Name of Museum archaeologist:
(Müze Müdürlüğü arkeoloğunun ismi)

Contact number of Museum Directorate archaeologist:
(Müze Müdürlüğü arkeoloğunun iletişim numarası)

DECISION OF MUSEUM DIRECTORATE ARCHAEOLOGIST
(MÜZE MÜDÜRLÜĞÜ KARARI)

Date of site visit:
(İlk saha ziyaret tarihi)

☐ **Site / Finding of no significance - Construction to proceed with no further action – End of chance find procedure** *(Önemsiz saha – İnşaat daha fazla araştırma yapılmadan devam edilebilir – **Tesadüfi Bulgu Prosedürünün sonu**)* **Date of notice to resume work:** *(İşe başlama tarihi bildirisi)*	☐ **Site / Finding of significance - Further actions required** *(Önemli saha – Ek araştırma gerekmektedir)* **Please Fill out Part C** ***(Lütfen Bölüm C'yi doldurun)***

Name of Museum Directorate archaeologist:
(Müze Müdürlüğü arkeoloğunun ismi)

Contact information:
(İletişim numarası)

FOIAS Project Management contacted ☐ **Yes** ☐ **No**
(FOIAS Proje Yönetimi ile irtibata geçildi) *(Evet)* *(Hayır)*

PART C *(BÖLÜM C)*		
FURTHER FIELD INVESTIGATION *(EK SAHA ARAŞTIRMASI)*		
☐ **Site / Finding of <u>MINOR</u> significance** *(Düşük önemli saha)*	☐ **Site / Finding of <u>MODERATE</u> significance** *(Orta önemli saha)*	☐ **Site / Finding of <u>MAJOR</u> significance** *(Çok önemli saha)*
Describe additional work to be conducted: *(Yapılması gereken ek işlerin tanımları)*		
Date Started: *(Başlangıç Tarihi)*	**Date Completed:** *(Bitiriş Tarihi)*	
Date of notice to resume work: *(İşe başlama tarihi bildirisi)*		
Name of Museum Directorate archaeologist: *(Müze Müdürlüğü arkeoloğunun ismi)* **Contact Information:** *(İletişim numarası)*		
FOIAS Project Management contacted *(FOIAS Proje Yönetimi ile irtibata geçildi)*	☐ **Yes** *(Evet)*	☐ **No** *(Hayır)*

13.4 Summary of Assessment and Residual Impact

By the studies conducted by cultural heritage experts, several new unregistered sites in addition to the known registered sites have been identified. With effective implementation of the mitigation measures for conservation of these sites in accordance with this Supplementary ESIA Report, it would be possible to reduce the significance of impacts to generally low levels. Cooperation with the Regional Board for Conservation, implementation of Chance Finds Procedure and archaeological monitoring to be done by experts to be hired by the Project during the land preparation and construction phase is crucial for management of cultural heritage corresponding to the route. The ADMP and so South Alternative has already identified important sites. Therefore the project is likely to contribute to the cultural and archaeological inventory of Türkiye and the still less known past of the region with these and possible new archaeological findings and the process to be conducted with the authorities within the framework of interdisciplinary archaeological studies.

Overall, the Project will be a benefit that contributes to the country's cultural and archaeological inventory through the implementation of appropriate techniques, methods and ESIA measures.

Table 13.4 provides a summary of the assessments on archaeological and immovable cultural heritage in line with the Impact Significance Categorization Matrix in Chapter 4 (“ESIA Methodology”).

Table 13.4 Summary of the Assessments on Archaeological and Immovable Cultural Heritage

Affected Ecosystem Component	Definition of Impact	Type	Archaeological / Historical Site Name	Registration Status			Motorway Km	Impact Magnitude						Sensitivity / Value of the Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken					Significance of Residual Impacts
				Registered	Under Registration	Unregistered		Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude			Test or Salvage Excavation	The Decisions of the Board for Conservation Should be Followed	Archaeological Monitoring	Physical Intervention Avoided	Removal to Another Place	
Archaeological and immovable cultural heritage	Damage to archaeological and immovable cultural heritage due to land preparation and construction activities	Adverse	Charity Cube	X			Km 18+000	Restricted	Short	Low	Irreversible	One-off	Major (A)	Medium (2)	Medium (A2)					X	Low
			Aqueducts	X			Km 19+500			Low			Moderate (B)	Low (1)	Low (B1)		X		X		Low
			Martyrdom and Prayer Room	X			Km 19+700			Low			Moderate (B)	Low (1)	Low (B1)		X	X			Low
			Archaeological Items			X	Km 23+500			Low			Moderate (B)	Low (1)	Low (B1)		X	X			Low
			Aqueducts	X			Km 23+700			Low			Moderate (B)	Low (1)	Low (B1)		X	X			Low
			3rd Degree Archaeological Site	X			Km 26+000			Low			Moderate (B)	Low (1)	Low (B1)		X	X			Low
			Archaeological Site and Structural Elements	X			Km 31+000			Low			Moderate (B)	Low (1)	Low (B1)			X	X		Low
			Orthosia Ancient City	X			Km 33+150			Medium			Major (A)	High (3)	High (A3)				X		Medium

CHAPTER 14

SOCIO-ECONOMIC ENVIRONMENT

14. CHAPTER – SOCIO-ECONOMIC ENVIRONMENT

In this section, the potential impacts of the South Alternative project on socio-economic environment of the region are assessed. Within this scope, the construction and operation phases of the motorway are taken into consideration and impacts are evaluated separately. For the assessment of impacts on socio-economic environment, desktop and field studies were performed. In this regard, the chapter includes the followings:

- Assessment methodology and data sources,
- Baseline conditions of the socio-economic environment,
- Potential social impacts of the proposed project,
- Mitigation measures,
- Summary of Assessment and Residual Impacts.

14.1 Assessment Methodology and Data Sources

14.1.1 Significance Criteria

The significance criteria for the impacts on socio-economic environment will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 (“ESIA Methodology”) will be used for the determination of the magnitude of impact on the socio-economic environment, while sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 14.2.

Detailed explanation of the sensitivity components for each ecosystem component is provided in the following “Baseline Conditions” section.

Evaluation of magnitude of impacts was based on the baseline conditions of the affected area and expert judgment (see Table 14.1).

Table 14.1 Impact Magnitude Criteria

Affected Ecosystem Component	Definition of Impact	Magnitude of Impact
Livelihood and Economic and Physical Displacement	Effects on livelihood from agricultural activities / Physical displacement	Low
		Medium
		High
	Effects on livelihood from livestock activities	Low
Infrastructures and Distribution of Utility Services	Effects on traffic and mobility	Low
	Effects on infrastructures and utility services	Low
Demographic Structure of Settlements	Influence on local communities	Low
Employment Opportunities	Opportunities for local economy	Medium
Increase of Tensions in the Local Community	Increase of Tensions and Conflicts	Low

Table 14.2 Criteria for Sensitivity/Value of Resource/Receptor

Affected Ecosystem Component	Definition of Impact	Sensitivity Criteria	Sensitivity/Value Level		
			High (3)	Medium (2)	Low (1)
Livelihood and Economic and Physical Displacement	Effects on livelihood from agricultural activities	• Settlements where agriculture is one of the main source of income • Settlements where access to agricultural areas will be restricted due to the Project • 10% of the total agricultural lands of the settlements will be affected by the Project	3 Item	2 Item	0-1 Item
	Effects on livelihood from livestock activities	• Settlements where livestock is one of the source of income • Settlements where access to pasture lands will be restricted due to the Project	3 Item	2 Item	0-1 Item
Infrastructures and Distribution of Utility Services	Effects on traffic and mobility	• Settlement with a population ≥ 500 inhabitant • Settlements with single road access • Settlements benefiting from mobile schooling • Settlements with difficulties in access in winter	4 Item	2-3 Item	0-1 Item
	Effects on infrastructures and utility services	• Settlements with no municipal water supply • Settlements with electric cuts • Settlement with no sewage system	3 Item	2 Item	0-1 Item
Demographic Structure of Settlements	Influence on local communities	• Settlements experiencing out-migration or in-migration • Women ratio is above 52% • Presence of tensions and conflicts in the settlement	3 Item	2 Item	0-1 Item
Employment Opportunities	Opportunities for local economy	• Settlements with a population ≥ 500 inhabitant • Presence of industrial facilities within the 5 km buffer • Presence of organized industrial zones within the 5 km buffer • Settlements where unemployment is a major problem	4 Item	2-3 Item	0-1 Item
Increase of Tensions in the Local Community	Increase of Tensions and Conflicts	• Presence of tensions and conflicts in the settlement • Presence of minorities • Women ratio is above 52%	3 Item	2 Item	0-1 Item

14.1.2 Data Sources

Socioeconomic investigations consisted of two main components, namely the desktop studies and field studies. In this extent, firstly, information on the impact area and the settlements (e.g. land use, population information etc.) was gathered from available information sources (e.g. information from TÜİK) and later, to plan the field surveys, this information was used together with the information obtained from site visit conducted along the planned motorway route on 25-26 July, 2023.

Objective of the socioeconomic field survey (conducted on 25-26, July 2023); is to determine project affected area depending on land acquisition; to identify current socioeconomic characteristics of the settlements. In this context it is also aimed to provide database of measures and management implementations in order to assess possible social and economic impacts, and to prevent adverse impacts on socioeconomic living conditions in the settlements.

Socio-economic fieldwork is basically based on the aim of obtaining foresight about the settlements within the social impact area and obtaining certain quantitative and qualitative data of the settlements where the study was conducted. In this context, the settlements where the study was conducted were selected at intervals of approximately 4 km on project route and to cover approximately 10% of the total number settlements in order to draw a general perspective on the project's socio-economic environment.

Two main tools used survey for quantitative and qualitative data collection during the socioeconomic survey is described in Table 14.3.

Table 14.3 Data Collection Tools

Tools	Description
Key Informant Questionnaires	The key informant questionnaires were considered as supporting tools for information collection, aimed at making the information gathered during the entire research more comprehensive and rich. In this regard, key informant questionnaires provided a basis for checking the information obtained from other methods of data collection. This way, the reliability of information collected by other methods was ensured. In addition, key informant questionnaires were used to obtain preliminary information that is useful for application of other data collecting methods. Within the scope of the project in total, the key informant questionnaires were applied in 4 neighborhoods (Alhan, Alanlı, Gödrenli and Dereköy) that are likely to get affected by the project. Main topics of the key informant questionnaires are listed below: Within the scope of the project, main topics of the key informant questionnaires are listed below: • Population and Demographic Profile • Socioeconomic Conditions • Agriculture and Livestock • Infrastructure Services • Health/Education • Issues Related with Settlements • Perceptions on the Project
Focus Group Meetings	Focus group meetings are detailed interviews conducted with selective groups in accordance with an objective. The main purpose of the focus group meeting is to identify priorities and necessities of PAPs and vulnerable groups and also to identify direct and indirect effects of the Project. These meetings, which are important for taking stakeholders' thoughts, will be applied by meeting moderator and an assistant. Within the scope of Supplementary ESIA studies, one focus group meeting was held with employees of Satellite Construction Camp Site 25 July, 2023.

Sample photographs from the field study are presented in between Figure 14.1 and Figure 14.4. Additionally, in Figure 14.5, a map shows the locations of the social field surveys were held.

Figure 14.1 Key Informant Meeting with Gödrenli Neighborhood Mukhtar

Figure 14.2 Key Informant Meeting with Alanlı Neighborhood Mukhtar

Figure 14.3 Key Informant Meeting with Dereköy Neighborhood Mukhtar

Figure 14.4 Key Informant Meeting with Alhan Neighborhood Mukhtar

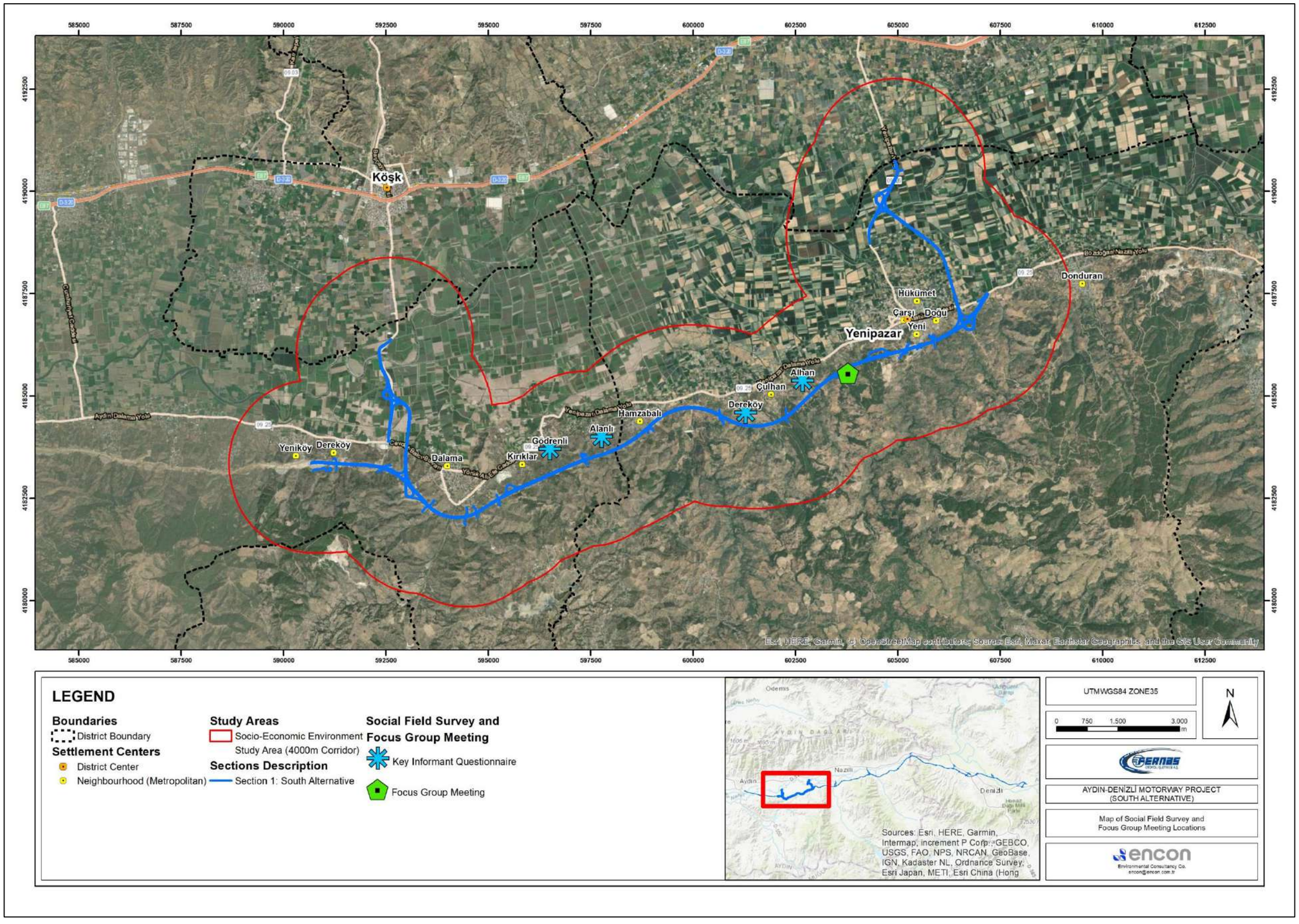


Figure 14.5 Map of Social Field Survey and Focus Group Meeting Locations

14.2 Baseline Conditions

Economy

The project is carried out in Aydın, one of the province TR32 South Aegean Region.

Aydın is one of the most special cities of the Aegean Region with an area of 8,116 km² and an altitude of 92 meters. Didim and Kuşadası is a province with high tourism potential with two important tourism centers of Türkiye. Aydın is the city where the first railway was established in Türkiye. There are many historical artifacts in Aydın. It is the 3rd largest province of the Aegean Region in terms of population. With a population of over 1 million, GDP per capita in Aydın is around 6,444 dollars (TUIK, 2021).

Specific indicators for the socioeconomic development level of Aydın are presented in Table 14.4. As seen in the table, the number of automobiles per thousand people is around 167 for Türkiye in average. For Aydın, the number is 178. It is seen that number of automobiles per thousand people is significantly high in Aydın. Other important indicator is the total electricity consumption per person which is 2,688 KWh for Aydın while it is 3,386 KWh for average in Türkiye.

Table 14.4 Indicators for Development Level of Aydın *(TUIK)*

Indicators of Development Level	Türkiye	Aydın
Total Electricity Consumption per Person, 2021 (KWh)	3,386	2,688
Net Schooling Rate in Secondary School, 2021-2022 (%)	89.67	90.56
Level of Happiness by Provinces*, 2013 (%)	39.44	43.84
Number of Automobiles per thousand People (2022)	167	178
Number of Hospital Beds per Hundred Thousand People (2021)	301	309

**Note: Level of Happiness by Provinces is the proportion of surveyed population who declared that they are happy (Level 2)*

Aydın province industry has developed as an agriculture-based industry. Among the products produced in the province; agricultural products (textiles), chemicals and products (cellulose), vegetable products (olive, olive oil, cotton, tobacco, fresh vegetables and fruits, etc.) and automotive industry products, machinery and machinery equipment are in the first place. With the presence of 23,692,169 olive trees, which make up 15% of the number of olive trees in Türkiye, and the fact that world-renowned companies in the production of olive oil pressing machines operate in the city, approximately 59,000 tons of olive oil is produced annually.

According to nomenclature of units for territorial statistics, Aydın is named as TR32 Level 2 territory together with D Muğla. Labor and Employment data and employment distribution by sectors are disclosed in Table 14.5 and Table 14.6 below. According to data labor force participation rate in TR32 region is slightly higher than the Türkiye's average. While labor force participation in Türkiye is 53.1%, in TR32 it is more than 56.1%. Unemployment rate is significantly lower in TR32 region. The unemployment rate of Türkiye is around 10.4% and 10.2% in TR10 İstanbul. However, it is less than 10% in TR32 region. As Table 14.6 shows the sectoral distribution of employment in TR32 region, it is clearly seen that the agricultural employment is higher than the average. While agricultural employment is around 15.8% in Türkiye and less than 1 % in İstanbul, it is 20.6% of total employment in TR32 region.

Table 14.5 Labor and Employment Data for TR32 (Aydın, Denizli, Muğla) (TUIK, 2022)

Regions	Labor Force Participation (%)	Unemployment (%)	Non-agricultural Unemployment Rate (%) 2021	Employment Rate (%)
Türkiye	53.1	10.4	12.8	47.5
TR10	56.1	10.2	-	50.4
TR32	54.6	8.6	-	49.9

Table 14.6 The Distribution of Employment by Sectors (TUIK, 2022)

Regions	Agriculture (%)	Industry (%)	Service (%)
Türkiye	15.8	27.7	56.5
TR10 (Istanbul)	0.6	31.5	68.0
TR32 (Aydın, Denizli, Muğla)	20.6	23.8	55.6

Socio-economic Baseline of the Surveyed Neighborhoods

Information regarding the main economic activities in the surveyed settlements is given in this section. In the 4 villages where the study was conducted, all of the headmen stated agriculture as their primary source of livelihood. Again, in all 4 villages, animal husbandry was determined as a secondary source of livelihood. Meanwhile, retirement pension, also declared as most common source of income for surveyed settlements however, considering the importance of livestock and agricultural activities, the contribution of such sources of livelihood to the household economy is relatively low (Social Field Survey, July 2023). Main sources of income in the surveyed settlements are given in Table 14.7.

Table 14.7 Main Sources of Income in the Surveyed Settlements (Social Field Survey, July, 2023)

Neighborhood	Primary Income Source	Secondary Income Source	Tertiary Income Source
Alanlı	Agricultural Activities	Livestock	Retirement Pension
Alhan	Agricultural Activities	Livestock	Retirement Pension
Gödrenli	Agricultural Activities	Livestock	Retirement Pension
Dereköy	Livestock	Agricultural Activities	Retirement Pension

Sewerage and Waste Disposal

Municipal water and spring water are used in every settlement In terms of sewerage system in the Neighborhoods, sewage system is not available any neighborhood; while all of them (Alanlı, Alhan, Gödrenli and Dereköy) use septic tanks. Domestic solid wastes are collected by Municipality in every neighborhood. Sewerage and waste disposal methods in the surveyed neighborhoods are given in Table 14.8.

Table 14.8 Sewerage and Waste Disposal Methods in the Surveyed Neighborhoods (Social Field Survey, July, 2023)

Neighborhood	Domestic Water	Quality of Domestic Water	Usage of Drinking Water	Type of Sewerage	Waste Disposal
Alanlı	Municipal Water/ Spring water	Potable	Bottled water/ groundwater	Septic	Collects by Municipality
Alhan	Municipal Water/ Spring water	Potable	Bottled water/ groundwater	Septic	Collects by Municipality
Gödrenli	Municipal Water/ Spring water	Potable	Bottled water/ groundwater	Septic	Collects by Municipality
Dereköy	Municipal Water/ Spring water	Potable	Bottled water/ groundwater	Septic	Collects by Municipality

Vulnerable Groups

It is necessary to identify disadvantaged and vulnerable groups for major projects which cover expropriation and resettlement plans. The reason for this is to protect disadvantaged and vulnerable groups from the disproportionate impacts of the project and take measures and precautions to prevent them to be disadvantaged in terms of development programs and opportunities'. According to the International Finance Corporation (IFC) Performance Standards (2012), factors such as gender, ethnicity, culture, literacy, illness, physical or mental disabilities, poverty, economic disadvantages and dependence on unique resources should be considered while identifying disadvantaged and vulnerable groups.

Within surveyed neighborhoods, there are 124 vulnerable people has been identified during the Social Field Survey. Alanlı has the largest population with 63 individuals who are identified as vulnerable by neighborhood headmen. The number of women-headed household was stated as around 30 by the mukhtar. Also, the number of widow or women living alone is around 5 in Alanlı. In this context, the number of widow and women headed households is lower than Dereköy. In total, the largest vulnerable group in the 4 villages where the field study was conducted is the people in need of charity and women-headed households. According to the numbers stated by the mukhtars in 4 villages, the number of people in need of charity is 36. In the interviews with the mukhtars, some of the physically and mentally disabled people were also mentioned as people in need of nursing. According to the Key informant interviews in these four neighborhoods, the total population stated by mukhtars is 1,573. Thus, the total of 124 vulnerable people consists of nearly 2% of total population which is social study conducted. Vulnerable Groups within the surveyed neighborhoods are given in Table 14.9.

Table 14.9 Vulnerable Groups within the Surveyed Neighborhoods (Social Field Survey, July, 2023)

Neighborhood	Person in Need of Charity	Women Headed Households	Mentally and Physically Disabled	Homeless	Widow and without Encumbrance	Refugee	Total
Alanlı	20	30	8	-	5	-	**63**
Alhan	3	10	2	-	2	-	**17**
Gödrenli	8	5	1	-	2	-	**16**
Dereköy	5	10	3	-	10	-	**28**
Total	**36**	**55**	**14**	**-**	**19**	**-**	**124**

Population

According to the data received from the Address-Based Population Registration System carried out in 2022, the population of Aydın Province is 1,148,241. The population of the province was 989,862 in 2010. Accordingly it can be said that the population of Aydın present an increasing trend through the past years. While the population growth rate of Aydın is 12.5 per thousand in 2022.

According to migration statistics, the net migration trend of Aydın is positive. In 2022, net migration in Aydın is 9,206. Aydın province received the most immigrants from İzmir. Aydın gave the most immigration to İstanbul. Figure 14.6 and 14.7 shows the population change in years between 2008 to 2022 for Aydın.

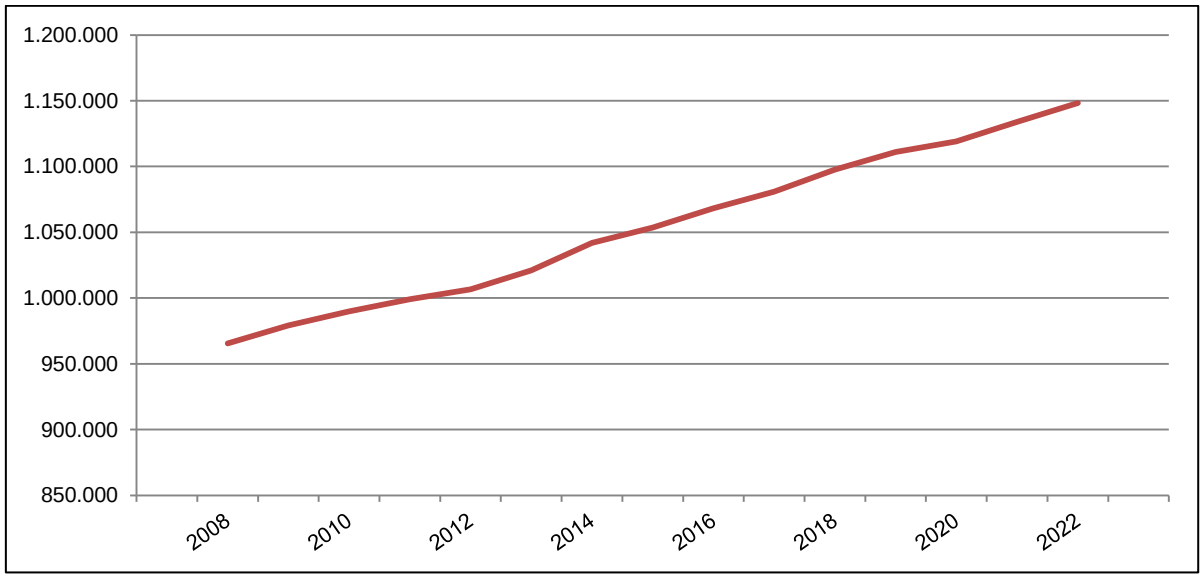


Figure 14.6 Population Change of Aydın Province by Years (TUIK, 2022)

Total fertility rate of Aydın province is 0.73 by the year of 2022. By considering that the fertility rate of the province was 1.70 in 2010, it is understood that the fertility rate has decreased within last decade. In addition based on the results of TUIK 2022; these rates are significantly lower than the fertility rate of Türkiye which is 1.62.

When the age distribution of Aydın examined separately, it seems that the age group of 40-44 (7.5%) has the highest ratio within the population. Table 14.10 and Figure 14.7 show the population distribution of Aydın province by age groups and gender.

Table 14.10 Age Groups and Male-Female Population Distribution of Aydın Province (TUIK, 2022)

Aydın				
Age Group	**Female**	**Male**	**Total**	**Percentage (%)**
0-4	30,517	32,147	62,664	5.45%
5-9	36,243	38,302	74,545	6.49%
10-14	35,475	37,488	72,963	6.35%
15-19	35,487	36,837	72,324	6.29%
20-24	38,241	38,355	76,596	6.67%
25-29	38,089	39,305	77,394	6.74%
30-34	37,197	38,044	75,241	6.55%
35-39	39,870	39,672	79,542	6.92%
40-44	43,046	43,089	86,135	7.50%
45-49	40,115	39,436	79,551	6.92%
50-54	38,437	38,151	76,588	6.67%
55-59	38,022	37,439	75,461	6.57%
60-64	36,846	35,800	72,646	6.31%
65-69	32,060	30,124	62,184	5.41%
70-74	23,339	20,504	43,843	3.81%
75-79	16,188	12,565	28,753	2.50%
80-84	10,639	7,281	17,920	1.56%
85-89	6,139	3,561	9,700	0.84%
90+	3,000	1,191	4,191	0.36%
Total	**578,950**	**569,291**	**1,148,241**	**100%**

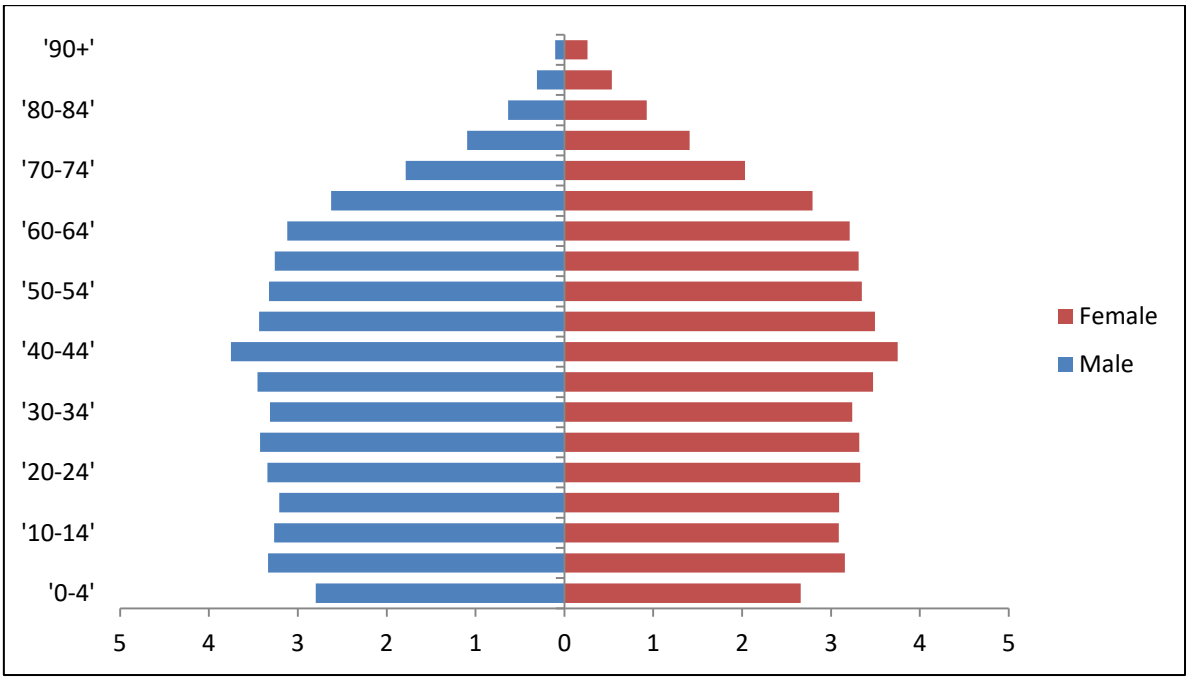


Figure 14.7 Population Pyramid of Aydın (TUIK, 2022)

Figure 14.6 and Figure 14.7 above show the population distribution of Aydın. These population pyramids show that the population between the ages of 15-64 is predominant age group in the population of both cities. As the total fertility rates show, as the birth rates begin to decline, the population growth rate of Aydın tends to decrease, while the economically dependent population also tends to decrease.

Districts' populations of both cities are given In Table 14.11. According to the Table, it is seen that Efeler is the most populous district in Aydın with 303,772 inhabitants and Nazilli (162,737) and Söke (123,301) following the Efeler district.

Table 14.11 District Populations of Aydın (TUIK, 2022)

Aydın	Male	Female	Male (%)	Female (%)	Total
Bozdoğan	16.294	16.313	49.97%	50.03%	32.607
Buharkent	6.456	6.566	49.58%	50.42%	13.022
Çine	24.032	24.434	49.59%	50.41%	48.466
Didim	49.149	47.851	50.67%	49.33%	97.000
Efeler	**149.234**	**154.538**	**49.13%**	**50.87%**	**303.772**
Germencik	21.944	22.228	49.68%	50.32%	44.172
İncirliova	27.715	28.133	49.63%	50.37%	55.848
Karacasu	8.681	8.939	49.27%	50.73%	17.620
Karpuzlu	5.269	5.321	49.75%	50.25%	10.590
Koçarlı	10.986	10.846	50.32%	49.68%	21.832
Köşk	14.341	13.894	50.79%	49.21%	28.235
Kuşadası	65.097	65.738	49.76%	50.24%	130.835
Kuyucak	12.975	13.136	49.69%	50.31%	26.111
Nazilli	79.744	82.993	49.00%	51.00%	162.737
Söke	61.740	61.561	50.07%	49.93%	123.301
Sultanhisar	9.897	10.333	48.92%	51.08%	20.230
Yenipazar	**5.737**	**6.126**	**48.36%**	**51.64%**	**11.863**

Population Characteristics of the Affected Neighborhoods

Total populations of the affected settlements are given in Table 14.12 for 2022 results which announced by TUIK. According to the TUIK 2022 total population of the affected neighborhoods is 10,045 with including district centers mentioned in list the below. Hükümet neighborhood of Yenipazar District in Aydın has the highest population with 2,033 in 2022; while Alhan neighborhood of Yenipazar District in Aydın has the lowest with 109 at the same year. Population of the affected settlements is given in Table 14.12. Although they are not within the socio-economic area of influence as a settlement center, neighborhoods with land within the expropriation corridor are also added to this table.

Table 14.12 Total Population of the Affected Settlements (TUIK, 2022)

Districts	Neighborhoods	Nearest Approximate Motorway Km	Approximate Distance of the Settlement Center to Nearest Motorway Components (m)	Direction with respect to Main Carriageway	Population (TÜİK 2022)
Efeler	Yeniköy	Km 15+500	125	Northwest	1,242
	Dereköy	Km 16+500	20	North	245
	Dalama	Km 19+000	40	North	1,561
	Kırıklar	Km 22+000	85	North-Northwest	388
	Gödrenli	Km 23+000	312	North-Northwest	336
	Alanlı	Km 24+000	50	North	436
Yenipazar	Hamzabali	Km 25+000	13	North-Northwest	782
	Dereköy	Km 27+500	20	North	404
	Çulhan	Km 28+500	230	North-Northwest	180
	Alhan	Km 29+500	0	North-Northwest	109
	Yeni	Km 32+000	0	North	1,337
	Çarşı	Km 32+000	260	North	1,587
	Doğu	Km 33+000	0	North	1,085
	Hükümet	Km 33+000	0	North	2,033
	Donduran	Km 37+000	850	East-northeast	1,019

The information regarding household/family size is obtained with key informant questionnaire and the data is analyzed based on settlements separately. According to the survey results, the common average number of household size in all four settlements is 2.47. Accordingly the average sizes of household in terms of all settlements in Aydın are 2.77. The average household sizes of the four settlements are presented in Table 14.13.

Table 14.13 Average Household Sizes in the Surveyed Neighborhoods (Social Field Survey, July, 2023)

Neighborhood	Population (TUIK 2022)	(A) Population (According to the Headmen)	(B) Number of Household (According to the Headmen)	(A/B) Average Household Size
Alanlı	436	435	230	1.89
Alhan	109	168	65	2.58
Gödrenli	336	370	180	2.05
Dereköy	404	600	160	3.75
Total	**1,285**	**1,573**	**635**	**10.27**

14.3 Potential Impacts

Motorway projects have both negative and positive impacts from socio-economic standpoint. Loss of livelihoods (such as agricultural lands, structures etc.), impacts on social infrastructures, noise and dust emissions generated by construction activities can be characterized as negative impacts; while short and long term employment opportunities and transportation benefits can be described as positive impacts. Both positive and negative impacts are explained separately 'land preparation and construction' and 'operation' phase under this section.

Certain other issues relating to socio-economic impacts are dealt with elsewhere in this ESIA Report, for example, in relation to Chapter 5 ("Land Use and Property") and Chapter 15 ("Community Health and Safety").

14.3.1 Land Preparation and Construction Phase

Various social impacts are expected to occur within the scope of the proposed project's land preparation and construction phase. These impacts can be categorized as follows:

- Impacts on livelihoods due to the expropriation and land acquisition activities;
- Restriction of access to the agricultural and pasturelands due to the route design;
- Impacts on local business;
- Impacts of noise and dust emissions generated by construction activities on human health and livelihoods;
- Effects on infrastructures and distribution of utility services;
- Short and long term employment opportunities created by project activities;
- Changes in the demographic structure of the settlements; and
- Increase of tensions and conflicts in the local community;

14.3.1.1 Livelihood and Economic and Physical Displacement

Project related land acquisition and/or restrictions on land use may results in physical or economic displacement of affected people. In the selection of the route, physical displacement has been avoided to the extent the highway design criteria allowed. In the current design, there is limited number of buildings, houses, structures located within the expropriation corridor in several settlements, thus physical displacement is anticipated at a limited extent if the current route design is maintained. Similarly, a prominent part of the Motorway crosses agricultural lands, thus economic displacement and the resulting impacts on the livelihood of the affected households has been identified as an issue for the project, despite the efforts made to minimize the amount of agricultural lands to be acquired.

During the interviews with the mukhtars, it was learned that the lands in the region are mostly owned privately. According to the information obtained from the headmen, they stated that the village legal entity was lost validity because Aydın province became a metropolitan city in 2014.

It was also stated that the majority of the approximately 600 households in the villages where the study was conducted make their living from farming. Agriculture and livestock activities progress in interaction with each other. It is also seen that the households engaged in livestock activities, tend to produce agricultural products such as corn silage and trefoil to be used as fodder. During the same studies, land use characteristics of the settlements were obtained from the headmen and this information is as follows (see Table 14.14).

Table 14.14 Land Use Characteristics in the Surveyed Settlements (Social Field Survey, July 2023)

Neighborhood	Total Area (da)	Treasury Land (Pastureland, Forest, etc.) (da)	Privately Owned Land (da)
Alanlı	3,490	1,090	2,400
Alhan	5,570	570	5,000
Gödrenli	3,600	600	3,000
Dereköy	5,750	1,250	4,500
Total	**18,410**	**3,510**	**14,900**

According to the headmen, the total land in the neighborhoods is 18,410 decares, while the size of the privately owned land within these areas is 14,900 decares.

There will be limited physical displacement in relation to the project activities. Physical displacement is considered a potential social impact issue as the process of selling and relocating property (particularly residential property) is considered a significant stressful activity for people (especially impacting health and wellbeing) from social impact perspective. According to the expropriation data that were available during the Supplementary ESIA studies, the number of PAPs that will be affected is 2,777. It should be noted that there will be impacts on property owners as well as on the tenants that occupy the property, during the expropriation process. In many cases these will be different parties and the impacts on each of them may be felt differently. People experience effects associated with displacement, loss of emotional attachment to places, feelings of uncertainty and anxiety from the acquisition and removal of these facilities. There will also be economic uncertainty; for property owners this may be in relation to compensation or finding new tenants, and for tenants, this may relate to a disruption in income or uncertainty around finding similarly priced accommodation in the same area.

During the construction activities, relevant measures will be taken into account in order to avoid any damages to the crops or agricultural lands. However, damages or losses of local people that may occur as a result of Project related activities, if occur, will be fully compensated by the Project Sponsor in line with the Turkish Law. Moreover, during the Project, specific attention will be given to vulnerable groups such as women, elderly people, disabled people and children.

14.3.1.2 Restriction of Access to the Agricultural Lands and Pasturelands

Motorway's sections passing through pasture areas and agricultural areas will cause the division of the land and the restriction of access between the separated pieces of land. In this case, the size of the impacts on land use, the underpass, culvert, etc. planned to be made within the project. structures will be decisive. While there will not be a major impact in terms of pastureland in the villages where fieldwork is carried out, the division of agricultural lands due to the motorway route will have impacts. Overviews of the project route passing in vicinity of neighborhoods studied are shown in between Figure 14.8 and 14.11.

Figure 14.8 Overview of the Route Passing in Vicinity of Alanlı Neighborhood

Figure 14.9 Overview of the Route Passing in Vicinity of Alhan Neighborhood

Figure 14.10 Overview of the Route Passing in Vicinity of Dereköy Neighborhood

Figure 14.11 Overview of the Route Passing in Vicinity of Gödrenli Neighborhood

14.3.1.3 Impacts on Local Business

Apart from above mentioned land acquisition and resettlement issues, temporarily economic displacement is expected as a result of the project construction activities. Especially the business and commercial facilities will be affected where traffic diversion and road closure is needed and considering the distance between construction sites and the commercial facilities, nuisance impacts such as dust and noise emissions are also expected cause by construction activities.

Business facilities may also be adversely affected as a result of the project construction activities, as congested roads led to reduced number of customers. All these aspects can lead to the reduction in customer's number, which adversely affect the economic conductions of the business places.

14.3.1.4 Effects on Infrastructures and Distribution of Utility Services

As a result of project construction activities, the need to transport material, products and staff will lead to increased traffic, mainly of heavy vehicles, on the existing road network. It is expected that traffic will be more intense around certain project components like campsites and quarries. The additional traffic can lead to delays in travel times and increased congestion, particularly in critical locations that are already subject to intense traffic. Construction traffic, in particular of heavy vehicles, can also contribute to the deterioration of existing roads, especially unpaved roads and roads that are already in bad conditions.

Additionally, construction activities will affect infrastructure and utility services mainly due to possible disruptions and interruptions that may occur where construction activities intersect underground utility networks (sewage systems, potable water networks etc.).

14.3.1.5 Noise and Dust Emissions Generated by Construction Activities

The significant effects from noise will occur during the construction phase of the project (indicated to be 2-3 years in duration), in those areas where surface works are occurring, and particularly from night construction activities. These effects though temporary are potentially disruptive and adverse, but they will cease after construction and once the motorway is operational. Additionally, there will be potential adverse effects on air quality as a result of the construction of the motorway, resulting from surface construction works. The main adverse construction effects to manage are dust from excavations and odor/hazardous air pollutants arising from the disturbance of contaminated soil.

14.3.1.6 Changes in the Demographic Structure of the Settlements

During the construction phase of the Project main impacts on local population are due to in-migration and out-migration events due to direct and indirect temporary employment opportunities brought by the Project. Currently, it is not possible to estimate how many direct and indirect jobs will be created and where staff is expected to be sourced from (local, provincial or national level); therefore it is difficult to draft with precision what demographic changes will occur. Directly employed workers will be accommodated in campsites, thus leading to increase in population in the areas where they are planned to be built. However campsites are planned to be built self-sufficient to the extent possible, therefore contacts and exchanges with local communities will be limited. In addition campsite will be temporary, therefore changes in the population are expected to be limited in time and will be reversed once construction activities are over.

14.3.1.7 Locals and Non-Locals Employment Opportunities Created by the Project

The workforce needed during the construction phase of the project will be sourced locally, regionally and nationally (from other parts of Türkiye). Due to the technical nature of the Project and the low skill set in local communities, it is likely that skilled labor will be sourced nationally. Typically, in Türkiye, most of the construction companies employ unskilled labor from the local communities, primarily to reduce costs associated with travel and accommodation.

Employment of locals will provide significant benefits on those who are employed however this will be a minor portion of the entire population. The employment of individuals from local communities will however be beneficial as it is expected to lead to improved relationships between the project and local communities.

Another benefit of the project will be indirect employment opportunities and these will be associated with the project supply chain (goods and services) and spending of project employees in local communities.

Employment of non-locals, as well as the increase of incomes of local employees, may also bring in some minor benefits for local communities, associated with increased spending in the project area. Due to the fact that, nearest vicinities to project area is large scale residential areas, this positive impact is anticipated to be minor.

14.3.1.8 Increase of Tensions and Conflicts in the Local Community

During the construction phase an increase of tensions and conflicts may occur both within communities or between communities; this can be due to a series of factors directly and indirectly linked to the project activities.

Temporary and permanent changes to land use may create in tensions in owners or people making a livelihood from the affected areas. The perception that the expropriation activities are not performed in an equitable and transparent manner might lead to tensions among land owners.

Additionally, the perception that economic benefits are not distributed equitably or that certain groups are excluded from employment opportunities can create situations of frustration and resentment in local communities.

In addition the arrival of workers directly or indirectly employed in the project can have consequences in settlements where contacts among workers and local communities are more common. Increased tensions would be due to general nuisances brought by workers, increased pressure on infrastructures or services or localize cultural aspects. This is more likely to occur in settlements closer to campsites, where the influx of workers is stronger.

14.3.2 Operation Phase

The proposed project will increase the economic activities around the region and it will improve the commercial activity in the project area resulting in economic uplift of the local communities. There would be a wider economic impact in terms of generating opportunities for other business like transportation, marketing, repair and maintenance tasks, etc. It will also increase in value of land along the carriage way resulting due to gentrification effect and speedy and secure transportation to the access roads and important locations for commercial activities and/or touristic activities. Property value especially near interchanges may increase in future.

The project also reduces the high traffic load in existing roads and specific locations along the existing route. In addition, within the scope of the business opportunities, such as fuel stations, markets and restaurants and other units on the motorway will contribute positively to the employment and business opportunities in the region during the operation phase.

Relevant impacts cause by noise emissions is given in Chapter 11 (“Noise and Vibration”); while dust emissions are given in Chapter 10 (“Air Quality and Climate Change”). Additionally, potential impacts and mitigation measures regarding to the local communities’ health and safety issues are explained in Chapter 15 (“Community Health and Safety”).

14.4 Mitigation Measures

Mitigation measures are proposed in accordance with Turkish legislation and international standards (e.g. IFC PS 5). Relevant mitigation measures will be taken against potential social impacts during the Project’s all phases are described under this section.

14.4.1 Land Preparation and Construction Phase

Mitigation measures will be taken to potential social impacts during the land preparation and construction phase of the project are explained below sections.

14.4.1.1 Livelihood and Economic and Physical Displacement

International Finance Corporation (IFC) Performance Standards 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. In order to minimize this impact PS 5 defines basic mitigations. These are as follows:

PS5. Land Acquisition and Involuntary Resettlement	To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs; To avoid forced eviction; To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement costs and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected; To improve, or restore, the livelihoods and standards of living of displaced persons; and To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.

In spite of IFC PS5’s recognitions, all related expropriation and land acquisition activities will be performed in line with national laws and regulations.

When displacement cannot be avoided, displaced communities and persons will be provided with appropriate compensation for loss of assets through Project-specific measures to be developed. Implementation of the expropriation works are under the responsibility of KGM as the administrative authority. The costs related with the procurement of services for the valuation works and others will be separately covered by the Project Owner.

Additional compensation method will be available for the affected communities through “Government Assisted Resettlement”. Article 12 of 5543 Resettlement Law refers to the resettlement of persons whose immovable properties are expropriated and specifies eligibility criteria for government assisted resettlement as follows:

(1) Due to the construction of a dam, an area adjacent to the dam, an area under protection, airport, highway, railway, plant and other facilities related to national economy and defense will be erected by public institutions and organizations; and due to the implementation of special laws and in order to protect historical and natural valuables;

a) The families who have to leave their locations/places as a result of partial or full expropriation of their immobile properties,

b) The families who do not own any immovable property, but who reside in the expropriation area at least for three years before the beginning of the calendar year, in which the resettlement planning studies were commenced, will be resettled to the locations/places indicated by the MoEUCC according to the provisions of this Law, provided that they request.

(2) However, the families who own immovable properties to be expropriated but left their places before the commencement date of resettlement planning studies shall not be resettled. Within the last three years as of this date, the families who sold their immobile properties without any compulsory situation and did not purchase immovable property with the equal or higher value shall not be resettled even if they did not leave their places. The compulsory situations mentioned above shall be determined by the regulations.

(3) Among the families residing in the expropriation area, those who are affected from the expropriation implemented by the public institutions and organizations, can be resettled by the Ministry to a location indicated within their village boundaries upon their written application if they do not want to be resettled by the government in any other place, provided that the suggestion of relevant Governorate and the approval of the Ministry of Interior are obtained.

(4) Among the families included in the scope of the this article, and requested to be resettled by the Government; the families who do not apply within the ninety day following the ending date of the announcement of resettlement, and the families who do not commit to deposit the amount determined by the MoEUCC from their expropriation compensation they received or will receive, or their full expropriation compensation and additional increase awarded by court in the case that the amount of expropriation compensation is lower than the amount (determined by the Ministry) into the account of the Central Account Unit of the Ministry, shall not be resettled.

Article 9 of Resettlement Law explains the resettlement assistance (which is similar to World Bank Standards) as follows:

(1) The immigrants, nomads, the persons whose places/grounds are expropriated and persons who are decided to be relocated by the reason of the national security shall be resettled in cities, towns and villages by means of providing the following through debiting/repayment according to the provisions of this Law, and pursuant to the plan and the project (specific) prepared by the MoEUCC;

a) At first, house and its' house-plot (for building),
b) For craftsmen, artisans and tradesmen: work place and its' building plot and operation credit to enable them providing for their livelihood,
c) For farmers, land, necessary agricultural inputs, agricultural structures or plot of structure, and in kind and in cash operation and equipment credits as envisaged in agricultural resettlement project (specific),
d) (ç) In case of the request of the right holder families (entitled to resettlement), resettlement credits can be given to the families collectively or individually, if the house, work place and agricultural land are found by themselves and their suggestions are approved by MoEUCC.

(2) Annual operation and equipment credits provisioned in agricultural resettlement projects (specific) shall not be paid to the families who did not request the mentioned credits within two years following the transfer of their agricultural lands.

(3) For immigrants accepted to enter the country according to this Law, as of the date they pass (enter) the border gates with their used goods which are exempt of customs; and for the people whose grounds (immovable properties) are expropriated and for those who are resettled due to national security and for the nomads, as of time when they are transferred to their resettlement areas; they shall be provided the support of medical help, accommodation, food, fuel and the support of clothing (for once only) for persons in need, and gratuitous assistances for temporary re-settlement for

those whose immovable properties are expropriated; these supports shall be provided according to the time, amount and the conditions specified in the regulations of the Law.

(4) Transportation (moving) of those (families) mentioned above to the resettlement areas (sites) shall be provided free of charge by the government according to the "Transportation (moving) Project" to be prepared (specifically) by the Ministry.

From the international standards point of view, another important point is the allocation of expenditure regarding land acquisition and resettlement under a single/same budget item. Article 33 of the Resettlement Law no 5543, states that the resettlement allowance will be allocated in the budget of the institution responsible for expropriation (in this case KGM).

14.4.1.2 Restriction of Access to the Agricultural Lands and Pasturelands

Expropriation of privately-owned agricultural lands will be done by KGM in accordance with the relevant provisions of the Expropriation Law. In accordance with Turkish Expropriation Law, if the land portion remaining from expropriation would not be viable anymore, eligible persons have the right to request the expropriation of the entire parcel (application has to be in line with the requirements of the Law) including the remaining portion, even if this portion is out of the expropriation corridor.

- Several underpasses and culverts have been included in the design to ensure access of local people to agricultural lands. These underpasses and culverts will ensure sufficient dimensions for the passage of harvesters, vehicles, etc. where required. Detailed lists of underpasses and culverts planned in the Project are provided in Chapter 3 ("Project Description")
- Access roads will be constructed in parallel to the motorway near agricultural areas/zones to provide access to agricultural lands, where necessary
- Legitimate requests of local people regarding the avoidance and/or minimization of the restriction of access between their settlement areas and agricultural lands will be considered by the Project Sponsor's design team and feasible solutions will be developed and implemented, where possible.
- For the pasturelands that will be separated by the motorway (fragmentation of land), impacts on the public users of the pasturelands will be mitigated by ensuring access between severed lands. In this scope, culverts, underpasses and over bridges have already been included in the design. However, additional passage ways that will be requested by local communities will be added in the design.
- It should be noted that, any change on project design could be materialized once approved by KGM.

14.4.1.3 Impacts on Local Business

Although business owner will be compensated by the government, project activities may cause economic displacement for those business premises located nearby the Motorway route. Within the scope of Stakeholder Engagement Plan (SEP), Project Sponsor will inform the local business owners prior to commence construction activities, 15 days' notice.

14.4.1.4 Effects on Infrastructures and Distribution of Utility Services

The mitigation of impacts on infrastructures and utility distribution are partially addressed in the Supplementary ESIA Annex 6, A3 (Solid Waste Management Procedures). The following mitigation measures will be applied throughout the construction phase:

- Mobile schooling times will be taken into account during the transportation of construction materials. Neighborhood headmen will be informed about the upcoming construction activities' date and times.

- All utility distribution networks intersected by Project Components will be identified and appropriate construction techniques will be used to reduce disruptions to the extent possible.
- Any planned disruption of utility distribution services will be communicated to local authorities and local communities at least 72 hours' notice where the project sponsor has information beforehand; and planned disruptions are expected to last more than 12 hours, a specific risk analysis will be performed to assess impacts expected on local communities and to identify additional mitigation measures.
- Any damage to utility distribution networks will be repaired promptly in accordance with the network owner or operator. Any unplanned disruption of utility distribution services will be managed through communication to local communities, written and/or verbal information to explain event occurred and repair measures needed. Grievance mechanism will be used to record and solve the relevant incidents results.
- Access to properties will be guaranteed or appropriate alternative access solutions that are agreed with users will be implemented. The existing irrigation networks affected by Project activities will be mapped and appropriate technical solutions will be implemented to reduce possible interferences; if interferences are unavoidable, appropriate alternative solutions will be agreed with irrigation water users.

During the course of construction phase, grievance mechanism will be in effect in order to receive local community's nuisance and disturbance.

14.4.1.5 Noise and Dust Emissions Generated by Construction Activities

Relevant mitigation measures regarding the noise emissions are given in Chapter 11 ("Noise and Vibration") while dust emissions are given in Chapter 10 ("Air Quality and Climate Change"). Additionally, potential impacts and mitigation measures regarding to the local communities' health and safety issues are explained in Chapter 15 ("Community Health and Safety").

During the course of construction phase, grievance mechanism will be in effect in order to receive local community's nuisance and disturbance.

14.4.1.6 Changes in the Demographic Structure of the Settlements

In order to avoid population influx to the nearby settlements, all the workers will be accommodated in the campsites. Assessment of the potential problems between workers and local communities is highly important to avoid growing conflicts. Reviewed SEP and grievance mechanism will be in effect at all stages of the construction phase.

14.4.1.7 Locals and Non-Locals Employment Opportunities Created by the Project

The Project Sponsor shall take all necessary actions and measures for labor and employment in order to be in compliance with Turkish legislation and international standards. A "Human Resources Management Procedure" will be developed by the Project Sponsor.

Project Sponsor aims at employing local workers to the extent possible, in order to increase the Project's local benefits. The recruitment processes will be transparent, public and non-discriminatory, providing equal opportunities with respect to ethnicity, religion, language, gender and sexuality.

The Project Sponsor will provide clear information on the recruitment process, with particular emphasis on informing local communities of employment opportunities through different channels such as settlement headmen and local associations. Communication material such as posters and

brochures will be distributed locally. Job descriptions will be clearly communicated in advance and will contain complete information on working conditions.

Contracts will comply with Turkish legal requirements and will contain complete information on working conditions; a copy will be signed by both parties and will be provided to the worker.

14.4.1.8 Increase of Tensions and Conflicts in the Local Community

Project Sponsor will provide clear information on the recruitment process, with particular emphasis on informing local communities of employment opportunities through different channels such as settlement heads and local associations. Communication material such as posters and brochures will be distributed locally. The recruitment processes will be transparent, public and non-discriminatory, providing equal opportunities with respect to ethnicity, religion, language, gender and sexuality.

In order to increase the project's local benefits, goods, services and materials will be procured from local businesses to the extent possible.

Training on community relations will be provided to workers during induction and regularly throughout their employment; workers will be informed on the code of conduct to keep according to local customs and on approach to be used when interacting with local communities and individuals.

Project Sponsor and contractors will conduct medical check-up of the labor force before hiring them; this will minimize risk of increase in diseases due to the entry of the labor force into the project construction area. In addition communicable diseases that could be transmitted by the workforce should be identified.

Local authorities and local communities will be informed and consulted on impacts due to project activities and planned mitigation measures. An effective SEP will be in effect. As part of the Stakeholder Engagement Activities, a Grievance Mechanism already been set up for communities and individuals to formally communicate their concerns, complaints and grievances and facilitate resolutions that are mutually acceptable by the parties.

Accidental damages caused by project activities will be compensated by Project Sponsor.

14.5 Summary of Assessment and Residual Impacts

Table 14.15 provides a summary on the social impact assessments. Significance of the identified impacts before and after the implementation of mitigation measures are summarized in this table. As can be seen from the Table, in general, potential impacts on the livelihoods, infrastructures and utility services and demographic characteristics etc. are anticipated to be reduced to low levels in the long-run with effective implementation of mitigation measures, with the exception of impacts on livestock activities within the affected settlements. However, residual impacts related to the livestock owners which the residual impacts have been evaluated as medium due to their importance.

Table 14.15 Summary of Social Impact Assessment

Affected Socio economic Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Livelihood and Economic Displacement	Land preparation and construction / Operation	Effects on livelihood from agricultural activities	Adverse	Restricted	Long	Medium (Section 1)	Irreversible	One-off	Moderate (B)	Medium (2)	Medium (B2)	• When displacement cannot be avoided, displaced communities and persons will be provided with appropriate compensation for loss of assets through Project-specific measures to be developed • Additional compensation method will be available for the affected communities through "Government Assisted Resettlement". • Several underpasses and culverts have been included in the design to ensure access of local people to agricultural lands. These underpasses and culverts will ensure sufficient dimensions for the passage of harvesters, vehicles, etc. where required. • Access roads will be constructed in parallel to the Motorway near agricultural areas/zones to provide access to agricultural lands. • Legitimate requests of local people regarding the avoidance and/or minimization of the restriction of access between their settlement areas and agricultural lands will be considered by the Project Sponsor's design team and feasible solutions will be developed and implemented, where possible • It should be noted that, any change on project design could be materialized once approved by KGM.	Low
		Effects on livelihood from livestock activities	Adverse	Restricted	Long	Low (affected area of the pasture parcel is less than 10% of the entire parcel area)	Short term reversible	One-off	Minor (C)	High (3)	High (C3)	• For the pasturelands that will be separated by the Motorway (fragmentation of land), impacts on the public users of the pasturelands will be mitigated by ensuring access between severed lands. In this scope, culverts, underpasses and over bridges have already been included in the design. However, additional passage ways that will be requested by local communities will be added in the design in case of approved by KGM.	Low
			Adverse	Local	Long	Medium (distance of the construction zone to the settlements is ≤500m)	Short term reversible	One-off	Moderate (B)	High (3)	High (B3)	• For the pasturelands that will be separated by the Motorway (fragmentation of land), impacts on the public users of the pasturelands will be mitigated by ensuring access between severed lands. In this scope, culverts, underpasses and over bridges have already been included in the design. However, additional passage ways that will be requested by local communities will be added in the design in case of approved by KGM.	Medium
			Adverse	Restricted	Long	High (affected area of the pasture parcel is more than 25% of the entire parcel area)	Short term reversible	One-off	Major (A)	High (3)	High (A3)	• For the pasturelands that will be separated by the Motorway (fragmentation of land), impacts on the public users of the pasturelands will be mitigated by ensuring access between severed lands. In this scope, culverts, underpasses and over bridges have already been included in the design. However, additional passage ways that will be requested by local communities will be added in the design in case of approved by KGM	Medium
Infrastructures and Distribution of Utility Services	Land preparation and construction / Operation	Effects on traffic and mobility	Adverse	Local	Medium	Low	Short term reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)	• All utility distribution networks intersected by Project Components will be identified and appropriate construction techniques will be used to reduce disruptions to the extent possible. • Any planned disruption of utility distribution services will be communicated to local authorities and local communities with at least 72 hours' notice where the project sponsor has information beforehand and planned disruptions are expected to last more than 12 hours, a specific risk analysis will be performed to assess impacts expected on local communities and to identify additional mitigation measures • Any damage to utility distribution networks will be repaired promptly in accordance with the network owner or operator. Any unplanned disruption of utility distribution services will be managed through communication to local communities, written information to explain event occurred and repair measures needed. Grievance mechanism will be used to record and solve the relevant incidents results. • During the course of construction phase, grievance mechanism will be in effect in order to receive local community's nuisance and disturbance.	Low

Affected Socio economic Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity/ Value of Resource /Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												• Mobile schooling times will be taken into account during the transportation of construction materials. Neighborhood headmen will be informed about the upcoming construction activities' date and times.	
		Effects on infrastructures and utility services	Adverse	Local	Medium	Low	Short term reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)	• Any damage to utility distribution networks will be repaired promptly in accordance with the network owner or operator. Any unplanned disruption of utility distribution services will be managed through communication to local communities, written information to explain event occurred and repair measures needed. Grievance mechanism will be used to record and solve the relevant incidents results. • During the course of construction phase, grievance mechanism will be in effect in order to receive local community's nuisance and disturbance.	Low
Demographic Structure of Settlements	Land preparation and construction	Influence on local communities	Adverse	Wide	Medium	Low	Short term reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)	• In order to avoid population influx to the nearby settlements, all the workers will be accommodated in the campsites. Assessment of the potential problems between workers and local communities is highly important to avoid growing conflicts. SEP and grievance mechanism will be in effect at all stages of the construction phase.	Low
Employment Opportunities	Land preparation and construction	Opportunities for local economy	Beneficial	Wide	Medium	Medium	Short term reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)	• Project Sponsor aims at employing local workers to the extent possible, in order to increase the Project's local benefits. The recruitment processes will be transparent, public and non-discriminatory, providing equal opportunities with respect to ethnicity, religion, language, gender and sexuality. • Contracts will comply with Turkish legal requirements and will contain complete information on working conditions; a copy will be signed by both parties and will be provided to the worker. • The Contractors will provide clear information on the recruitment process, with particular emphasis on informing local communities of employment opportunities through different channels such as settlement headmen and local associations	Low
Increase of Tensions in the Local Community	Land preparation and construction	Increase of Tensions and Conflicts	Adverse	Wide	Medium	Low	Short term reversible	Intermittent	Moderate (B)	Medium (2)	Medium (B2)	• Training on community relations will be provided to workers during induction and regularly throughout their employment; workers will be informed on the code of conduct to keep according to local customs and on approach to be used when interacting with local communities and individuals. • Local authorities and local communities will be informed and consulted on impacts due to project activities and planned mitigation measures. An effective SEP will be in effect. As part of the Stakeholder Engagement Activities, a Grievance Mechanism already been set up for communities and individuals to formally communicate their concerns, complaints and grievances and facilitate resolutions that are mutually acceptable by the parties • In order to increase the project's local benefits, goods, services and materials will be procured from local businesses to the extent possible.	Low

CHAPTER 15

COMMUNITY HEALTH AND SAFETY

15. CHAPTER – COMMUNITY, HEALTH AND SAFETY

The South Alternative project, will involve typical community health and safety impacts and/or risks that are applicable in most of the large scale infrastructure projects. Especially, construction phase will include significant earth moving activities and involvement of a large number of workforces. However, due to temporary nature of the construction activities, associated impacts on the health and safety of the community will be short-term and temporary. During the operation phase, pedestrian safety, traffic safety and emergency preparedness and response would be among the most important community health and safety issues that are to be properly managed throughout the long-term operational activities. It should be noted that, with the improved road standards, accidents rates for the associated routes are anticipated to reduce providing an overall benefit to the community safety and public welfare. Socio-economic impacts and benefits of the project that would also be related with public welfare have been discussed in Chapter 14 ("Socio-economic Environment"). Main community health and safety issues to be covered in the following sections are summarized below:

- Traffic safety during construction and operation;
- Impacts of blasting operations during construction;
- Impacts on water quality and availability during construction;
- Airborne/communicable diseases due to construction workforce inflow;
- Pedestrian safety during operation;
- Emergency preparedness and response during the construction and operation;
- Disturbance of public health and welfare due to air emissions, noise generation, water-borne, water-based and water-related during the construction and operation;
- Security personnel arrangements during construction;
- Structural safety during operation.

15.1 Assessment Methodology and Data Sources

Impacts of the project on the community health and safety will be assessed based on qualitative approaches. As some of the potential impacts on the community health and safety are primarily associated with other direct environmental impacts such as air emissions, noise generation, wastewater and waste production, etc., outcome of the assessments done for those impacts in the previous chapters of this Supplementary ESIA Report have been taken into consideration as well.

- TUIK's transportation statistics (accidents, fatalities, etc.);
- TUIK's population statistics;
- Aydın Metropolitan Municipality's database.

Study area for the community health and safety impacts have been determined as 2 km corridor (1000 m from each side of the Motorway axis), as the settlements located within this area would be more likely to be subject to associated risks and impacts when compared to the settlements located at farther distances.

Significance Criteria

The significance criteria for the impacts on community health and safety will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impact on the land use components, while sensitivity/value criteria to be used in the scope of impact assessment is summarized in Table 15.1. Detailed explanation of the sensitivity components for each ecosystem component is provided in the following "Baseline Conditions" section.

Table 15.1 Criteria for Sensitivity/Value of Resource/Receptor

Ecosystem Component	Sensitivity/Value Level		
	High (3)	**Moderate (2)**	**Low (1)**
Local Communities (Risk of Construction Accidents)	Settlements within the expropriation corridor having affected population of >500 habitants or Settlements within the study corridor having affected population of >1,000	Settlements within the study corridor (inc. exp. corridor) having affected population of 500-1.000 habitants	Settlements within the expropriation corridor having affected population<500 habitants
Local Communities (Blasting Effects)	Settlements where number of residential buildings within the expropriation corridor	Settlements where number of residential buildings within the expropriation corridor between10-20	Settlements where number of residential buildings within the expropriation corridor<10
Local Communities (Water Supply)	Settlements with limited water availability		Settlements with sufficient water availability
Local Communities (Airborne/ communicable diseases)	Settlements with existing health issues		Settlements with no existing health issue
Local Communities (Disturbance due to acts of security personnel)	Settlements with particular sensitivity/past issues related with improper acts of security		Settlements with no particular sensitivity/past issues related with improper acts of security
Local Communities (Traffic accidents)	All locations		

15.2 Baseline Conditions

Information regarding the Baseline Conditions is presented sub-headings as follows;

Existing Transportation Infrastructure

Motorway network of Turkey is currently under development. As of 2020, total length of the Motorways was recorded as 3,633 km, which is around 5% of the total length of the road network in the country. The 2035 target of KGM is to complete construction of 7,800 km of motorway. Increase in the length of the roads in Turkey between 1990 to 2022 is summarized in Table 15.2.

Table 15.2 Road Length in Turkey

		State highways		Provincial roads			
Year	**General Total**	**Divided road**	**Other**	**Divided road**	**Other**	**Motorways**	**Village road**
1990	**367,956**	1,798	29,351	111	27,868	241	308,587
1991	**368,165**	1,836	29,426	136	27,824	342	308,602
1992	**387,079**	1,890	29,454	153	28,346	716	326,521
1993	**388,035**	2,018	29,407	167	28,179	1.012	327,253
1994	**381,012**	2,149	29,240	202	28,241	1.151	320,029
2002	**427,411**	3,859	27,459	467	29,583	1.714	364,329
2003	**428,415**	4,926	26,432	521	29,612	1.753	365,171
2004	**349,215**	6,735	24,711	575	29,793	1.662	285,739
2005	**349,238**	7,917	23,454	594	29,974	1.667	285,632
2006	**349,304**	9,135	22,200	642	29,787	1.908	285,632
2007	**350,708**	10,387	20,946	678	29,901	1.908	286,888
2008	**351,958**	11,747	19,564	789	29,923	1.922	288,013
2009	**362,660**	13,606	17,665	852	30,096	2,036	298,405
2010	**367,263**	15,788	15,607	996	30,394	2,080	302,398
2011	**370,276**	17,033	14,339	1,122	30,436	2,119	305,227
2012	**385,748**	17,886	13,489	1,181	30,699	2,127	320,366
2013	**388,783**	18,524	12,817	1,311	30,844	2,244	323,043
2014	**236,794**	18,944	12,336	1,361	31,113	2,278	170,762
2015	**238,899**	19,357	11,856	1,467	31,598	2,282	172,339
2016	**242,590**	19,790	11,316	1,499	32,014	2,542	175,429
2017	**247,514**	20,237	10,829	1,613	32,283	2,657	179,895
2018	**247,553**	20,475	10,546	1,796	32,357	2,842	179,537
2019	**250,731**	20,723	10,283	1,922	32,243	3,060	182,500
2020	**256,328**	21,023	9,951	2,100	32,036	3,523	187,695
2021	**257,345**	21,292	9,673	2,149	31,880	3,532	188,819
2022	**259,072**	21,467	9,473	2,258	31,858	3,633	190,383

Source: TUIK 2022

Number of vehicle ownership and vehicle movement density and usage rate of the roads (vehicle-kilometers) has increased rapidly (in parallel to population growth) since the beginning of 2000s. The table 15.3 below shows the change in the number of registered vehicles, the number of accidents and the number of deaths by years.

Table 15.3 Number of vehicles registered, accident, persons killed and injured, 2009-2022

Year	Number of Vehicles Registered	Total Number of Accidents	Accidents Involving Material loss only	Accidents involving death or injury	Persons Killed (1)			Number of persons injured
					Total	At accident scene	Accident follow-up	
2009	14,316,700	1,053,346	942,225	111,121	4,324	4,324	-	201,380
2010	15,095,603	1,106,201	989,397	116,804	4,045	4,045	-	211,496
2011	16,089,528	1,228,928	1,097,083	131,845	3,835	3,835	-	238,074
2012	17,033,413	1,296,634	1,143,082	153,552	3,750	3,750	-	268,079
2013	17,939,447	1,207,354	1,046,048	161,306	3,685	3,685	-	274,829
2014	18,828,721	1,199,010	1,030,498	168,512	3,524	3,524	-	285,059
2015	19,994,472	1,313,359	1,130,348	183,011	7,530	3,831	3,699	304,421
2016	21,090,424	1,182,491	997,363	185,128	7,300	3,493	3,807	303,812
2017	22,218,945	1,202,716	1,020,047	182,669	7,427	3,534	3,893	300,383
2018	22,865,921	1,229,364	1,042,832	186,532	6,675	3,368	3,307	307,071
2019	23,156,975	1,168,144	993,248	174,896	5,473	2,524	2,949	283,234
2020	24,144,857	983,808	833,533	150,275	4,866	2,197	2,669	226,266
2021	25,249,119	1,186,353	998,390	187,963	5,362	2,421	2,941	274,615
2022	26,482,847	1,232,957	1,035,696	197,261	5,229	2,282	2,947	288,696

(1) Includes the deaths within 30 days after the traffic accidents due to related accident and its impacts for people who were injured and sent to health facilities.

- Denotes magnitude null.

The South Alternative is located within the authority and responsibility area of KGM's İzmir (2nd) Regional Directorate. Relevant network and traffic volume maps of 2021 within this area are presented in Figure 15.1, Figure 15.2 and Figure 15.3.

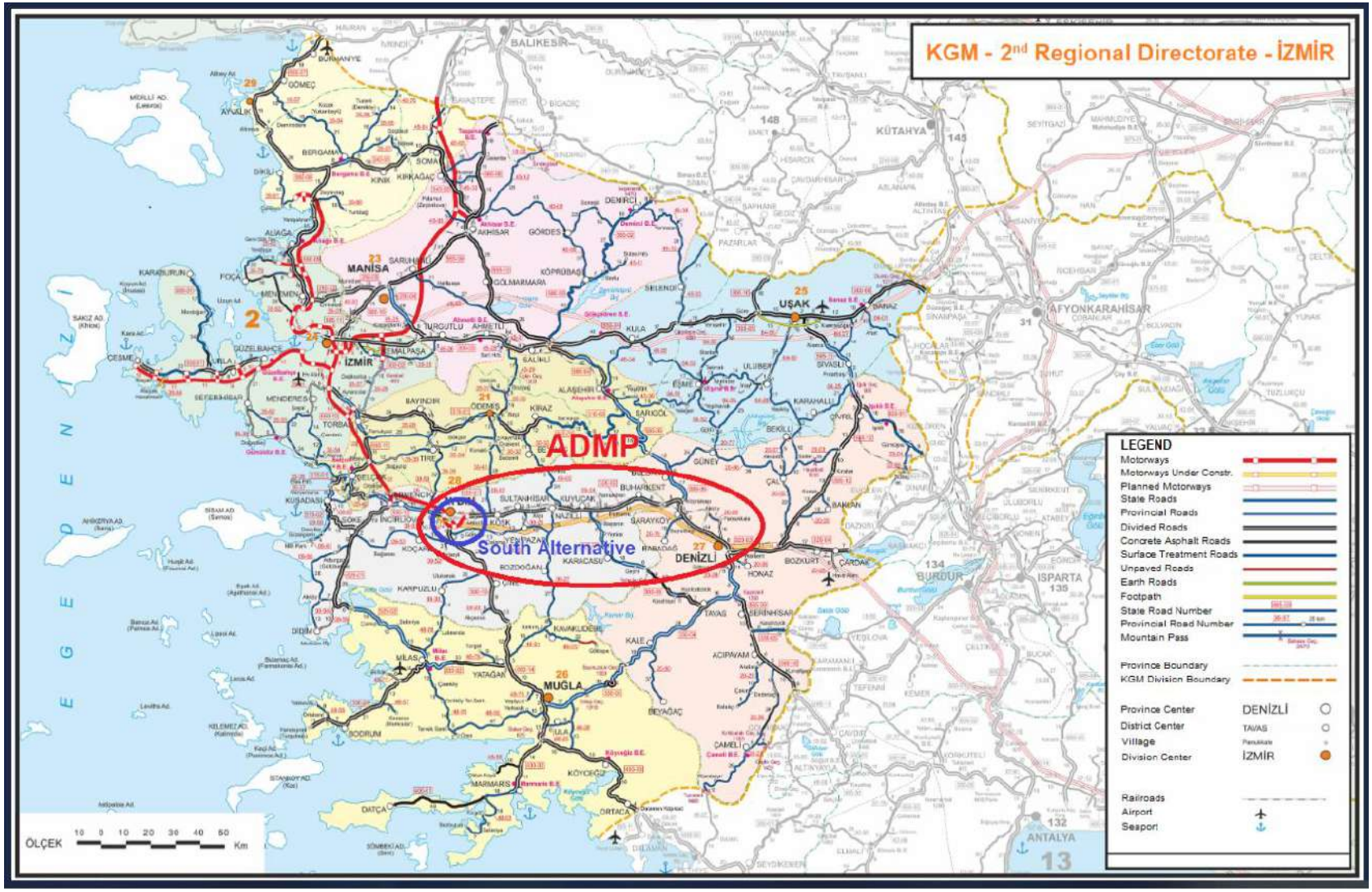


Figure 15.1 Map of the Road Network within KGM's İzmir (2nd) Regional Directorate Authority Area

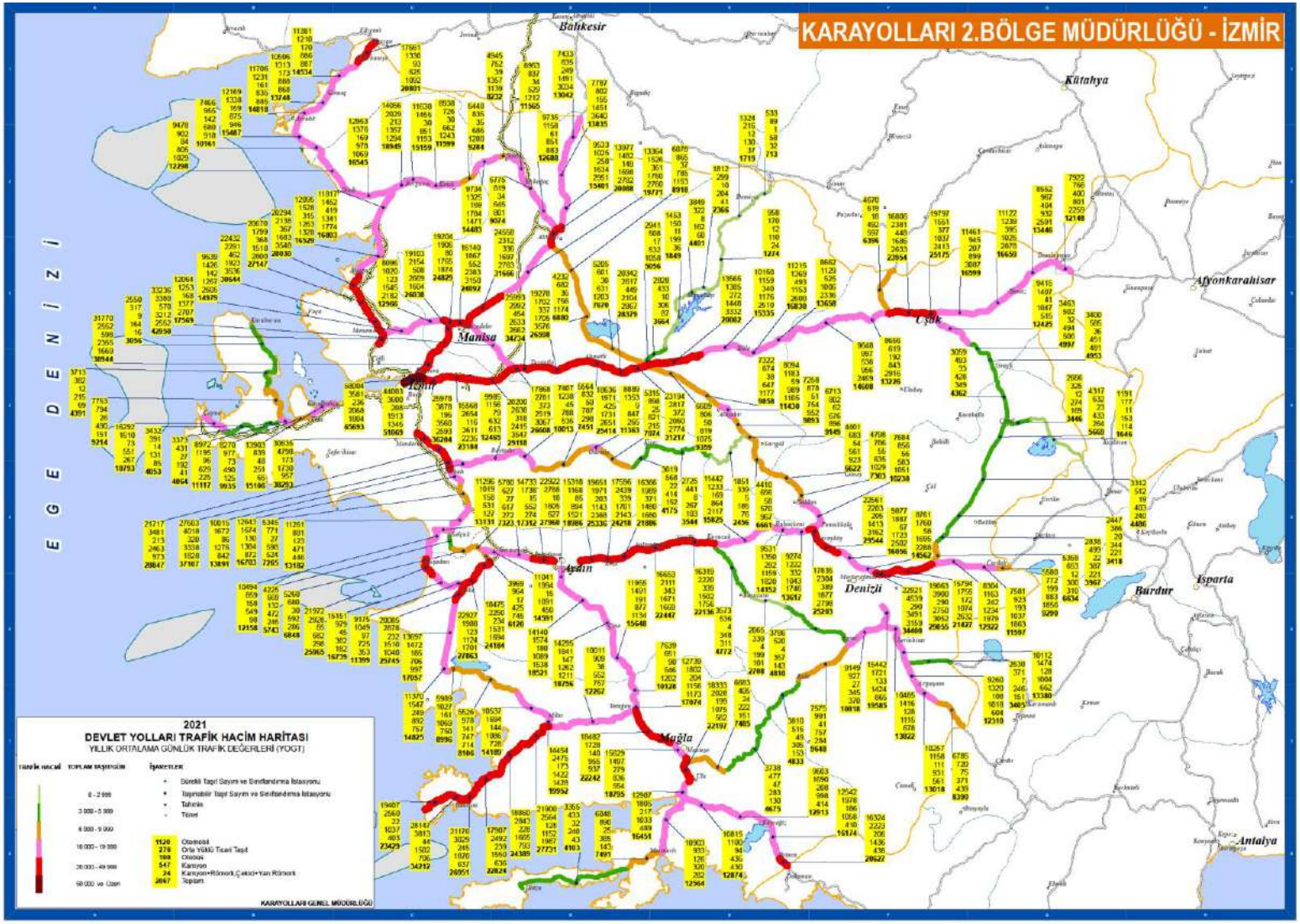


Figure 15.2 Map of the Existing Daily Traffic Volumes (Annual Average for 2021) on State Roads within KGM's İzmir (2nd) Regional Directorate Authority Area (In Turkish)

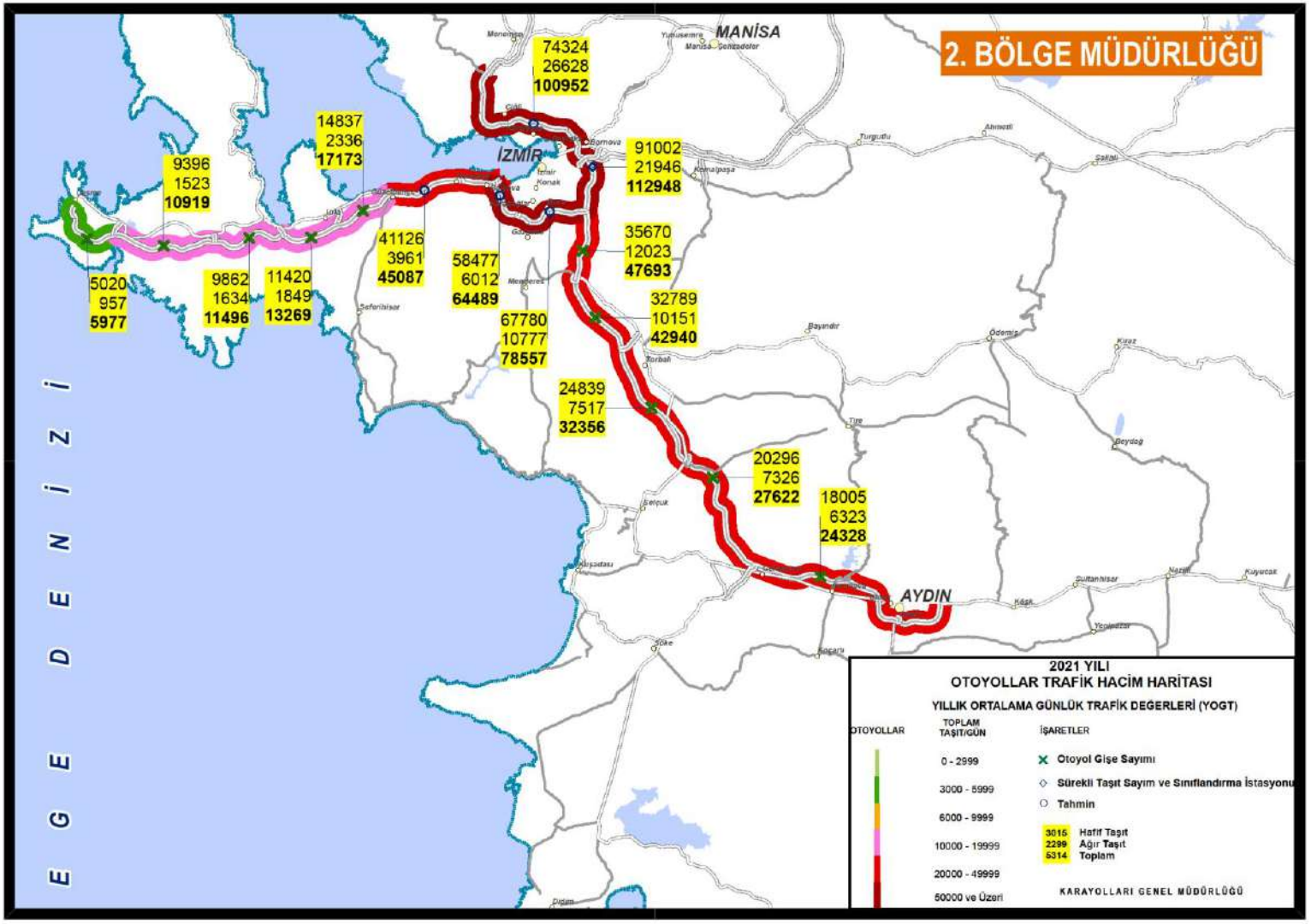


Figure 15.3 Map of the Existing Daily Traffic Volumes (Annual Average for 2021) on Motorways within KGM's Relevant Regional Directorates' Authority Area (In Turkish)

15.3 Potential Impacts

Similar to most large construction sites, community health and safety issues during the construction of the project will include the dust, noise and vibration from construction vehicle transit and issues related that may be associated with the influx of temporary construction labor.

Mobile vehicle traffic during the construction and operation phases of the project is also likely to result in the risk of accidents and potential impacts due to air and noise emissions that need management to minimize community and personnel health and safety issues. On the other hand, overall number of accidents may reduce as a result of the improved driving conditions to be provided by the high motorway standards.

Fire incidents would be another aspect that needs management to avoid risks on health and safety of the local people living nearby the construction sites and the Motorway components as well as the users of the Motorway during the operation phase. Further assessments on the potential impacts on community health and safety during the land preparation and construction and operation phase are provided below. Health and safety risks for the construction and operation personnel will be discussed in Chapter 16 (“Labor and Working Conditions”).

15.3.1 Land Preparation and Construction Phase

Land preparation and construction phase impacts of the project, would include emissions of dust and noise, and vibration from earthmoving activities, construction vehicle transit, increased traffic load, water supply, material extraction, blasting, and communicable/airborne diseases (respiratory or allergic) associated with the influx of temporary construction labor. Workers’ influx in the vicinity of a community may also strain existing infrastructure, in particular the water and sanitation, electricity and transport systems (*IFC/EBRD, 2009*). These impacts can be managed through good management practices and significance of impacts would then be reduced to acceptable levels. Assessment of specific community health and safety issues associated with the land preparation and construction phase is provided below. Detailed assessments of the impacts caused by air emissions and noise generation have been discussed in Chapter 10 (“Air Quality and Climate Change”) and Chapter 11 (“Noise and Vibration”), respectively.

Construction Traffic Safety

Significant numbers of trucks and other construction machinery will be involved in the land preparation and construction activities increasing the risk of accidents. Since the heavy machinery will work within the construction corridor, the risks posed on the users of public roads would be insignificant. On the other hand, delivery of the construction materials extracted at the quarries and material borrow sites to the construction site and transportation of the unused excavated materials from the work sites to the storage sites by means of trucks, delivery of construction materials (steel, beams, concrete, etc.) by means of trailers and trucks, transportation of personnel accommodating at Camp Sites to the work sites will be the main activities associated with increased traffic.

Some of the public roads may need to be diverted or closed for a certain period of time during the construction and if these activities are conducted in the lack of proper measures (i.e. putting road signs, providing adequate lightning at night), risk of accidents may increase.

Especially, routes passing through settlements may pose significant risks and disturbances on the health and safety of the local communities including those who are the most vulnerable to road traffic accidents (e.g. pedestrians, pedal cyclist, motorcyclists, children, and older people). Thus, minimizing the passage of trucks and other construction machinery through the settlements where alternative roads are present would be an effective measure to reduce the risk of traffic accidents. No service road is planned to be constructed to provide access to Camp Sites, no interaction is foreseen with the nearby settlements.

Behaviors of the drivers and construction machinery operators are among the most important factors related with the risk of traffic accidents, thus requirements for the training and licensing of drivers and operators would reduce the associated risks.

Blasting Operations

If not properly planned and mitigated, blasting operations to be conducted at the quarry sites may disturb the communities living or conducting agricultural activities in the close distance or users of the nearby roads due to vibration, air shock, fly rock impacts.

Dalama 2 Quarry

Dalama 2 Quarry is located at around Km 20+000 near Dalama neighborhood of Efeler district of Aydın province. The closest settlement is Dereköy neighborhood with a distance of 1.98 km to the north. The quarry is 24.68 ha with a capacity of 1,560,000 tonnes/year. And also there will be a crushing and screening plant with a capacity of 395,000 tonnes/year. 7,800,000 tonnes of material to be used as base and sub base material for the project is planned to be supplied from this quarry. The operational period is planned to be 5 years.

Dalama 3 Quarry

Dalama 3 Quarry is 20.79 ha with a capacity of 1,593,800 tonnes/year. 7,969,000 tonnes of material to be used as base and sub base material for the project is planned to be supplied from this quarry. The operational period is planned to be 5 years.

Dalama 7 Quarry

Dalama 7 Quarry is 24.88 ha with a capacity of 1,560,000 tonnes/year. The operational period is planned to be 5 years.

Akçaköy Quarry

Akçaköy Quarry is located at around Km 21+000 near Akçaköy neighborhood of Köşk district of Aydın province. The closest settlement is Yeniköy neighborhood with distance of 17.4 km to the north. According to the documents provide. And also there will be a crushing and screening plant with a capacity of 332,800 tonnes/year. The operational period is planned to be 5 years.

Water Quality and Availability

Potential impacts of the land preparation and construction activities involving water extraction, wastewater discharges, diversion or impoundment on the groundwater and surface water resources may pose impacts on the community if these resources are used by local people for drinking or irrigation purposes. Water resources of the local people residing in the settlements along the Motorway and near the construction sites were identified in the scope of social field surveys conducted as a part of the ESIA studies (see Chapter 14 (“Socio-economic Environment”) for further details and findings of the social field surveys). Table 15.4 summarizes the water resources and wastewater removal methods of the settlements surveyed in the scope of the studies as indicated by the neighborhood headmen. As can be seen from the table, all the neighborhoods surveyed around the Motorway route, use municipal distribution system as the source of domestic water.

Table 15.4 Water Resources and Wastewater Management in the Settlements Surveyed

Name of the Settlement Surveyed	Source of Water Used for Domestic Purposes	Perceived Quality of Domestic Water Source	Wastewater Management Method
Alhan (Section 1)	Municipal water	Good	Septic tank
Alanlı (Section 1)	Municipal water	Good	Septic tank
Dereköy (Section 1)	Municipal water	Good	Septic tank
Gödrenli (Section 1)	Municipal water	Good	Septic tank

Source: Social Field Survey, July 2023

Sources of water supply and demand for the Camp Sites and of settlements surveyed are given in Table 15.5. No impact on the water availability is anticipated at the settlements.

Table 15.5 Daily Water Demand at Neighborhoods and Camp Sites

Location	Population	Daily Water Demand (m^3/day)	Source of Water Supply
Dalama Satellite Construction Camp Site (Section 1)	70	15.680	Municipal Water
Alanlı Neighborhood (Section 1)	436	97.667	Municipal Water

Domestic wastewaters produced at the Camp Sites will be treated at the package domestic wastewater treatment plants and discharged into the nearest receiving water bodies in line with the discharge permits to be obtained from the Ministry of Environment, Urbanization and Climate Change. As these water bodies are not the drinking water sources of the communities, thus, no significant impact is anticipated.

Airborne/Communicable Diseases

Involving large numbers of workforce, large development projects are seen as a factor for health hazards among local communities due communicable diseases, especially if sanitation standards and living conditions at the Camp Sites remain insufficient. Since the project will give priority to employment of local people and proper accommodation facilities (water supply, waste management, food safety, etc.) will be provided at the Camp Sites, no significant risk of introduction of diseases by the incoming construction workers is anticipated in the scope of the project.

Security Personnel Arrangements

Involvement of security personnel to control unauthorized access to work sites and safeguard the project personnel and property would be another issue related with the community safety and welfare. Risks that may be posed by security arrangements may be due to use of disproportionate use of force and where applicable firearms, inappropriate conduct toward workers and local people. In the scope of the South Alternative security services will be provided by the Project Sponsor. Unarmed security service will be provided within the scope of Project Sponsor's support services unit. The working area of these personnel will be limited with the project borders (e.g. Camp Sites).

Straight forward measures such as proper inquiries to be done at the hiring stage for the personnel to be employed, good management of the related personnel, trainings to be provided to security personnel in relevant subjects, monitoring of legal compliance of the acts of the personnel, applying contractual sanctions, etc. would be effective in avoiding and/or minimizing associated risks so that no significant impact is anticipated due to security personnel arrangements of the South Alternative.

Emergency Preparedness and Response

An emergency is an unplanned event when a project activity/operation loses control, or could lose control, of a situation that may result in risks to human health, property, or the environment, either within the facility or in the local community. Emergencies do not normally include safe work practices for frequent upsets or events that are covered by occupational health and safety (*IFC, April 2007*).

Emergency situations that may be encountered during the land preparation and construction phase of the South Alternative may include accidents, fires, spills and leakages, geotechnical stability issues for the large engineering structures, earthquakes, etc. If the consequences of these situations cannot be controlled within the borders of the work sites (e.g. construction corridor, Camp Sites, quarries, etc.), risks may be posed to the health, safety and security of the local communities. Nevertheless, with effective implementation of the measures/actions defined in the Project's Emergency Preparedness and Response Plan presented in Annex-3, emergency situations can be controlled without causing significant risks and/or impacts on the health and safety of the local communities.

Risk of forest fires and spills/leakages have been covered in Chapter 5 ("Land Use and Property") and Chapter 6 ("Topography, Soils and Geology")

Public Health and Welfare

Air emissions and noise generation during land preparation and construction activities, especially at dry periods, may cause disturbance and discomfort for some of the local people, especially in settlements living in close distance to the construction/working sites. Impacts caused by construction phase emissions will be removed upon the completion of construction activities, nevertheless gaseous emissions and traffic noise will remain to be a concern of the subsequent operation phase. Impacts on public health and welfare due to air emissions and noise have been covered in Chapter 10 ("Air Quality and Climate Change") and Chapter 11 ("Noise and Vibration").

15.3.2 Operation Phase

Once the project is taken into operation, it is anticipated to host significant numbers of motor vehicles, including passenger cars and heavy vehicles. The feasibility study for the ADMP assumes that the number of motor vehicles that will use the motorway would increase from year to year. As the traffic density on the Motorway increases, risks on the safety of the traffic may also increase. Information of the minimum traffic guaranteed for the duration of operation as defined under the relevant terms of BOT contract have been provided in Section 3.8 ("Traffic Projections"). Furthermore, the traffic projection (between 4th quarter 2023 and end of 2nd quarter 2041) for the route has been completed in August, 2021. Annual Average Daily Traffic (AADT) data is given in Table 15.6.

Table 15.6 Number of Vehicles Estimated for Section 1 of the ADMP (AADT)

Year	Class Category; (LV:Light Vehicle), (HV:Heavy Vehicle)					Total
	Car+Moto (LV)	Light Commercial Vehicle (HV)	Bus (HV)	Truck (HV)	Truck & Trailer (HV)	
Section 1						
2023	404	53	13	40	48	558
2024	5,718	736	180	555	669	7858
2025	6,748	857	204	646	778	9233
2026	7,832	984	229	742	894	10,681
2027	8,170	1,018	231	767	924	11,110
2028	8,511	1,052	234	793	956	11,545
2029	8,854	1,088	236	820	988	11,987
2030	9,200	1,125	238	848	1,022	12,434
2031	9,559	1,163	241	877	1,056	12,896
2032	9,933	1,202	243	906	1,092	13,375
2033	10,321	1,242	245	936	1,128	13,872
2034	10,724	1,282	248	967	1,164	14,385
2035	11,143	1,324	250	998	1,202	14,917
2036	11,578	1,366	253	1030	1,241	15,467
2037	12,030	1,410	255	1063	1,280	16,037
2038	12,500	1,454	258	1096	1,320	16,627
2039	12,988	1,499	260	1,130	1,361	17,238
2040	13,496	1,545	263	1,165	1,403	17,870
2041	14,023	1,592	265	1,200	1,445	18,525

Together with traffic safety, structural safety will be the most important community health and safety issues during the operation phase. Pedestrian safety and emergency preparedness and response are other issues that need proper management to avoid/minimize risks on project. Additionally, air emissions and noise and vibration may cause disruption of the populations along the motorway route. Further assessment of impacts during the operation phase is provided below.

Structural Safety

The Project involves several large and small engineering structures. Safety failure of these structures (i.e. culverts, viaducts, bridges, etc.) may pose significant risks on the health and safety of the community. The Project are located in first degree earthquake zone according to Earthquake Zoning Map of Türkiye, thus failures that may be triggered by earthquake events are among the most important design considerations for the Project. On the other hand, since the Project will be designed in accordance with KGM's technical specifications and international standards (including seismic), structural failure risks have already been minimized by design. Seismic and other geotechnical risks have been covered in Chapter 6 ("Topography, Soils and Geology").

Traffic Safety

Traffic accidents, which have become one of the most significant causes of injuries and fatalities among members of the public, may be mainly related with the behavior of the drivers, quality of the vehicles used and/or design, construction and maintenance conditions of the road itself. Accordingly, improved driving conditions to be provided by the new Motorway are likely to prompt some of the drivers to a speedy traffic increasing the risk for accidents. On the other hand, this risk may be contra balanced by overall reduction of traffic accidents related to improved driving conditions for a more fluent and safe traffic on motorways having high physical and geometrical standards (*JASPERS, 2010*). Also, snow and ice, if not properly and timely removed, may reduce or eliminate the friction ability and road holding capacity of the vehicles resulting in risks on traffic safety. Thus, snow and ice removal is an important operation phase activity (*IFC, April 2007*).

With Aydın-Denizli Motorway- South Alternative, other motorways and divided roads in the country, is anticipated to contribute the improvements on the fatality rate reductions targeted to be achieved in the next decades despite the expected increase in the number of vehicle ownership and vehicle kilometers. Since there is no statistical information or analyses published by Turkish authorities about the effect of Motorway on the number of accidents and fatality rates that would support this assessment, the study "Road Safety Statistics at Regional Level" published by Eurostat (the Directorate General of the European Commission responsible to provide statistical information to the institutions of the European Union-EU, road safety statistics in the EU, as well as the European Free Trade Association (EFTA) and candidate countries) have been reviewed *(http://ec.europa.eu/eurostat/).* Motorway density and risk based on the total number of fatalities in road traffic accidents has been a special topic under this study.

According to the findings of the analysis, statistically, the numbers of road accident fatalities are particularly low for many regions with high traffic volumes. This is true especially in many regions in western Germany and England, in particular around major cities, and in most parts of the Netherlands. Around major cities and transport hubs, high traffic volumes cause congestion, which reduces average speeds and, therefore, also the likelihood of fatalities when accidents do occur. A closer look at this phenomenon also reveals that many of these regions tend to have high motorway density (expressed as length of motorways in relation to the region's total territory). In general, motorways are far safer than secondary roads. Furthermore, transit traffic mainly uses the motorway network, further reducing the number of road accidents, despite high total traffic volumes (*http://ec.europa.eu/eurostat/*).

In contrast, fatality rates are high in regions with a low motorway density, such as most regions in Romania, Hungary and the Czech Republic, except their capital regions, all Bulgarian and Polish regions, the Baltic Member States, and many rural areas in France and Spain. These data suggest that the high proportion of road traffic using motorways is an important factor behind the low number of road fatalities in many regions.

In addition to the share of the total road network accounted for by motorways, the significant reductions in the number of road deaths are also due to a combination of high in-vehicle and out-of-vehicle safety standards, better enforced speed limits and a general 'safety culture', including the quality of the emergency and healthcare systems.

Pedestrian Safety

Pedestrians and bicyclists are at greatest risk of serious injury from collisions with moving vehicles. Children are generally the most vulnerable due to lack of experience and knowledge of traffic related hazards, their behavior while at play, and their small size making them less visible to motorists. In addition, collisions and accidents can involve a single or multiple vehicles, pedestrians or bicyclists, and animals. Many factors contribute to traffic accidents. Some are associated with the behavior of the driver or the quality of the vehicle, while others are linked to the road design, or construction and maintenance issues. For example, risks that emerge during rainy weather conditions because of the wet road surface may be properly managed by drivers strictly obeying the traffic rules (*IFC, April 2007*).

Public Health and Welfare

The new Motorway route will be a source of dust and gaseous emissions and traffic noise that may cause disturbance of the local people living, conducting agricultural, grazing or other economic activities, etc. along the route.

Emergency Preparedness and Response

Emergency situations most commonly associated with road operations include accidents involving single or multiple vehicles, pedestrians, and/or the release of oil or hazardous materials. Thus, an Emergency Preparedness and Response Plan, covering the emergency situations (involving vehicles and pedestrians) that may occur during the Motorway's operation, has to be prepared and implemented by trained personnel (*IFC, April 2007*).

15.4 Mitigation Measures

The design, construction and operation of the Motorway will be done in accordance with most recent project standards and technical specifications of KGM as well as robust engineering design criteria. KGM will control the works to be conducted by the Project Sponsor during the BOT Contract.

An Emergency Preparedness and Response Plan, describing the targets and framework regarding the means for dealing with possible emergency situation during the construction and operation phases has been prepared for the Project (see Annex-3). With effective implementation of this Plan, The Project Sponsor will aim to prevent emergencies and respond to unavoidable incidents that could not be prevented by taking relevant measures properly so that no significant risk is posed to health and/or safety of the public. Specific measures to be taken during the land preparation and construction as well as operation phases of the Project are described in the following sub-sections.

15.4.1 Land Preparation and Construction Phase

During the land preparation and construction phase, primarily, access to construction/work sites will be restricted by means of proper measures such as fencing, signage, etc. Other specific measures to be taken for particular risk subjects to ensure community health and safety and public welfare during the land preparation and construction phases of the Project are described below.

Construction Traffic Safety

In this regard, following measures will be taken in accordance with the KGM's Technical Specifications for Motorways and relevant international standards to ensure traffic safety at the construction sites and minimize the risk of accidents:

- Construction works on existing roads will not be started until relevant traffic safety measures (including traffic signing and placement of equipment) are taken on roads serving pedestrian and vehicle traffic. These measures will be designed to ensure the safety of life and property of the local people and the users of the roads.
- In the scope of better working organization, construction traffic routes will be strictly defined and road construction machinery will use only these routes.
- Passage of the routes through the settlements (i.e. neighborhoods) will be avoided where alternative routes are available. Dangerous routes that are to be avoided, if there is any, will be specified and informed. In this scope, construction contractors will construct service roads in order not the affect (such as increasing the heavy traffic load) the natural flow on the existing roads and for avoiding the passage of heavy vehicles through residential areas to the extent possible. In addition service roads will be constructed

where the traffic will be temporarily diverted. Furthermore, service roads will be used for transportation of the construction machinery, equipment and materials used for Project.

- Pedestrian interaction with construction vehicles will be minimized by taking appropriate measures in and around the construction corridor.
- Valid licenses will be required for the drivers and operators.
- Drivers and operators will be provided with relevant trainings that emphasize the safety aspects.
- Working hours of the day for the drivers/operators will be specified and informed to relevant personnel.
- Limits will be defined for the working/trip duration for the drivers and operators to avoid overtiredness.
- Speed control devices will be used on trucks.
- All the construction machinery and equipment will be operated in alignment with the direction of the traffic flow.
- Rigid objects will not be used for the purpose of traffic diversion.
- Unused construction materials, equipment or machinery will not be left on the road in an uncontrolled way. They will be put in designated places.
- Construction-related traffic delays will be minimized. Flow of traffic will be allowed in every 30 minutes.
- Road signing for night traffic will be provided with reflectors and flashing signals of sufficient number.
- Relevant dust control measures will be taken at the road construction sites so that safe sight distances could be maintained on the existing roads under service.
- Upon the completion of works, signing equipment will be immediately removed and standard signing will be provided.
- To reduce transportation distances, services and materials required for construction works will be aimed to be primarily supplied from the local sources, wherever possible.

Disturbance due to Blasting Operations

- Relevant permits will be obtained from the security authorities for the delivery, transportation and use of explosives in the scope of the blasting operations to be conducted on the Motorway route and the quarries.
- Blasting operations including their transportation, storage, preparation, utilization, discharge of surplus explosives or unblasted materials, etc. and use will be carried out by competent trained experts under the control of technical supervisor.
- Explosives will be kept within permitted storage areas having isolated divisions for capsules.
- Blasting operations will be performed only after necessary announcements are made to local people. Blasting schedule will be prepared and activities will comply with this schedule.
- Warning signs explaining the blasting schedule will be posted at proper locations within the construction sites and at the nearby roads and passageways.
- Flagged signal person will be located at designated locations prior to each blasting activity.
- Blasting operations will be conducted daytime between 08:00-18:00. No blasting operation will be conducted on Sundays and holidays.
- Blasting calculations will be done and maximum number of holes to be blasted at one shot and total charge amounts per shot that would not cause significant environmental impacts (i.e. vibration, air shock, flyrock, etc.) will be determined prior to execution of operations in consideration of the manufacturers' suggestions. Prior to blasting operations, calculations done in consideration of the type of explosive and blasting method will be rechecked.
- Safety distances ensuring no hazard to Project personnel and local people will be determined and maintained during blasting operations. Where required, structures preventing scattering of materials will be used.

- Locations of holes will be measured and marked before the execution of blasting operations to ensure that blasting energy would be effectively distributed.
- Blasting operations will not be performed during stormy weather conditions.
- Access by unauthorized persons to blasting sites will be prevented.
- If required, cooperation will be made with local authorities to ensure safety of nearby roads by controlling traffic during the time of blasting.

Airborne/Communicable Diseases

Involving large numbers of workforce, large development projects are seen as a factor for health hazards among local communities due communicable and vector-borne diseases, especially if sanitation standards and living conditions at the Camp Sites remain insufficient.

In the Project, Camp Sites have been established at sufficiently large areas and most of the construction workforce (except the ones from local) and the sanitation and living conditions at the Camp Sites are assumed to be sufficient. Drinking water to be provided to Project workforce will meet the requirements of the Regulation Concerning Water Intended for Human Consumption so that diseases related with low quality drinking water are not anticipated to emerge. Additionally, domestic wastewaters and solid wastes will be managed in accordance with waste management procedures meeting the requirements of the national waste management regulations and international standards so that hygienic problems related with insufficient management of wastewaters and solid wastes are not anticipated.

- General health and safety trainings and education materials to be provided to Project personnel will include hygienic rules.
- Surveillance and active screening and treatment of workers will be provided.
- Immunization programs will be conducted for workers in local communities to improve health and guard against infection.
- Medical rooms with competent personnel will be available at Camp Sites.
- Measures will be taken against insect bites whenever required.

Security Personnel Arrangements

In the scope of the Project security services will be provided by the Project Sponsor. Unarmed security service will be provided within the scope of Project Sponsor's support services unit.

In consideration of good international practice, trainings will be provided to these personnel covering the following subjects:

- Legal requirements regarding their acts under the applicable Turkish legislation,
- Principles of proportionality,
- Rules of conduct,
- Use of force and where applicable firearms,
- Legitimate preventive and defensive purposes for the use of force (in proportion to the nature and extent of the threat),
- Conduct towards Project workers and local people.

Security personnel will be required to act in accordance with the requirements of the applicable Turkish legislation through the contractual agreements to be done with the contracting companies.

The Grievance Mechanism established by the Project Sponsor (see Chapter 19 "Public Consultation") will provide a mechanism for the local communities to express their concerns about the security arrangements and acts of security personnel, if there is any. This mechanism will be kept operational throughout the entire BOT Contract Duration. In case of any grievance or allegations of

unlawful or abusive acts of security personnel, Project Sponsor will take all the necessary measures to prevent recurrence and take action in accordance with legal requirements.

Emergency Preparedness and Response

Against emergency situations arising at the construction/work sites and Camp Sites, relevant emergency preparedness and response measures will be taken in accordance with the plan given in Annex-3. Details of the nature of the emergency and protection options (evacuation, quarantine, etc.) will be communicated to the directly affected settlements/communities, if there is any.

Public Health and Welfare

Following measures will be taken to minimize impacts of air emissions and noise generation on public health and welfare:

- To minimize the impacts on community health and safety and local disturbances due to air emissions and noise and vibration, new, highly efficient and reliable road construction machinery and equipment and high quality fuels will be used in the scope of construction works.
- Only construction machinery and equipment having proper emission controls and certificates in the scope of relevant Turkish regulations will be used.
- Well-balanced measures will be developed to limit worker movements to minimize disruption of local people while providing the workers with the right of movement freedom.
- Vehicle/wheel wash basins will be constructed at suitable locations to minimize transportation of sediments/mud and pollution/dustiness of public roads.

15.4.2 Operation Phase

Traffic and pedestrian safety risks that may emerge during the operation of the Motorway can be reduced by proper Motorway design including safe crossing, fencing, installation of warning signs, etc. (*IFC, April 2007*). In the scope of the Aydın-Denizli Motorway Project, such measures will be taken in accordance with KGM's technical specifications and international standards, as detailed below.

In accordance with the related terms of the BOT Contract, Project Sponsor will be responsible from taking necessary traffic safety measures under the related national legislation. In this respect, Project Sponsor will cooperate with the related government agencies and institutions where necessary. In case of situations that may emerge to violate traffic and environmental safety during the operation period, Project Sponsor will be liable for taking immediate actions to reassure the safety of relevant aspects. Project Sponsor will also take all the necessary measures to avoid damage on life and/or any private or legal property, structure, infrastructure, existing traffic or environmental resources.

Structural Safety

Structural safety of the Project components will be ensured by design, engineering and construction in accordance with most recent project standards and international codes as well as technical specifications of KGM. In accordance with KGM's specifications, safety and durability have been the main considerations in the design and engineering of the structures. Static and dynamic stability analyses and cross-section calculations of the engineering structures have been done by using internationally accepted computer programs approved by the KGM. In the design of the engineering structures, the Standard Specifications for Highway Bridges published by the American Association of State Highway and Transportation Officials (AASHTO) has been used. In the seismic calculations, the Standard Specifications used for the seismic design of the highway bridges has been taken as basis. Where required, Project-specific revisions have been/would be done with the approval

of KGM to adequately adapt these specifications to the Project. In accordance with the KGM's technical specifications, design of the traffic safety measures including guardrails, wire fences, horizontal and vertical traffic signs and markings and signalization implementations will also meet KGM standards. Guardrails will fulfill the internationally accepted standards. KGM will control the operation works during the BOT Contract.

In case of natural disasters that may risk the structural safety of the Project structures, the operation personnel will conduct visual inspections, take immediate actions (e.g. communication with local people, restricting access to risky areas, etc.) and collaborate with local emergency response authorities to prevent any adverse impact on the health and safety of the local people or users of the Motorway.

Additional measures to be taken to ensure community health and safety during the operation phase of the Motorway are described below.

Traffic Safety

Traffic accidents directly related with the behavior of the drivers and quality of the vehicles will not be under the control of the Motorway's operators. Additionally, legal speed limits different types of vehicles driving on Motorways are defined in relevant Turkish laws and regulations. Thus, all the drivers using the Motorway will be obliged to comply with the legal speed limitations

On the other hand, design, construction and maintenance measures can contribute to the minimization of traffic safety risks to a certain extent. Especially, maintenance of the Motorway and the planning of traffic safety signings may be effective in preventing, minimizing and controlling risks to the community from traffic accidents and ensure safety of the traffic. Measures to be taken by the Project Sponsor in this context are provided below:

- Horizontal (i.e. shoulder lines, traffic lines, parking lines, etc.) and vertical signing (i.e. traffic signs, plates, etc.) of the Motorway will be in accordance with KGM's technical specifications.
- Rescue vehicles and tow trucks will be kept ready in adequate numbers to promptly respond to probable accidents and slippery vehicles that may cause the closure of the road.
- Pavement structure of the Motorway will be subject to routine maintenance works in order to remove any impairment on the road surface that may risk traffic safety, reduce driving comfort and decrease the structural strength. Large-scale repair and reconstruction works will also be conducted as required to maintain the functionality of the road.
- Wire fences will be installed along the expropriation border of the Motorway to minimize the risk of collisions between animals and vehicles and direct the animals towards crossing structures (i.e. culverts) to be built.
- Wire fences, welded wires, walls to be used to enclose the area to be allocated to the Motorway will be continuously checked to prevent any uncontrolled intrusion of wild animals to the Motorway corridor that may pose risk to traffic safety and damage the landscape components. Any damaged enclosure component will be immediately repaired/maintained.
- Intelligent Traffic System (ITS) will be installed in the scope of the Project. By means of the ITS, real-time warning systems with signage to warn drivers of congestion, accidents, adverse weather road conditions, and other potential hazards ahead will be used.
- Snow and ice removal works will be conducted within the Motorway corridor when the temperature is between 0^0C and -12^0C to ensure safe and secure driving conditions for the vehicles and users of the road (including interchanges, access roads, service areas) during severe winter conditions.
- If necessary, precautionary salt application will be done before the start of snowfall.
- Where required, road deicing will be done by application of a suitable agent in solid or solution forms such as salt (NaCl), calcium chloride ($CaCl_2$), magnesium chloride ($MgCl_2$), etc. directly or blended in proper ratios depending on road and weather temperature.

- In case of continuous snowfall periods, effectiveness of the chemicals applied may become insufficient in removing snow and ice. In such situations, mechanical snow and ice removal works will be conducted by using suitable and adequate vehicles and/or equipment.
- In case of oil spill or spill of other hazardous liquids, road surface will be washed with plenty of water.
- Measures will be taken to prevent parking vehicles at the entrance and exit roads of the services areas.

Service areas that will serve as roadside rest areas for the drivers have been planned in accordance with KGM's technical specifications and international standards. In this regard, to minimize driver fatigue and provide resting facilities to the users of the Motorway, service areas (Type C) will be constructed along the motorway route.

Pedestrian Safety

To ensure safe passage/crossing of the Motorway by the pedestrians and avoid population disruption, culverts and underpass/overpasses have been included in the design and will be constructed. Culverts and underpasses planned in each section and the settlements and roads connected by overpasses have been provided in Chapter 3 ("Project Description").

In this regard, to prevent crossing of the Motorway by pedestrian and wild life animals in an uncontrolled and unsafe way, wire fences will be installed along the expropriation border of the Motorway, except the designated crossing points, in accordance with the technical specifications of the KGM.

Public Health and Welfare

Air emissions and noise to be sourced by the Motorway traffic will be monitored at selected/sensitive locations along the route (see Chapter 20 ("Environmental and Social Management System")). Additionally, complaints related with air quality or noise impacts would be delivered to Project Sponsor by means of the Project-specific grievance mechanisms established (see Chapter 19 ("Public Consultation")). If the measurement results or the grievance mechanism indicate impacts on public's health and welfare at certain locations, effective and feasible corrective measures will be planned and implemented by the Project Sponsor.

Emergency Preparedness and Response Plan

The Emergency Preparedness and Response Plan prepared for the Project is presented in Annex-3. The main objective of this Plan is to establish strategies and procedures for managing all aspects of emergency situations associated with Project components. In this regard the Emergency Preparedness and Response Plan consists of targets and procedures regarding the following aspects of emergency management:

- Prevention and preparation measures (actions to be taken before emergency);
- Response measures (actions to be taken during emergency);
- Damage assessment and recovery measures (actions to be taken after emergency).

The Emergency Preparedness and Response Plan cover the actions to be implemented by the Project to ensure emergency preparedness. These actions are mainly associated with proper planning and design of the project units, construction in accordance with specifications and operation and maintenance in line with project safety requirements as well as the actions to be taken for preparing to an emergency such as installation of monitoring and warning systems, communication

systems, and carrying out impact studies, training of staff for awareness, procedures for warning, communication, mobilization of emergency forces and equipment, responsibilities, and evacuation practices.

The general emergency response procedures defined in the Emergency Preparedness and Response Plan cover the whole highway including bridges and viaducts for the major hazards such as accidents, fires, earthquakes and spills/leakages.

Finally, the actions to be taken following emergency response and further actions to be taken for recovery management purposes are also included in the Plan.

15.5 Summary of Assessment and Residual Impacts

Project-related risk would be minimized by taking relevant planning and design measures and implementation of an Emergency Preparedness and Response Plan, which meet the international requirements. On the other hand, some of the traffic and pedestrian safety risks will be mostly related with the users of the road on which the Project Sponsor will only have limited control. Summary of the community health and safety assessments are provided in Table 15.7.

Table 15.7 Summary of the Community Health and Safety Assessments

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Local communities	Land preparation and construction phase	Increased risk of accidents due to operation of heavy construction machinery or disturbance on the health, safety and welfare of local communities due to road closure, traffic passing through settlement centers, etc.	Adverse	Restricted	Medium	Moderate (machinery will not be localized but distributed along the linear route)	Short term reversible	Continuous	Moderate (B)	High (3) Settlements within the expropriation corridor having affected population >500 habitants; Settlements within the study corridor having affected population>1.000;	High (B3)	• Construction works on existing roads will not be started until relevant traffic safety measures (including traffic signing and placement of equipment) are taken on roads serving pedestrian and vehicle traffic. These measures will be designed to ensure the safety of life and property of the local people and the users of the roads. • In the scope of better working organization, construction traffic routes will be strictly defined and road construction machinery will use only these routes. • Passage of the routes through the settlements (i.e. neighborhoods) will be avoided where alternative routes are available. Dangerous routes that are to be avoided, if there is any, will be specified and informed. In this scope, construction contractors will construct service roads in order not the affect (such as increasing the heavy traffic load) the natural flow on the existing roads and for avoiding the passage of heavy vehicles through residential areas to the extent possible. In addition service roads will be constructed where the traffic will be temporarily diverted. Furthermore, service roads will be used for transportation of the construction machinery, equipment and materials used for Project. • Pedestrian interaction with construction vehicles will be minimized by taking appropriate measures in and around the construction corridor. • Valid licenses will be required for the drivers and operators. • Drivers and operators will be provided with relevant trainings that emphasize the safety aspects. • Working hours of the day for the drivers/operators will be specified and informed to relevant personnel. • Limits will be defined for the working/trip duration for the drivers and operators to avoid overtiredness. • Speed control devices will be used on trucks. • All the construction machinery and equipment will be operated in alignment with the direction of the traffic flow. • Rigid objects will not be used for the purpose of traffic diversion. • Unused construction materials, equipment or machinery will not be left on the road in an uncontrolled way. They will be put in designated places. • Construction-related traffic delays will be minimized. Flow of traffic will be allowed in every 30 minutes. • Road signing for night traffic will be provided with reflectors and flashing signals of sufficient number. • Relevant dust control measures will be taken at the road construction sites so that safe sight distances could be maintained on the existing roads under service. • Upon the completion of works, signing equipment will be immediately removed and standard signing will be provided. • To reduce transportation distances, services and materials required for construction works will be aimed to be primarily supplied from the local sources, wherever possible	Low
										Medium (2) Settlements within the study corridor (inc. exp. corridor) having affected population 500-1.000;	Medium (B2)		Low
										Low (1) Settlements within the expropriation corridor having affected population<500 habitants.	Low (B1)		Low
	Land preparation and construction phase	Blasting operations to be conducted at road construction sites, quarries etc.	Adverse	Restricted	Medium	Medium	Short term reversible	Intermittent	Moderate (B)	High (3) (Number of residential buildings within the expropriation corridor>20)	High (B3)	• Relevant permits will be obtained from the security authorities for the delivery, transportation and use of explosives in the scope of the blasting operations to be conducted on the Motorway route and the quarries. • Blasting operations including their transportation, storage, preparation, utilization, discharge of surplus explosives or unblasted materials, etc. and use will be carried out by competent trained experts under the control of technical supervisor. • Explosives will be kept within permitted storage areas having isolated divisions for capsules • Blasting operations will be performed only after necessary announcements are made to local people. Blasting schedule will be prepared and activities will comply with this schedule. • Warning signs explaining the blasting schedule will be posted at proper locations within the construction sites and at the nearby roads and passageways. • Flagged signal men will be located at designated locations prior to each blasting activity. • Blasting operations will be conducted daytime between 08:00-18:00. No blasting operation will be conducted on Sundays and holidays. • Blasting calculations will be done and maximum number of holes to be	Low
										Medium (2) (Number of residential buildings within the expropriation corridor between10-20)	High (A2)		Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
										Low (1) (Number of residential buildings within the expropriation corridor<10)	Medium (A1)	blasted at one shot and total charge amounts per shot that would not cause significant environmental impacts (i.e. vibration, air shock, flyrock, etc.) will be determined prior to execution of operations in consideration of the manufacturers' suggestions. Prior to blasting operations, calculations done in consideration of the type of explosive and blasting method will be rechecked. • Safety distances ensuring no hazard to Project personnel and local people will be determined and maintained during blasting operations. Where required, structures preventing scattering of materials will be used.	Low
		Blasting operations to be conducted at quarries	Adverse	Restricted	Medium	High	Short term reversible	Intermittent	Major (A)	Low (1) (Number of residential buildings within the AoI<10)	Medium (A1)	• Locations of holes will be measured and marked before the execution of blasting operations to ensure that blasting energy would be effectively distributed. • Blasting operations will not be performed during stormy weather conditions. • Access by unauthorized persons to blasting sites will be prevented. • If required, cooperation will be made with local authorities to ensure safety of nearby roads by controlling traffic during the time of blasting.	Low
		Water supply	Adverse	Local	Medium	High	Long term reversible	Continuous	Major (A)	Low (1)	Medium (A1)	• Permit will be obtained from DSI for groundwater supply.	Low
	Land preparation and construction phase	Health risks (spreading of airborne/ communicable diseases) due to population influx	Adverse	Wide	Medium	Low (Project will give priority to employment of local people, number of incoming workers is anticipated to be low)	Short term reversible	One-off	Minor (C)	Low (1) No existing health issues have been identified in the area.	Low (C1)	• Drinking water to be provided to Project workforce will meet the requirements of the Regulation Concerning Water Intended for Human Consumption so that diseases related with low quality drinking water are not anticipated to emerge. Additionally, domestic wastewaters and solid wastes will be managed in accordance with waste management procedures meeting the requirements of the national waste management regulations and international standards so that hygienic problems related with insufficient management of wastewaters and solid wastes are not anticipated. • General health and safety trainings and education materials to be provided to Project personnel will include hygienic rules. • Surveillance and active screening and treatment of workers will be provided. • Immunization programs will be conducted for workers in local communities to improve health and guard against infection. • Medical rooms with competent personnel will be available at Camp Sites. • Measures will be taken against insect bites whenever required. • Well-balanced measures will be developed to limit worker movements to minimize disruption of local people while providing the workers with the right of movement freedom. • Vehicle/wheel wash basins will be constructed at suitable locations to minimize transportation of sediments/mud and pollution/dustiness of public roads. • If the COVID 19 pandemic conditions continue during land preparation and construction phase of the project, measures to be taken will be aligned and implemented in accordance with the guidelines of relevant and responsible national and international organizations such as WHO, Ministry of Health and Ministry of Environment, Urbanization and Climate Change.	Low
	Land preparation and construction phase	Disturbance of local communities due to improper acts of security personnel	Adverse	Local	Medium	Low	Short term reversible	One-off	Minor (C)	Low (1) No particular sensitivity/past issues have been identified in the area	Low (C1)	• Reputable and legitimate enterprises/companies will be selected and cooperated for the hiring of security personnel through contracting companies. • Contracting company will be required to provide documents (e.g. identity cards issued in accordance with the relevant Regulation following legal security clearance/archive review processes) ensuring that security personnel to be hired have not implicated past abuses. • Trainings to be provided to the security personnel will cover legal requirements regarding their acts under the applicable Turkish legislation; principles of proportionality; rules of conduct; use of force and where applicable firearms; legitimate preventive and defensive purposes for the use of force (in proportion to the nature and extent of the threat); conduct towards Project workers and local people. • Security personnel will be required to act in accordance with the requirements of the applicable Turkish legislation through the contractual agreements to be done with the contracting companies. • In case of any grievance or allegations of unlawful or abusive acts of security personnel, Project Sponsor will inquiry, take all the necessary measures to prevent recurrence and take action (and require the Contracting Company to take action) in accordance with legal	Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												requirements.	
	Operation	Accident risks (involving vehicles or pedestrians) due to speedy traffic by some of the drivers on the new Motorway route	Adverse	Restricted	Long	High	Irreversible	One-off	Major (A)	High (3)	High (A3)	• To minimize driver fatigue and provide resting facilities to the users of the Motorway, Service areas that will serve as roadside rest areas for the drivers have been planned in accordance with KGM's technical specifications and international standards. In this regard, to minimize driver fatigue and provide resting facilities to the users of the Motorway, service areas (Type B and Type C) will be constructed along the motorway route. • Horizontal (i.e. shoulder lines, traffic lines, parking lines, etc.) and vertical signing (i.e. traffic signs, plates, etc.) of the Motorway will be in accordance with KGM's technical specifications. • Rescue vehicles and tow trucks will be kept ready in adequate numbers to promptly respond to probable accidents and slippery vehicles that may cause the closure of the road. • Pavement structure of the Motorway will be subject to routine maintenance works in order to remove any impairment on the road surface that may risk traffic safety, reduce driving comfort and decrease the structural strength. Large-scale repair and reconstruction works will also be conducted as required to maintain the functionality of the road. • Wire fences will be installed along the expropriation border of the Motorway to minimize the risk of collisions between animals and vehicles and direct the animals towards crossing structures (i.e. culverts) to be built. • Wire fences, welded wires, walls to be used to enclose the area to be allocated to the Motorway will be continuously checked to prevent any uncontrolled intrusion of wild animals to the Motorway corridor that may pose risk to traffic safety and damage the landscape components. Any damaged enclosure component will be immediately repaired/maintained. • Intelligent Traffic System (ITS) will be installed in the scope of the Project. By means of the ITS, real-time warning systems with signage to warn drivers of congestion, accidents, adverse weather road conditions, and other potential hazards ahead will be used. • Snow and ice removal works will be conducted within the Motorway corridor when the temperature is between 00C and -120C to ensure safe and secure driving conditions for the vehicles and users of the road (including interchanges, access roads, service areas) during severe winter conditions. • If necessary, precautionary salt application will be done before the start of snowfall. • Where required, road deicing will be done by application of a suitable agent in solid or solution forms such as salt (NaCl), calcium chloride (CaCl2), magnesium chloride (MgCl2), etc. directly or blended in proper ratios depending on road and weather temperature. • In case of continuous snowfall periods, effectiveness of the chemicals applied may become insufficient in removing snow and ice. In such situations, mechanical snow and ice removal works will be conducted by using suitable and adequate vehicles and/or equipment. • In case of oil spill or spill of other hazardous liquids, road surface will be washed with plenty of water. • Measures will be taken to prevent parking vehicles at the entrance and exit roads of the services areas. • To ensure safe passage/crossing of the Motorway by the pedestrians and avoid population disruption, culverts and underpass/overpasses included in the design will be constructed. • To prevent crossing of the Motorway by pedestrian and wild life animals in an uncontrolled and unsafe way, wire fences will be installed along the expropriation border of the Motorway, except the designated crossing points, in accordance with the technical specifications of the KGM.	Medium

CHAPTER 16

LABOR AND WORKING CONDITIONS

16. CHAPTER – LABOR AND WORKING CONDITIONS

In this section, labor and working conditions including the occupational health and safety aspects of the South Alternative project will be discussed. Since a large number of direct and contracted personnel will be involved in and significant earthworks will be conducted in the land preparation and construction activities, labor and working conditions and occupational health and safety management will be an important aspect of the project in this phase. On the other hand, maintenance activities to be conducted during the operation phase would also be subject to occupational health and safety issues that needs proper management. The occupational health and safety risks for the construction and operation phase would mainly include physical and chemical hazards. Biological and radiological hazards are not anticipated to be applicable to the project. Accordingly, following aspects will be assessed in the following sections of this chapter:

- Labor and working conditions
- General occupational health and safety risks (e.g. hygiene, access, air supply, etc.) especially during the construction phase
- Physical hazards during the construction and operation phases
- Chemical hazards during the construction and operation phases
- Emergency preparedness and response

16.1 Assessment Methodology and Data Sources

Labor and occupational health and safety aspects of the project have been assessed based on qualitative approaches in consideration of the typical risks in large-infrastructure projects. Key national legislation and international standards/guidance documents considered in the scope of the assessments are listed below:

- Turkish Labor Law
- Turkish Law and Occupational Health and Safety and related regulations
- IFC's Performance Standard 2: on Labor and Working Conditions (2012)
- Guidance Note by IFC/EBRD on Worker's Accommodation: Processes and Standards (2009)
- TUIK. Statistics on Child Labor (2012 and 2019) and Work Accidents (2020)
- Focus Group Meetings with employees in the scope of Socio-economic Field Study conducted in 25th of July, 2023

Significance Criteria

The significance criteria for the impacts on labor will be determined, as high, medium or low, based on the evaluation of magnitude of impact and sensitivity/value of the receptors/resources. The criteria previously presented in Chapter 4 ("ESIA Methodology") will be used for the determination of the magnitude of impact on the land use components, while sensitivity/value criteria to be used in the scope of impact assessment will be assumed as high for all types of impacts, except retrenchment, as the concern is the health and safety of the personnel. Detailed explanation of the sensitivity components for each ecosystem component is provided in the following "Baseline Conditions" section.

16.2 Baseline Conditions

The International Labor Organization (ILO) is a specialized agency of the United Nations for the world of work. It sets international labor standards, promotes rights at work, and encourages decent employment opportunities, the enhancement of social protection and the strengthening of dialogue on work-related issues. Turkey became a member state of the ILO in 1932 and ratified 59 ILO Conventions (4 of them have been denounced) including the ones related with occupational health and safety, minimum age, forced labor, weekly rest, equality treatment, etc. (*http://www.ilo.org*)

In 1992 Türkiye was one of the initial six countries to undertake direct action to combat child labor. On the other hand, the problem of child labor is one that Türkiye, as every country in transition, needs to address. The problem needs to be viewed in terms of demography, educational levels, economics and social development. Similar to global statistics for child labor, agriculture is by the most important sector where child laborers can be found (*http://www.ilo.org*).

Türkiye has ratified relevant ILO Conventions on improvement of gender equality and women employment. On the other hand low women's labor force participation and employment rates are among the most important issues in the field of employment in Türkiye. Compared to EU, Türkiye's female employments rates are extremely lower (*http://www.ilo.org*).

Within the scope of Supplementary ESIA studies, focus group meeting was held with the workers at the construction site within the scope of socioeconomic fieldwork. This meeting was held at Satellite Construction Camp Site. 7 interviewees participated in the focus group interview, respectively. These participants were mostly blue-collar and male employees, but were selected by random sampling. In the meeting, which were held on working conditions, accommodation conditions, OHS conditions and other related issues at the construction sites, it was aimed to obtain a general insight into the labor and working conditions of the employees.

Accordingly, Turkish labor law and related regulations covers the basic principles of international labor standards and the IFC PS 2 in the issues of equal treatment of employees, restrictions on the working age and employment of children, avoidance of forced labor and ensuring occupational health and safety at the workplaces. On the other hand, monitoring of the implementation is essential to ensure full compliance of the activities with the relevant legislation. Figure 16.1 presents a comparison of child labor in different sector in year 2012 and 2019. While 68.5% of children between the ages of 6-14 worked in the agricultural sector in 2012, this rate decreased to 64% in 2019. While the rate of working in the service sector for children of the same age group was around 17% in 2012, it increased to over 24% in 2019. In 2012, 37.4% of children aged 15-17 took part in the service sector. This rate increased to 51% in 2019. Also, Table 16.1 presents Child Labor statistics in comparative perspective between 2012 and 2019.

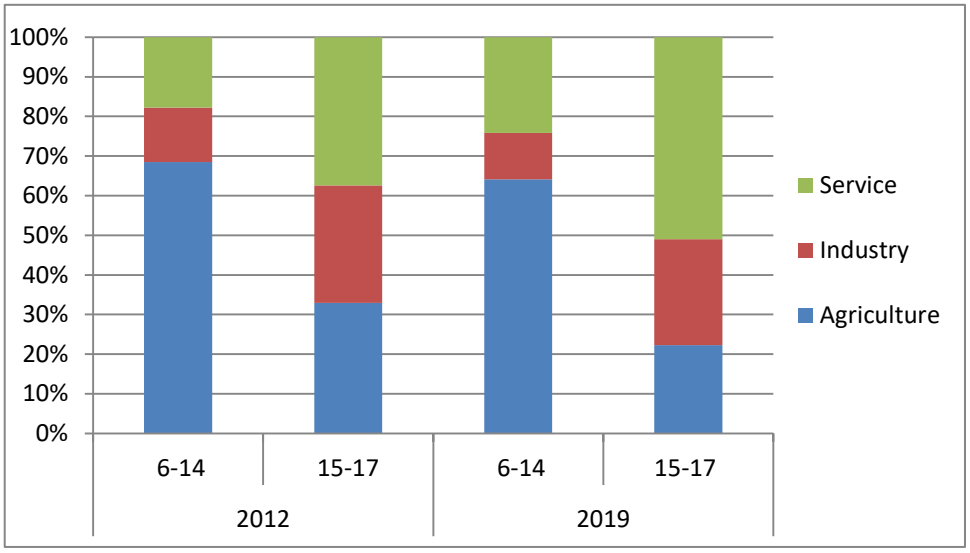


Figure 16.1 Comparison of the Ratio of Children Working in Different Economic Sectors in Years 2006 and 2012

Table 16.1 Child Labor Statistics for Turkey (years 2012 and 2019)

Years	2012		2019	
Age Group	6-14	15-17	6-14	15-17
Agriculture	68.5%	32.9%	64.1%	22.3%
Industry	13.7%	29.6%	11.7%	26.8%
Service	17.8%	37.4%	24.2%	51%

Source: http://www.tuik.gov.tr/

In 2015, Turkey made a moderate advancement in efforts to eliminate the worst forms of child labor. The Government implemented a project in cooperation with the ILO that provided services to more than 1,000 children working in commercial hazelnut production and amended the Labor Law to provide protections for children working in the arts and commercial advertising. Again in 2020, within the scope of the National Program for the Elimination of Child Labor (2017-2023), "Elimination of the Worst Forms of Child Labor in the Hazelnut Harvest in Seasonal Agriculture Project", was initiated in cooperation with the ILO tripartite partners (government, workers' and employers' organizations) within the framework of the public-private partnership, the experiences in the field of combating child labor, especially in the hazelnut supply chain, It with a view to sharing however, children in Turkey are engaged in child labor in street work and mobile seasonal work in agriculture. The Government does not have laws that protect children working in agricultural enterprises employing fewer than 50 workers. Although the Government took important steps to increase Syrian refugee children's access to education and other services nationwide, many Syrian refugee children in urban areas of Turkey had low or no access to education and other social services, leaving significant numbers at increased risk of exploitation in the worst forms of child labor. The growing number of Syrian refugees in the country is likely to adversely affect the child labor rates in the recent years Children in Turkey are mainly engaged in child labor, including in street work and mobile seasonal work in agriculture Table 16.2 provides an overview of children's work by sector and activity. (*US Department of Labor, 2018*).

Table 16.2 Overview of Children's Work by Sector and Activity

Sector/Industry	Activity
Agriculture	Production of cotton, hazelnuts, citrus fruits, sugar beets, cumin, peanuts, pulses, apricots, melons, and cherries
Industry	Production of furniture, bricks, shoes, leather goods, and textiles; auto repair; mining
Services	Street work, including vending small items, carrying bundles in market areas, cleaning car windshields, collecting recyclable materials, and begging ; working in restaurants and small shops

Source: US Department of Labor, 2018.

Statistics on work accidents for the insured personnel working in different industries are published by TUIK. Statistics kept for the insured personnel (under Article 4-1/a of the Law on Social Security and General Health Insurance Law) working in road and motorway construction sector works are provided in Table 16.3.

Table 16.3 Statistics on Work Accidents and Occupational Diseases for Road and Motorway Construction

Activity Classification	Number of Insured Persons Having Work Accident by Incapacity Days in 2022 (5+)		
	Male	Female	Total
Construction of roads and motorways	1,511	0	1,511

**Source: TUIK, 2022, Work Accidents and Occupational Diseases.*

The health services capacity of the region is well developed. State and private hospital located in the district where the Project is located are listed in Table 16.4.

Table 16.4 Health Facilities in the Vicinity of the Project

Section	Province	District	State and Private Hospitals
Section 1	Aydın	Efeler	Adnan Menderes University Training and Research Hospital
			Aydın State Hospital
			Aydın Ataturk State Hospital
			Private Medinova Hospital
			Private Ege Liva Hospital
		Yenipazar	Yenipazar District State Hospital

**Source: https://aydinism.saglik.gov.tr/, https://shgmozelhasdb.saglik.gov.tr/*

16.3 Potential Impacts

As with the South Alternative, in projects that entail involvement of large numbers of personnel, management of working relationships and terms of employment, provision of adequate accommodation and working conditions, ensuring non-discrimination, equal opportunity and employee satisfaction and establishment of mechanisms for feedback are particularly important issues to establish a sound worker-management relationship. This relationship would ensure efficiency and productivity of the activities/operations and avoid any reputational risk that may jeopardize the project. Accordingly, issues related with labor and working conditions, including safety and security of the workers, will have to be properly managed during the construction and operation phases of the project.

Since the Project Sponsor will comply with the requirements of Turkish labor law, which covers the basic principles of international labor standards and the IFC PS 2 in the issues of equal treatment of employees, restrictions on the working age and employment of children, avoidance of forced labor and ensuring occupational health and safety at the workplaces, and implement Project-specific labor and employment and health and safety policies (see Chapter 20 “Environmental and Social Management System” for the relevant project policies), no significant risk is anticipated in labor issues during the construction and operation phases of the project.

On the other hand, occupational health and safety is an important aspect of the construction and operation of large infrastructure projects, especially during the construction phase when large number of direct and contracted personnel is involved to perform large-scale earthwork and construction activities. Key labor and occupational health and safety issues associated with the construction of motorways primarily include the following:

- Labor issues and working conditions for the construction and operation phases
- Workers’ accommodation conditions and general occupational health and safety issues for the construction phase
- Physical and chemical hazards during the construction and operation phases
- Emergency preparedness and response during the construction and operation phases

16.3.1 Land Preparation and Construction Phase

Large-scale employment of workforce will occur during the land preparation and construction phase of the Project. Activities of the site personnel will involve typical construction risks observed at construction sites such as risks due to moving equipment, elevated work, chemical hazards, exposure to noise and dust emissions, etc. (*IFC, April 2007*). The rate of accidents will be highly dependent on the consciousness and cautiousness of the personnel regarding the specific hazards of the construction work they are involved in. These risks together with labor issues and working conditions have to be managed in accordance with the good management approaches and international construction site practices to avoid problems with the worker-employer relations and significant occupational health and safety risks.

Child labor is common in agricultural, industry and service sectors in Türkiye. Accordingly, due to the nature of the project, the South Alternative is not likely to contribute to Türkiye's child labor workforce.

Since the construction activities of ADMP will be completed in 3 years (maximum), retrenchment will be an issue at the end of the construction phase that needs proper management. Additionally, resolving the complaints of the workers within the project through an effective grievance mechanism would be very important to protect the reputation of the project.

Workers Accommodation Conditions

Ensuring good standards in accommodation facilities is important in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents, as well as to maintain a good level of morale. In this scope, the standards of the rooms or dormitory facilities are important to allow workers to rest properly and to maintain good standards of hygiene. Conditions ensuring a good standard of personal hygiene and hygiene in canteens need to be ensured to prevent contamination and the spread of diseases which result from inadequate sanitary facilities and may affect the community health and safety as well. Medical facilities (first-aid facilities, additional medical facilities) are also important to maintain workers' health and to provide adequate responses in case of health emergency situations. Additionally, basic leisure, social and telecommunication facilities are important for workers to rest and also to socialize during their free time. Since accommodation will be provided at Camp Sites in the scope of the project, all these requirements at the facilities will need to be optimized to minimize potential impacts on the workers' welfare and risk of work-related accidents and maximize the overall productivity (*IFC/EBRD, 2009*).

Physical Hazards

Physical hazards represent potential for accident or injury or illness due to repetitive exposure to mechanical action or work activity. Road construction personnel may be exposed to physical hazards during the land preparation and construction phase of the Project. These hazards may be due to the operation of heavy construction vehicles during the earthworks, working at height for the construction of bridges, overpasses, viaducts, exposure to severe weather conditions, exposure to high noise levels caused by construction machinery and equipment, etc. Poorly trained or inexperienced drivers would increase risk of accident with other vehicles, pedestrians, and equipment. Additionally, heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. These risks would be similar to any large scale infrastructure project and can be managed effectively with good management and implementation of occupational health and safety measures (*IFC, April 2007*).

Chemical Hazards

Significant volumes of earthworks and paving activities will be conducted within the long construction corridor of the project. The dust to be emitted during earthworks, exhaust emissions from large number construction machinery, hazardous materials used for painting and paving operations are among main sources of chemical hazards for construction workforce (*IFC, April 2007*).

Emergency Preparedness and Response

As discussed in details in Chapter 15 ("Community Health and Safety"), emergencies such as accidents, fire, natural hazards, etc. may occur during the land preparation and construction phase of the project and if not properly managed, associated risks may be posed on the health and safety of the project personnel. Nevertheless, with effective implementation of the measures/actions defined in the project's Emergency Preparedness and Response Plan presented in Annex-3, emergency situations can be controlled without causing significant risks and/or impacts on the health and safety of the project personnel as well as local communities.

16.3.2 Operation Phase

In the operation phase, maintenance personnel (i.e. road maintenance and landscaping workers), especially workers on foot, may be subject to occupational health and safety risks if not properly mitigated. Road repairs have to be managed within a structured plan to ensure safety zone and minimize relevant risks. In addition to the maintenance, personnel will be employed at toll plazas and control centers. Sub-contractors may also be involved in the operation of service areas. Since the overall number of personnel to be involved in operation activities will reduce significantly during the operation phase when compared to land preparation and construction phase, associated labor and occupational health and safety issues are anticipated to be limited in this phase of the project.

Physical and Chemical Hazards

Road maintenance personnel, as the workers on foot, may be exposed to physical hazards during the operation phase of the project. Similar to the construction phase, operation, maintenance and landscaping personnel working on the motorway may be subject to the chemical hazards due to exhaust emissions of the vehicles driving on the road or passing through the toll plazas or due to hazardous dust or asphalt fumes generated during activities such as pavement, painting, vegetation removal, etc.

Emergency Preparedness and Response

Emergency situations most commonly associated with road operations include accidents involving single or multiple vehicles, pedestrians, and/or the release of oil or hazardous materials (*IFC, April 2007*). Thus, an Emergency Preparedness and Response Plan, covering the emergency situations (involving vehicles and pedestrians) that may occur during the motorway's operation, has to be prepared and implemented by trained personnel in order to avoid significant risks.

16.4 Mitigation Measures

Project Sponsor will strictly comply with the requirements of the Turkish Labor Law and Occupational Health and Safety Regulation regarding the management of occupational health and safety risks and protection of the health and safety of project workers including the direct and contracted personnel. Additionally, project's policy on Labor, Employment and Occupational Health and Safety are described in the Environmental and Social Management System (see Chapter 20), which will be implemented during the land preparation, construction and operation phases of the project to ensure compliance with international standards on labor and working conditions. Contracted workers and Sponsor will also be required to comply with the project policy on Labor, Employment and Occupational Health and Safety through contractual requirements.

Project Sponsor will ensure that the sub-contractors do have the technical capability to manage the occupational health and safety issues of their employees. Accordingly, all the sub-contractors who will be involved in the project will be required to be subject to the same contractual conditions with the Project Sponsor in the issue of occupational health and safety and will be required to implement project's occupational health and safety policies.

Regarding the labor conditions, sub-contractors will be subject to the same contractual conditions with the Project Sponsor. Duration of the contracts to be made with the sub-contractors will not exceed the duration of BOT Contract.

In the management of occupational health and safety hazards, preventive and protective measures will be taken in the following order of priority in accordance with the following approach as recommended by IFC both during the construction and operation phases of the Project:

- The activity causing the hazard will be eliminated from the work process;
- Hazard will be controlled at its source through use of engineering controls.
- Hazard will be minimized through design of safe work systems and administrative or institutional control measures.
- Appropriate personal protective equipment (PPE) will be provided in conjunction with training, use, and maintenance of the PPE.

With effective implementation of occupational health and safety measures including compliance with the requirements of the relevant regulations, implementation of safe practices and procedures when conducting assignments, provision of occupational health and safety trainings, proper use of personal protection equipment (PPE) and monitoring of occupational health and safety impacts, number of accidents/incidents would be effectively reduced and associated risks with significant consequences are likely to be well managed throughout the construction and operation phases of the project.

16.4.1 Land Preparation and Construction Phase

Land preparation and construction phase will involve a significant number of workforces, including both direct and contracted workers. Accommodation will be provided at Camp Sites in the scope of the project. Thus, promotion of safe and healthy working conditions and provision of good labor and accommodation conditions will be important during this phase of the project. Good management of the potential issues would positively affect not only the quality, efficiency and productivity but also the reputation of the project and its Sponsor.

Retrenchment of the construction workforce following the completion of construction activities will be done in compliance with all legal and contractual requirements.

Workers Accommodation Conditions

The Camp Sites will include facilities such as cafeteria, medical room, showers and toilets, wastewater treatment plants/septic tanks, water supply facilities (i.e. water well) etc. Concrete plants will be located at the Camp Sites; asphalt and mechanical plants will be sited at Camp Sites and close to the quarries to the extent feasible (see Section 3.2.1 for the description of Camp Sites). General measures to be taken at the workers accommodation facilities will be as follows:

- The accommodation to be provided will be clean and safe and meet the basic needs of workers, providing minimum amounts of space for each worker; sanitary, laundry and cooking facilities. Overcrowding will be avoided.
- Heating, air-conditioning and ventilation will be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time.
- Drinking water to be provided to Project workforce and water to be supplied to food preparation, washing and bathing areas will meet the requirements of the Turkish Regulation Concerning Water Intended for Human Consumption.
- Adequate lavatory facilities (toilets, urinals, washbasins and showers) will be provided for the number of people expected to work in the facility and allowances will made for indicating whether the toilet facility is “In Use” or “Vacant”. Toilet facilities will also be

provided with adequate supplies of hot and cold running water, soap, and hand drying devices.

- Domestic wastewater and waste to be produced at Camp Sites will be properly managed and disposed of in line with the requirements of relevant Turkish regulations as well as good site practices described in this Supplementary ESIA Report (see Chapter 7 for the management of wastes; see Chapter 8 for the management of wastewater).
- First aid and medical facilities as well as provisions for safety against potential hazards (fire, etc.) will be provided at the camp sites.
- Residents of the Camp Sites will be made aware of any rules governing the accommodation.
- Project's Grievance Mechanism to be established will provide means to the project personnel to lodge their complaints. Project Sponsor will ensure that the workers are informed of the grievance mechanism at the time of recruitment and make it easily accessible to them.

Measures against Physical Hazards

- Safe work zone will be established to separate workers on foot from the traffic.
- For the construction works to be conducted at location where traffic exists, safe work zones will be established by taking relevant measures (closure of roads, diversion of traffic, use of protective barriers, cones, warning lights, etc.)
- The area around which elevated work is taking place will be barricaded to prevent unauthorized access and working under personnel on elevated structures will be avoided.
- Hoisting and lifting equipment will be rated and properly maintained, and operators trained in their use. Elevating platforms will be maintained and operated according to established safety procedures including use of fall protection measures (e.g. railings), equipment movement protocols (e.g. movement only when the lift is in a retracted position), repair by qualified individuals, and installation of locks to avoid unauthorized use by untrained individuals.
- Ladders will be used according to pre-established safety procedures for proper placement, climbing, standing, as well as the use of extensions.
- When working at height, proper fall protection measures will be implemented. Fixtures will be installed on bridge components. Safety belts with proper thickness and of suitable materials ensuring sufficient strength will be used. Rope safety belts will be replaced before signs of aging or fraying of fibers become evident. When operating power tools at height, workers will use a second (backup) safety strap.
- Personnel exposed to high levels of noise will be required to use personal hearing protection devices/equipment that will be provided by the Project Sponsor at no cost. Where required for specific works, work rotation programs will be implemented to reduce cumulative exposure.
- Weather forecasts will be monitored for outdoor work to provide advance warning of extreme weather and schedule the work accordingly. Protective clothing will be used where required.

Measures against Chemical Hazards

- Properly maintained construction machinery, equipment and vehicles will be used to minimize air emissions.
- Engine idling time will be reduced in construction sites.
- Direct diesel exhaust will be properly removed to minimize exposure of the operators.
- Indoor working areas where vehicles or engines are operated will be ventilated or the exhaust gases will be properly diverted.
- Lead-containing paint will be avoided and appropriate respiratory protection will be used when cutting galvanized steel.
- At work sites where dust levels are excessive, dust masks will be used by relevant personnel.

- Hazardous materials will be replaced with a less hazardous substitute.
- Engineering and administrative control measures will be performed in order to prevent or reduce the release of hazardous materials into the work site. Level of exposure will be kept below internationally established or recognized limits.
- The number of workers to be exposed will be kept in minimum.
- Hazardous materials will be labeled and marked properly considering national and international regulations and guidelines. Materials Safety Data Sheets (MSDS) will be prepared. All written communication will be readable and available to workers to be exposed and first-aid personnel.
- Workers will be trained in use of information related to hazardous materials (MSDSs etc.), safe work practices and appropriate use of PPE.

General Occupational Health and Safety Measures

Following additional measures will be taken in accordance with the KGM's Technical Specifications for Motorways to avoid and/or minimize risks due to moving equipment and vehicles or works to be conducted at height or elevated/overhead works, etc.:

- Project Sponsor will ensure that qualified first-aid can be provided at all times at the working/construction sites.
- Adequate lightning (that would not distract drivers' sight) will be provided for works to be conducted at night-time. Lightning system will be moved forward in parallel to the progress of works.
- All the vehicles that will operate at night will have yellow colored overhead flashlights that will be activated during the time of works.
- Good cooperation with the local medical services will be ensured.
- A system will be established for the reporting and recording of occupational accidents and dangerous occurrences/incidents.
- Personal protective equipment/devices (PPE/PPD) and seasonal working outfits, meeting the requirements of the relevant Turkish regulations and good site practices, will be provided to all construction personnel by the Project Sponsor at no cost. Effective use of the PPEs/PPDs by the construction personnel will be monitored and ensured by the Project Sponsor.
- Sub-contractor workers will also be strictly required to use necessary PPEs/PPDs by means of contractual stipulations to be done with the sub-contracting companies.

Use of Personal Protective Equipment's (PPEs)

PPE will be considered as an additional protection for workers, on top of all other measures that will be taken to prevent and reduce the potential risks that may occur at the project site. Appropriate PPE will be determined based on the job to be performed and the kind of hazard that the workers are potentially exposed to. PPE will be provided to all workers who are in need of them and a training program, which explains proper uses of each PPE, would be conducted. All relevant personnel will be obliged to participate in the training program.

The Project will meet the requirements of Turkish Law on Occupational Health and Safety and Regulation on the Use of Personal Protective Equipment at/in Workplaces, which has been prepared in parallel with the relevant European Union Directives. PPEs will be selected based on the specific hazards and risks of the task to be performed and properly maintained to keep them effective and operational throughout their use.

Occupational Health and Safety Trainings

Training of the project workers and other personnel including the management, supervisors, and even occasional visitors is a key in reducing the number of accidents during the construction phase. Basic occupational health and safety orientation trainings will be provided to all new personnel including direct and contracted workers, management, supervisors and occasional visitors. These trainings will include specific occupational health and safety subjects that include, but not limited to the following:

- Basic site rules and hazard awareness
- Hygiene requirements
- Potential risks to health
- Site-specific hazards
- Safe work practices
- Knowledge of materials, equipment and tools
- Wearing and use of protective equipment and clothing
- Hazards of working on foot around equipment and vehicles;
- Preventing injury to fellow workers
- Safe practice for work at night and in other low-visibility conditions (e.g. use of high-visibility safety apparel and proper illumination for the work space while controlling glare)
- Emergency procedures (e.g. during fires, natural disasters, etc.)

In addition to orientation trainings, all the direct and contracted workers will be provided with relevant trainings prior to commencement of new assignments (change of workplace/task, change of working machinery and equipment, introduction of new technologies, etc.). Workers with rescue and first-aid duties will be provided with dedicated training. Through appropriate contract specifications and monitoring, Project Sponsor will ensure that service providers, as well as contracted and subcontracted labor, are trained adequately before assignments begin.

A visitor orientation and control program will be established to ensure visitors do not enter hazard areas unescorted. In this respect, relevant checkpoints and record keeping practices will be used for ensuring both safety of the works and the visitors.

Emergency Preparedness and Response

Against emergency situations arising at the construction/work sites and Camp Sites, relevant emergency preparedness and response measures will be taken in accordance with the Emergency Preparedness and Response Plan given in Annex-3.

16.4.2 Operation Phase

Some of the occupational health and safety measures described for the land preparation and construction phase for the mitigation of physical and chemical hazards, provision of occupational health and safety trainings, use of PPE, etc. would also be applicable for the management of operation phase risks and thus be implemented during the operation phase. Specific measures for the operation phase risks and impacts are described below. Regarding the management of emergencies, measures specified in the Emergency Preparedness and Response Plan presented in Annex-3 will be implemented.

In accordance with the related terms of the BOT contract, Project Sponsor will ensure that the operation and maintenance personnel are properly trained in their specialty and successfully completed the necessary security investigations. Operation and Maintenance Plan will be submitted to the KGM 4 months ahead of the start of Motorway's operation. In accordance with the related terms of the BOT contract, 1 year ahead of the end of the contract duration, personnel designated by the KGM

will be trained by the Project Sponsor on the aspects related with the operation and maintenance works of the Motorway.

Sub-contractors to be involved in the operation of service areas will be subject to the same contractual conditions with the Project Sponsor, sub-contractors will be required to apply occupational health and safety measures to be taken by the Project Sponsor.

Measures against Physical Hazards

Following measures will be taken to ensure safety during the road maintenance or landscaping works:

- Safe work zones will be established to separate workers on foot from the traffic by using proper methods/devices (e.g. use of protective barriers, traffic cones, barrels)
- When possible, traffic will be route to alternative roads.
- Proper land closure or traffic diversion measures will be taken in consideration of the width of the road.
- Protective barriers will be used to shield workers where required.
- Traffic flow will be primarily regulated by warning lights and use of flaggers will be avoided where possible.
- Maximum speed limits will be reduced in the work zones.
- Blind spots will be avoided to the maximum extent possible by means of proper design of the work space.

Measures against Chemical Hazards

- Pavers with exhaust ventilation systems will be used and proper maintenance of such systems will be ensured to maintain worker exposure to crystalline silica (millers and grinders) and asphalt fumes (pavers) below applicable occupational exposure levels.
- Correct asphalt product will be used for each specific application and application at the correct temperature will be ensured to reduce the fuming of bitumen during normal handling.
- Adequate ventilation will be provided in necessary areas with limited natural air circulation;
- Tollbooths will be equipped with proper ventilation and air filtration systems;
- Protective clothing will be used when working with cutbacks (a mixture of asphalt and solvents for the repair of pavement), diesel fuel, or other solvents.
- Appropriate respiratory protection will be used when removing paints.

16.5 Summary of Assessment and Residual Impact

Project-related occupational health and safety risks would be minimized by taking relevant design, operational and administrative measures and implementation of an Emergency Preparedness and Response Plan, which meet the international requirements. Control of risks caused by third parties is more challenging, but they can also be properly mitigated by means of good management, contractual obligations and effective monitoring. Summary of the community health and safety assessments are presented in Table 16.5.

Table 16.5 Summary of the Assessments on Labor and Working Conditions

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
Project Personnel	Land preparation and construction	Poor accommodation conditions resulting on safety hazards, spread of disesases and reduced level of morale	Adverse	Restricted	Medium	Medium (personnel will not be localized but distributed along the linear route and camp sites, quarries, etc.)	Short term reversible	Continous	Moderate (B)	High (3)	High (B3)	• The accommodation to be provided will be clean and safe and meet the basic needs of workers, providing minimum amounts of space for each worker; sanitary, laundry and cooking facilities. Overcrowding will be avoided. • Heating, air-conditioning and ventilation will be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time. • Drinking water to be provided to Project workforce and water to be supplied to food preparation, washing and bathing areas will meet the requirements of the Turkish Regulation Concerning Water Intended for Human Consumption. • Adequate lavatory facilities (toilets, urinals, washbasins and showers) will be provided for the number of people expected to work in the facility and allowances will made for indicating whether the toilet facility is “In Use” or “Vacant”. Toilet facilities will also be provided with adequate supplies of hot and cold running water, soap, and hand drying devices. • Domestic wastewater and waste to be produced at Camp Sites will be properly managed and disposed of in line with the requirements of relevant Turkish regulations as well as good site practices described in this ESIA (see Chapter 7 for the management of wastes; see Chapter 8 for the management of wastewater). • First aid and medical facilities as well as provisions for safety against potential hazards (fire, etc.) will be provided at the camp sites. • Residents of the Camp Sites will be made aware of any rules governing the accommodation. • Project’s Grievance Mechanism to be established will provide means to the Project personnel to lodge their complaints. Project Sponsor will ensure that the workers are informed of the grievance mechanism at the time of recruitment and make it easily accessible to them. • Project Sponsor prevents infected persons from entering workers’ accommodations areas, and if applicable or necessary, quarantine these persons per local regulations and/or recommendations from relevant international organizations. • Common surfaces, including ones in vehicles transporting workers from their accommodations to the workplace, counters, floors, and walls, should be treated as potentially contaminated and be cleaned regularly.	Low
		General occupational health and safety hazards	Adverse	Restricted	Medium	Low (there may be several cases with minor results)	Short term reversible	Intermittent	Minor (C)	High (3)	Medium (C3)	• Project Sponsor will ensure that qualified first-aid can be provided at all times at the working/construction sites. • Adequate lightning (that would not distract drivers’ sight) will be provided for works to be conducted at night-time. Lightning system will be moved forward in parallel to the progress of works. • All the vehicles that will operate at night will have yellow colored overhead flashlights that will be activated during the time of works. • Good cooperation with the local medical services will be ensured. • A system will be established for the reporting and recording of occupational accidents and dangerous occurrences/incidents. • Personal protective equipment/devices (PPE/PPD) and seasonal working outfits, meeting the requirements of the relevant Turkish regulations and good site practices, will be provided to all construction personnel by the Project Sponsor at no cost. Effective use of the PPEs/PPDs by the construction personnel will be monitored and ensured by the Project Sponsor.	Low
				Restricted	Medium	Medium (there may be rare cases with significant results)	Irreversible	One-off	Moderate (B)	High (3)	High (B3)		

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												• Sub-contractor workers will also be strictly required to use necessary PPEs/PPDs by means of contractual stipulations to be done with the sub-contracting companies. • Basic occupational health and safety orientation trainings will be provided to all new personnel including direct and contracted workers, management, supervisors and occasional visitors. • In addition to orientation trainings, all the direct and contracted workers will be provided with relevant trainings prior to commencement of new assignments (change of workplace/task, change of working machinery and equipment, introduction of new technologies, etc.). Workers with rescue and first-aid duties will be provided with dedicated training. Through appropriate contract specifications and monitoring, Project Sponsor will ensure that service providers, as well as contracted and subcontracted labor, are trained adequately before assignments begin. • A visitor orientation and control program will be established to ensure visitors do not enter hazard areas unescorted. In this respect, relevant checkpoints and record keeping practices will be used for ensuring both safety of the works and the visitors. • Emergency Preparedness and Response Plan will be implemented.	
		Phsyical and chemical hazards due to operation of heavy vehicles, earthworks, exposure to noise, emissions	Adverse	Restricted	Medium	Medium (machinery / activities will not be localized but distributed along the linear route, use of chemicals will be limited)	Short term reversible	Intermittent	Moderate (B)	High (3)	High (B3)	• Emergency Preparedness and Response Plan will be implemented. • Hazardous materials will be replaced with a less hazardous substitute. • Engineering and administrative control measures will be performed in order to prevent or reduce the release of hazardous materials into the work site. Level of exposure will be kept below internationally established or recognized limits. • The number of workers to be exposed will be kept in minimum. • Hazardous materials will be labeled and marked properly considering national and international regulations and guidelines. Materials Safety Data Sheets (MSDS) will be prepared. All written communication will be readable and available to workers to be exposed and first-aid personnel. • Workers will be trained in use of information related to hazardous materials (MSDSs etc.), safe work practices and appropriate use of PPE. • Safe work zone will be established to separate workers on foot from the traffic. • For the construction works to be conducted at location where traffic exists, safe work zones will be established by taking relevant measures (closure of roads, diversion of traffic, use of protective barriers, cones, warning lights, etc.) • The area around which elevated work is taking place will be barricaded to prevent unauthorized access and working under personnel on elevated structures will be avoided. • Hoisting and lifting equipment will be rated and properly maintained, and operators trained in their use. Elevating platforms will be maintained and operated according to established safety procedures including use of fall protection measures (e.g. railings), equipment movement protocols (e.g. movement only when the lift is in a retracted position), repair by qualified individuals, and installation of locks to avoid unauthorized use by untrained individuals. • Ladders will be used according to pre-established safety procedures for proper placement, climbing, standing, as well as the use of extensions. • When working at height, proper fall protection measures will be implemented. Fixtures will be installed on bridge components. Safety belts with proper thickness and of suitable materials ensuring sufficient strength will be used.	Low
		Emergencies such as accidents, fires, natural hazards, etc.	Adverse	Restricted	Medium	Medium	Short term reversible	One-off	Moderate (B)	High (3)	High (B3)		Low
				Restricted	Medium	High	Irreversible	One-off	Moderate (B)	High (3)	High (B3)		Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												Rope safety belts will be replaced before signs of aging or fraying of fibers become evident. When operating power tools at height, workers will use a second (backup) safety strap. • Personnel exposed to high levels of noise will be required to use personal hearing protection devices/equipment that will be provided by the Project Sponsor at no cost. Where required for specific works, work rotation programs will be implemented to reduce cumulative exposure. • Weather forecasts will be monitored for outdoor work to provide advance warning of extreme weather and schedule the work accordingly. Protective clothing will be used where required. • Properly maintained construction machinery, equipment and vehicles will be used to minimize air emissions. • Engine idling time will be reduced in construction sites. • Direct diesel exhaust will be properly removed to minimize exposure of the operators. • Indoor working areas where vehicles or engines are operated will be ventilated or the exhaust gases will be properly diverted. • Lead-containing paint will be avoided and appropriate respiratory protection will be used when cutting galvanized steel. • At work sites where dust levels are excessive, dust masks will be used by relevant personnel.	
		Retrenchment of construction workforce at the end of construction phase	Adverse	Restricted	Short	High	Short term reversible	One-off	Moderate (B)	Medium (2) (Since the Project will not cause retrenchment of personnel from an existing workplace but from a Project construction with predefined limited duration sensitivity of personnel is asummed as medium instead of high)	Medium (B2)	• Retrenchment of the construction workforce following the completion of construction activities will be done in compliance with all legal and contractual requirements. • A Retrenchment Plan in compliance with IFC PS2 will be prepared and implemented during the retrenchment process.	Low
	Operation	Phsyical and chemical hazards during road maintenace and landscaping works.	Adverse	Restricted	Long	Medium (stationary personnel) Road maintenance personnel, workers on foot	Short term reversible	Intermittent	Moderate (B)	High (3)	High (B3)	• In accordance with the related terms of the BOT contract, Project Sponsor will ensure that the operation and maintenance personnel are properly trained in their specialty and successfully completed the necessary security investigations. Operation and Maintenance Plan will be submitted to the KGM 4 months ahead of the start of Motorway's operation. In accordance with the related terms of the BOT contract, 1 year ahead of the end of the contract duration, personnel designated by the KGM will be trained by the Project Sponsor on the aspects related with the operation and maintenance works of the Motorway. • Sub-contractors to be involved in the operation of service areas will be subject to the same contractual conditions with the Project Sponsor, sub-contractors will be required to apply occupational health and safety measures to be taken by the Project Sponsor. • Safe work zones will be established to separate workers on foot from the traffic by using proper methods/devices (e.g. use of protective barriers, traffic cones, barrels) • When possible, traffic will be route to alternative roads. • Proper land closure or traffic diversion measures will be taken in consideration of the width of the road. • Protective barriers will be used to shield workers where required. • Traffic flow will be primarily regulated by warning lights and use of flaggers will be avoided where possible. • Maximum speed limits will be reduced in the work zones. • Blind spots will be avoided to the maximum extent possible by means of proper design of the work space. • Pavers with exhaust ventilation systems will be used and proper maintenance of such systems will be ensured to	Low

Affected Ecosystem Component	Project Phase	Definition of Potential Impact	Type of Impact	Impact Magnitude						Sensitivity / Value of Resource / Receptor	Impact Significance (Before Mitigation)	Measures to be Taken	Significance of Residual Impacts
				Geographic Extent	Duration	Magnitude	Reversibility	Frequency	Overall Magnitude				
												maintain worker exposure to crystalline silica (millers and grinders) and asphalt fumes (pavers) below applicable occupational exposure levels. • Correct asphalt product will be used for each specific application and application at the correct temperature will be ensured to reduce the fuming of bitumen during normal handling. • Adequate ventilation will be provided in necessary areas with limited natural air circulation; • Tollbooths will be equipped with proper ventilation and air filtration systems; • Protective clothing will be used when working with cutbacks (a mixture of asphalt and solvents for the repair of pavement), diesel fuel, or other solvents. • Appropriate respiratory protection will be used when removing paints.	

CHAPTER 17

CUMULATIVE IMPACT ASSESSMENT

17. CHAPTER – CUMULATIVE IMPACT ASSESSMENT

Project-level environmental and social impacts of the project have been evaluated in the previous sections of this ESIA Report. This Section aims to assess the potential cumulative impacts that may arise from incremental impacts from other past, current or future (reasonably foreseeable) developments/activities implemented or planned in the region.

17.1 Definitions, Methodology Assessment and Data Sources

- **Definitions**

- **Cumulative Impact**

The Cumulative Impact Assessment (CIA) study to be undertaken under this ESIA will follow the core principles of the International Finance Corporation's (IFC, August 2013) Good Practice Handbook (IFC, August 2013) that is one of the most recent and up-to-date work on the Cumulative Impact Assessment and Management Guidelines. It compiles the most comprehensive document available to CIA practitioners and key approaches to the assessment of cumulative impacts from key reference documents. Additional key references to be used in the assessment will include:

- Sample Guidelines: Cumulative Environmental Impact Assessment for Hydropower Projects in Turkey (ESMAP, 2012) published under the World Bank's Energy Sector Management Assistance Programme;
- Cumulative Impact Assessment and Management Guidelines published by the International Association for Impact Assessment (IAIA) (Canter L. and William R., 2009; http://www.iaia.org/);
- European Commission's (EC) Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (May, 1999);
- Canadian Environmental Assessment Agency (Hegmann, GC Cockling, R. Creasey, S. Dupuis, Kennedy, L. Kingsley, W. Rodd, H. Spaling and D. Stalker; February, 1999).

The International Finance Corporation (IFC) defines cumulative impacts as “Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity (collectively referred to in this document as “developments”) when added to other existing, planned, and/or reasonably anticipated future ones.” (IFC, August 2013).

Cumulative impacts occur in the form of interaction. This interaction can be between actions and/or between actions and environmental components. The magnitude of the cumulative impacts may equal the sum of the individual effects (aggregate effect) or result in an incremental effect (synergistic effect) (World Bank, June 2012). Several independent activities/projects/developments with insignificant effects on their own can together cause a cumulative impact that can be significant (EC, May 1999; see Figure 17.1).

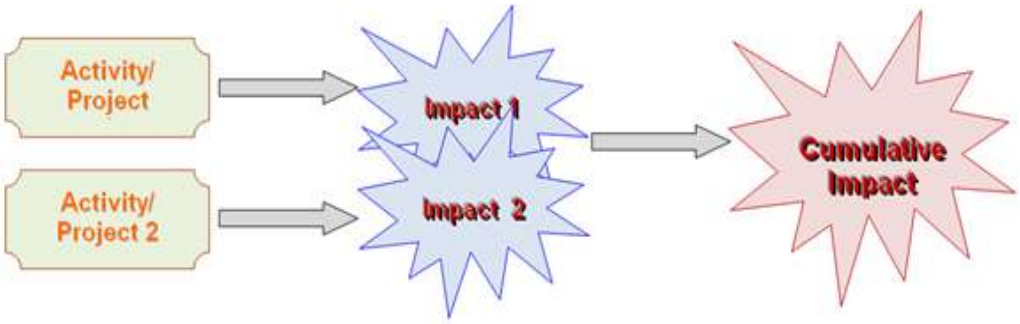


Figure 17.1 Illustration of Cumulative Impacts (adapted from EC, May 1999)

- **Valued Ecosystem Components (VECs)**

Valued Ecosystem Components that is one of the main components of cumulative impact assessment processes are defined as “Any part of the environment that is considered important by the proponent, public, scientists or government involved in the assessment process.” (Hegmann et al., 1999).

In the cumulative impact assessment, the environmental and social impacts and risks of a project or activity are determined through VECs. VECs may include the following environmental and social elements. (IFC, August):

- Physical features, habitats, wildlife populations (e.g., biodiversity),
- Ecosystem services,
- Natural processes (e.g., water and nutrient cycles, microclimate),
- Social conditions (e.g., health, economics), or
- Cultural aspects (e.g., traditional spiritual ceremonies).

- **Area of Impact**

The concept of “Area of Impact” in the CIA process (named CIA in this report) describes the boundaries of the spatial area where the assessment will be made, as in an EIA study. Area of impact is defined as the minimum study area where EIA and/or CIA for a project will be carried out (World Bank, June 2012; World Bank ESMAP, December 2012).

Identifying spatial boundaries is one of the key and most challenging stages of the CIA process. Spatial boundaries should be determined by striking an appropriate balance, taking into account the budget, available data, practical constraints, and the geographic and temporal dimensions of complex environmental interactions (World Bank, June 2012; World Bank ESMAP, December 2012).

- **Limits of Acceptable Change and Limit Values**

Since thresholds play a key role in determining the severity of impacts, setting thresholds is an important process for both assessing and managing cumulative impacts. Thresholds are limits where cumulative change becomes a concern when exceeded, and can also be expressed as a target, standard, carrying capacity, or limits of acceptable change (World Bank, June 2012; World Bank ESMAP, December 2012).

A threshold value may be the maximum intensity at which a given pollutant will adversely affect health if exceeded, or the maximum amount at which the natural state of an area will change unacceptably (e.g., reduction of forest or agricultural land). To reach a conclusion about the significance of the cumulative impacts, a certain limit of variation is required that can be used to compare the effects. Theoretically, if the cumulative impacts of all combined actions in a region do not exceed a limit or threshold, that action may be considered acceptable. However, in practice, the absence of such thresholds is a constraint on the assessment of cumulative impacts. This is especially true for the terrestrial components of ecosystems. Pollutants affecting human health and components in air and water are generally subjected to legal regulations. Therefore, the necessary threshold values for the assessment of the effects on these components are defined in the regulations or included in the guidelines (World Bank, June 2012; World Bank ESMAP, December 2012).

The concept of "Limits of Acceptable Change" is based on describing the acceptable level of environmental conditions rather than determining appropriate use levels (World Bank, June 2012). In this approach, after the acceptable conditions are identified, the necessary practices are determined in order to maintain these conditions.

- **Cumulative Impact Assessment (CIA)**

Cumulative Impact Assessment (CIA), assessment of the possible impacts and risks of planned actions, projects or activities (development), together with other human activities and natural environmental and social external factors, on selected VECs and reducing or mitigating the identified cumulative impacts and risks of the process that involves proposing concrete measures as far as possible.

In this context, the two main components that form the basis of CIA are (IFC, August 2013):

- The contribution of the activity subject to the assessment to the cumulative impacts;
- Expected future conditions after the aggregate impact of other past, present and reasonably foreseeable future activities and natural, external environmental and social factors.

In the region where South Alternative route passes, there are projects in different sectors within the scope of EIA Regulation Annex-I and Annex-II lists. In accordance with good practices of CIA, the possible cumulative impacts of the projects in and around South Alternative on VECs will be evaluated within the scope of this study.

- **Cumulative Impact Assessment Methodology**

Cumulative Impact Assessment (CIA) aims to determine how the potential impacts of a project will cumulatively combine with the potential impacts of other human activities and natural factors (e.g. floods or extreme climatic events) (IFC, August 2013).

Identifying the cumulative environmental impacts of a project requires a much broader and regional perspective beyond the direct and immediate impacts of the project. CIA requires a broader scope for impact assessment and a more complex consideration of the interaction between human activities and VECs compared to a general EIA study. In this context, in a general EIA study, the evaluation focuses on the project that caused the impact, while the CIA study keeps the affected VECs at its center.

CIA studies basically have the same logical framework and analytical process as EIA studies. Within this scope, as generally the case with EIA studies, CIA studies consist of the basic stages of scoping, existing situation determination, impact assessment and management, which follow each other.

IFC describes the CIA process in six steps in its Good Practice Handbook on Cumulative Impact Assessment and Management:

- Step 1: Scoping Phase I – VECs, Spatial and Temporal Boundaries
- Step 2: Scoping Phase II – Other Activities and Environmental Drivers
- Step 3: Establish Information on Baseline Status of VECs
- Step 4: Assess Cumulative Impacts on VECs
- Step 5: Assess Significance of Predicted Cumulative Impacts
- Step 6: Management of Cumulative Impacts – Design and Implementation

This six-step process generally coincides with the process (Canter L., and William, R., 2009. IAIA Wiki: Cumulative Impact Assessment and Management) described by the International Association for Impact Assessment (IAIA), which gathers similar principles adopted in EU countries, Australia, New Zealand and other countries where implementation is carried out, in six steps and the cumulative impact assessment and management frameworks published in the USA and Canada. Similarly, the cumulative impact assessment process described in the Cumulative Environmental Impact Assessment for Hydropower Projects in Turkey Sample Guideline developed by the World Bank within the scope of the Energy Sector Management Support Program also basically adopts the principles of this processes proposed by IFC.

Cumulative impacts are considered separately for the physical, biological and socio-economic environment while evaluating the construction and operation phases. In each case, after the projects are classified under the following three groups, a cumulative impact assessment can be made under different scenarios consisting of combinations of these groups (World Bank, June 2012; World Bank ESMAP, December 2012):

- Project subject to evaluation (source project);
- Other existing projects (secondary projects) that have an impact on VECs;
- Future projects (confirmed, reasonably foreseeable and probable).

South Alternative Cumulative Impact Assessment

In the CIA study conducted for the South Alternative, the six-step process presented above was followed.

For the project, a CIA study was conducted to achieve the following outputs in accordance with international standards. These are;

- Identification of VECs that are likely to be affected by the activities under evaluation in the project in question
- Identification of all other existing, certain, reasonably foreseeable and/or likely to be triggered developments and natural environmental and external social factors likely to affect the selected VECs
- Evaluation of the future status of VECs by comparing them with current or foreseeable limit/reference values
- Preventing or mitigating potential impacts on VECs during the life of the activity or during the lifetime of the activity, in accordance with the mitigation hierarchy;
- Monitoring and managing risks to the existence or sustainability of VECs throughout the life of the operation or the duration of the operation's effects, whichever is longer;

Within the scope of the Cumulative Impact Assessment, South Alternative will be considered as a resource Project that may cause cumulative impacts together with other projects/activity/developments affecting the same VECs.

- **Step 1: Scoping Phase I – VECs, Spatial and Temporal Boundaries**

Valued Ecosystem Components (VECs)

Valued Ecosystem Components (VECs), which are one of the main elements of the cumulative impact assessment process, are defined as “parts of the environment that are considered important by the organization that proposes the project, the public, scientists or the public administration involved in the evaluation process”, and the selection criteria in international standards are explained under the title of “Valued Ecosystem Components”.

Identifying the cumulative environmental impacts of a project requires a much broader and regional perspective beyond the direct and immediate impacts of the project. CIA requires broader scope for impact assessment and more complex consideration of the interaction between human activities and VECs compared to general EIA study. In this context, in a general EIA study, the evaluation focuses on the project causing the impact, while the CIA study keeps the affected VECs in its center. The project-centered approach of a general EIA process and the VEC-centered approach of the CIA process are represented in Figure 17.2 and Figure 17.3, respectively.

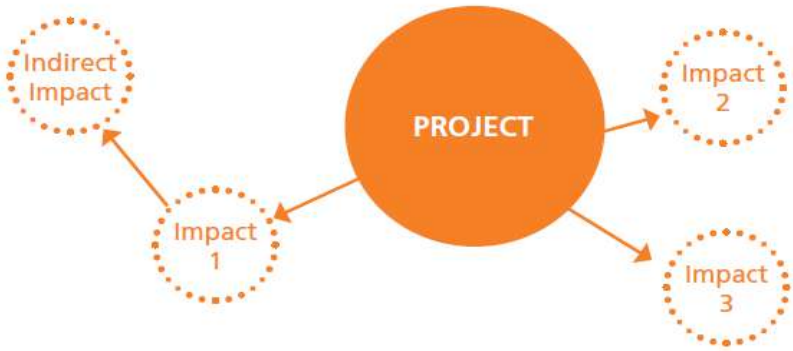


Figure 17.2 EIA Approach

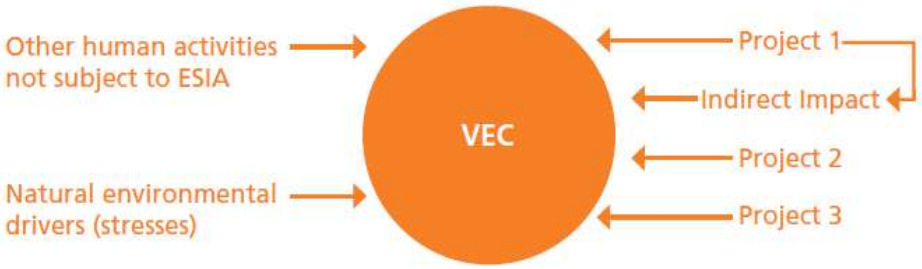


Figure 17.3 CIA Approach

With CIA study, it is aimed to understand the situation of VECs as a result of the effects of one or more actions, projects or activities and/or natural factors. A good CIA study focuses on understanding whether the cumulative impacts of planned developments have a significant impact on the existence and sustainability of VECs. Evaluation of expected conditions after potential impacts of VECs forms the basis of this approach (IFC August 2013).

International good practice on impact assessment recommends focusing on the evaluation and method of "VECs" in CIA studies, since it would not be realistic to reasonably include every environmental and social component that would be exposed to cumulative impacts in a Project within the CIA process. The Figure 17.4 below represents the VEC-driven impact assessment approach.

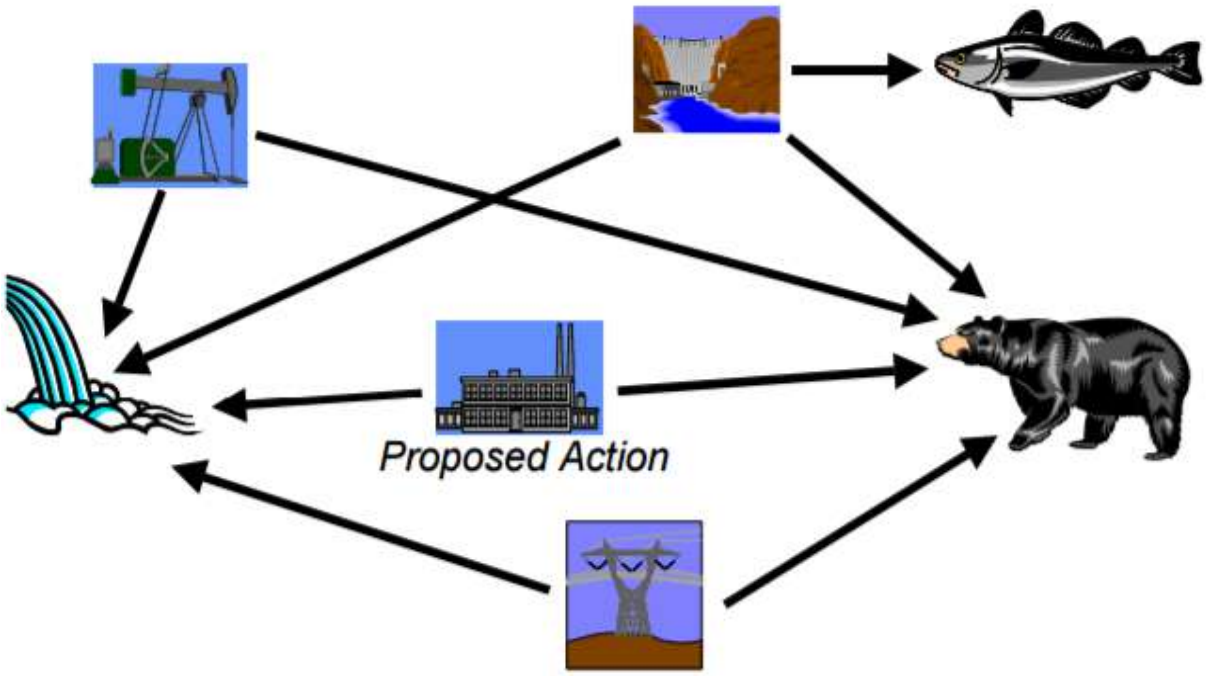


Figure 17.4 Focusing on Impacts on VECs

For example, fish affected by one of the other projects as shown according to the VEC focused approach should not be considered as VEC in the CIA process of the proposed project, as they are not affected by the proposed project. In this direction, since the selection of VECs will affect the entire CIA process, the first step of the scoping phase is the identification of VECs (IFC, August 2013).

In the cumulative impact assessment to be made within the scope of South Alternative, only VECs that will be affected by South Alternative will be considered. In other words, any VEC that is not affected by the South Alternative but will be affected by other developments (e.g. protected areas, sensitive habitats, water resources, etc.) will not be taken into account in the assessment.

Determination of Temporal and Spatial Boundaries

In the first scoping phase of CIA, it is an important step to determine the temporal and spatial (geographical) boundaries on which impact assessment will be made. This step provides an understanding of the temporal and geographic dimensions of potential impacts on VECs during the duration of project impacts. Geographical boundaries within the scope of CIA are likely to exceed the direct impact area of the project (IFC, August 2013).

International good practices provide some suggestions for basic steps to be followed in determining geographical boundaries within the scope of CIA (IFC, August 2013):

i. The area that will be directly affected by the project or activity is determined (The area where direct impacts will be seen in a generally in EIA report - the direct impact area);
ii. VECs within the direct impact area are identified;
iii. Examined whether the boundaries of the determined VECs extend beyond the direct impact area;
iv. Geographical boundaries are set taking into account the distance that possible cumulative impacts can reach and affect VECs; Activities that do not affect VECs outside the geographic boundary and that do not make it technically or scientifically reasonable to participate in the evaluation are eliminated.

Similarly, recommended steps for determining the temporal limits of evaluation are also included in international standards:

i. The estimated life of the project subject to evaluation (source project) is taken into account;
ii. It is determined whether the potential impacts of the source project will continue after the project life is completed;
iii. The most conservative time interval between (i) and (ii) is chosen;
iv. In line with the evaluation of the experts who make the cumulative impact assessment, a balance is established for the time limit that will not be too long or too short;

- **Step 2: Scoping Phase II – Other Activities and Environmental Drivers**

In the second scoping phase of the CIA process (Step 2), studies are carried out to determine whether there is an existing or planned activity ("secondary activities") or natural external factor affecting the same VECs within the analytical framework determined in the previous step.

Other (Secondary) Activities

The aim of the studies to be carried out in this step is to determine the activities (secondary activities) that can affect the status of VECs evaluated within the scope of CIA, in addition to the source project. Secondary activities may include existing and future activities (IFC, August 2013). Future activities, on the other hand, can be grouped into certain activities, reasonably foreseeable activities and hypothetical activities.

Within these three groups, certain activities represent activities that are certain to occur or are expected to occur with a very high probability. Reasonably foreseeable activities include activities that are likely to occur but involve uncertainty. Hypothetical activities include activities for which there is a serious uncertainty about their realization. The criteria for how future activities can be classified under these three groups are summarized in the graph presented in the Figure 17.5 below.

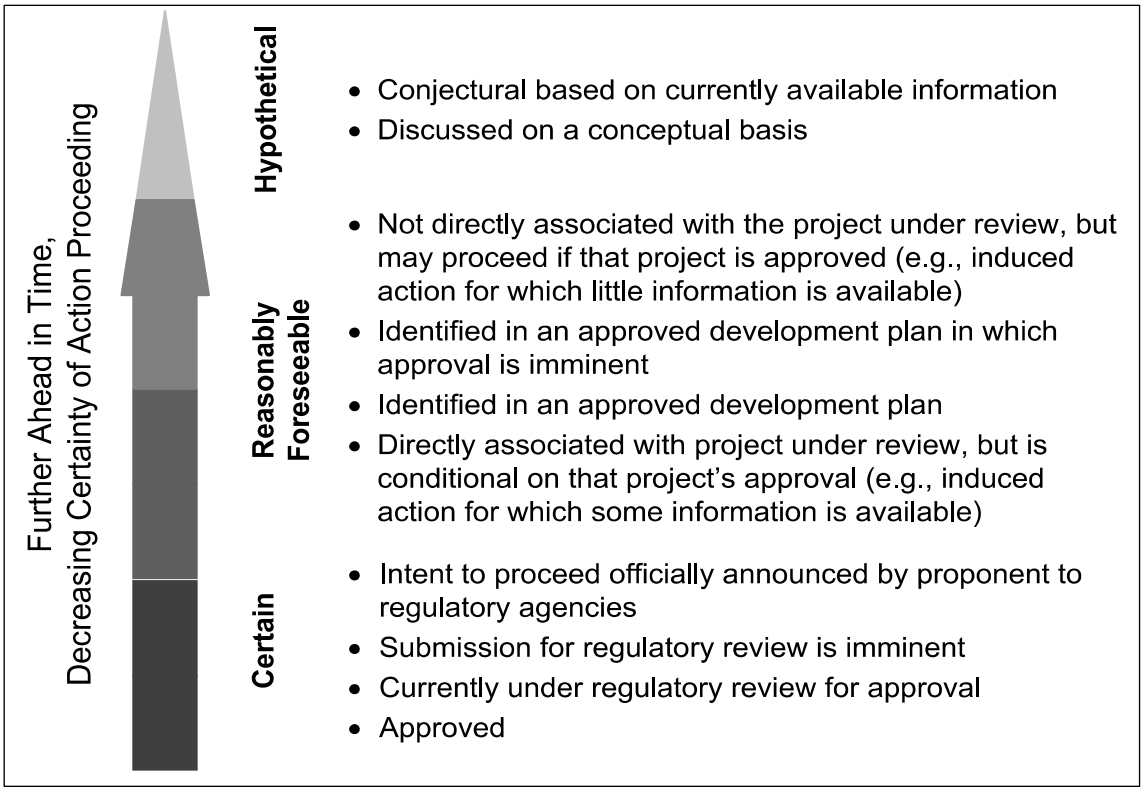


Figure 17.5 Classification of Future Actions

In the classification described in the Figure 17.5 above, it will create difficulties in practice if the certain and reasonably foreseeable projects can be clearly differentiated according to certain criteria. Therefore, within the scope of the CIA study of the South Alternative, all of the projects that are certain and reasonably foreseeable will be named as “reasonably foreseeable” projects.

In determining reasonably foreseeable projects, it is recommended to refer primarily to local, regional and national plans, and to consider a generally not very long time frame due to uncertainties in long-term investment plans. This period is accepted as 3-4 years in the European Union. Good practice recommends that where local, regional and national plans are not available, activities that are in the planning stage and whose official permit processes are in progress (e.g. EIA Report has been prepared, permit application has been made, etc.) should be considered. However, it is not possible for this approach to reveal a certainty about which activity will take place. It will always be possible that some of the activities in the planning phase will not be realized within the stipulated time, or that an unforeseen project will be developed and implemented. At this point, it is important that the time limits taken into account in the evaluation and all the developments and factors included in the evaluation are clearly explained in the CIA report (IFC, August 2013).

While the evaluation of past and current projects within the scope of CIA can be mostly based on tangible data, the existence of different possibilities regarding the realization status of the projects included in the evaluation with the definition of "Reasonably Foreseeable" may cause uncertainties within the scope of CIA. International good practices suggest that “scenario analyzes” be included in the evaluation to eliminate such uncertainties. The purpose of scenario analysis is not to identify the most probable scenario, but to enable assessment based on the consequences of uncertainties and, if necessary, the development of measures for cumulative impact management (IFC, August 2013).

After the Cumulative Impact Assessment area is determined in the assessment to be made within the scope of South Alternative, other activities and environmental factors that will affect the status of VECs selected for the Cumulative Impact Assessment within this geographical boundary, available resources (e.g. Master Plans, EIA Positive Decisions for Projects etc.) and the infrastructure databases of the Ministry of Transport and Infrastructure, which are made available to Project Sponsor, will primarily focus on transportation infrastructure projects.

- **Step 3: Establish Information on Baseline Status of VECs**

In the third step of the CIA process, the current status of VECs is determined. The main purpose of this step is to understand the response of a VEC to the impact, its resilience and the time it will need to recover, and to determine the trend of change in the conditions of VECs (IFC, August 2013). In this step, first of all, the scope and adequacy of the available data should be evaluated. It is important to anticipate the need for data at this early stage of the scoping process. If the available data provide sufficient information to fully assess the cumulative impacts, no additional data collection process will be needed (IFC, August 2013).

In a typical CIA study, since a larger area is studied compared to a typical EIA study, it is generally not possible to create a database as comprehensive as an EIA. In this respect, data focusing on especially on important VECs are taken into account within the scope of the CIA study. The need for new baseline data collection is often limited and, if needed, these efforts focus on indicators to assess changes in the state of VECs (IFC, August 2013; World Bank ESMAP, December 2012).

Historical information on the status of VECs is important in determining trends in conditions, thereby assessing important issues within the scope of cumulative impacts. For example, if there is a prolonged/significant deterioration in the conditions of a particular VEC, this may be an indication that the threshold (limit) values are approaching at which change is no longer acceptable (IFC, August 2013). For this reason, the development of the required database on the current status of the selected VECs by utilizing the current sources constitutes an important part of the CIA process.

For South Alternative, the basic conditions for VECs to be evaluated within the scope of this study will be based on the information collected for each environmental and social issue under the ESIA process. Relevant information on VECs is provided in the relevant sections of this ESIA Report.

- **Step 4: Assess Cumulative Impacts on VECs**

Cumulative impacts on VECs will be analyzed by estimating the future state of VECs under the collective influence of past, present and future (reasonably foreseeable activities/projects/developments). The purpose of this step is to make an assessment of what conditions VECs will have as a result of the combined impact of all relevant resources.

The assessment made in this context should reveal the possible impacts and risks that may threaten the long-term existence and sustainability of VECs. Also, in this step, the total impact on VECs and the contribution of the source project to this impact (World Bank ESMAP, December 2012) should also be revealed, as well as the known or predictable cause-effect relationships and whether impacts and risks will interact with each other (IFC, August 2013).

The assessment will be based on a qualitative approach and will focus on the final state of the relevant VEC under the influence of all impact factors.

Potential cumulative impacts will be estimated with a holistic approach, considering the possible impacts (project impacts) of the activities carried out within the scope of South Alternative and the possible impacts of external factors, if any. If the source project does not have any impact on a VEC, the possible cumulative impacts on that VEC (cumulative impacts on the VEC of other projects other than the source project) will not be considered within the scope of this study.

The cumulative impacts of the project, which are estimated using the results of the EIA study, will show what kind of mitigation measures will be required for the project. On the other hand, the cumulative impact assessment, taking into account all sources of impact on a VEC, will provide a description of the measures that will need to be implemented by all parties/project owners contributing to the total impact (IFC, August 2013).

- **Step 5: Assess Significance of Predicted Cumulative Impacts**

Considered on its own, the environmental impacts of any single project on any recipient/resource may not be significant. However, the cumulative impact can be significant when the individual effects are considered together. The focus in giving importance to cumulative impacts should be determined by the extent to which impacts can be borne by the recipient/source. Thresholds of a recipient/resource (the limits at which cumulative change becomes a concern) and indicative acceptable performance levels can also assist in the evaluation process1. The standardized matrix developed by the UK Highway Agency to assess the significance of cumulative impacts is presented in Table 17.1.

Table 17.1 Criteria for Determining the Significance of Cumulative Impacts

Significance	Impacts
Severe	Impacts that the decision maker should consider when the Recipient/Source is irreversibly compromised.
Major	Impacts that may become key decision-making issue.
Moderate	Impacts that are unlikely to become issues on whether the project design should be selected, but where future study may be needed to improve on current performance.
Minor	Impacts those are locally significant.
Not Significant	Impacts that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

Source: UK Highways Agency 205/08: Design Manual for Roads and Bridges; http://www.standardsforhighways.co.uk /ha/standards/dmrb/

Current practice shows that setting thresholds is an important part of the process, not only for assessing cumulative impacts, but also for developing management strategies. In order to assess the significance of cumulative impacts, it is necessary to define the limits at which change in the conditions of VECs is acceptable. These limits will allow comparison of incremental effects. In practice, the activity will be considered acceptable if the cumulative impact of all relevant actions, projects and activities on a VEC does not exceed a certain threshold (IFC, August 2013).

- **Step 6: Management of Cumulative Impacts – Design and Implementation**

The last step of the CIA process describes how the cumulative impacts identified in the previous steps will be managed. Management practices required to prevent anticipated cumulative impacts are shaped by both how the impacts arise (e.g. through other projects and natural factors affecting VECs) and the characteristics of impacts. At the end of this step, after taking preventive and mitigation measures, the importance of residual effects is evaluated (e.g. by matrix method), and if there is a residual effect, measures for their management are recommended (IFC, August 2013).

[1] (UK Highways Agency 205/08: Design Manual for Roads and Bridges; http://www.standardsforhighways.co.uk/ha/standards/dmrb/)

Although the management of impacts at the project level and the reduction of the contribution to cumulative impacts are the responsibility of the contributing projects, the highest level of responsibility in cumulative impact management rests with the relevant government authorities. In this context, government authorities should establish a framework for the identification of interested/contributory parties within the scope of CIA, selection of VECs and impact management processes (IFC, August 2013).

17.2 Potential Impacts

The cumulative impact assessment will be carried out step by step below in accordance with the methodology described in the previous section.

Step 1: Scoping Phase I – Valued Ecosystem Components (VECs), Spatial and Temporal Boundaries

For the initial determination of VECs, environmental and social issues within the scope of the impact assessment conducted for the South Alternative in the previous sections of this ESIA report will be taken into account. VECs to focus on in the Cumulative Impact Assessment were selected as follows:

- Land use
  - Forests
  - Farmland
- Water resources
  - Drinking water reservoirs/dams
  - Natural lakes
- Sensitive habitats
  - Key Biodiversity Areas
- Protected areas
  - Nature parks etc.
  - Registered cultural heritage/archaeological sites
- Local communities (air quality, noise, socio-economy)

With regard to the temporal dimension of impacts, the assessment will cover, to the maximum extent possible, the impacts of past, present and reasonably foreseeable future developments that will correspond to the economic life of the Project.

Within the scope of the cumulative impact assessment, which is the subject of this study, the area covered by the provincial border of Aydın, where the project route is located, was determined as the pre-cumulative impact assessment area. Within the scope of the studies, the current situation and the secondary projects in the region were primarily investigated within the aforementioned Pre-CIA Area. The locations of the remaining projects (projects where all EIA and Project Identification Document (Within the scope of the Environmental Impact Assessment Regulation, the date when legally required to prepare EIA and Project Identification Document (PID) is accepted as the starting date, and all EIA and PID reports from the period up to the present can be accessed) were determined. The map showing the Preliminary CIA Area is given in Figure 17.6.

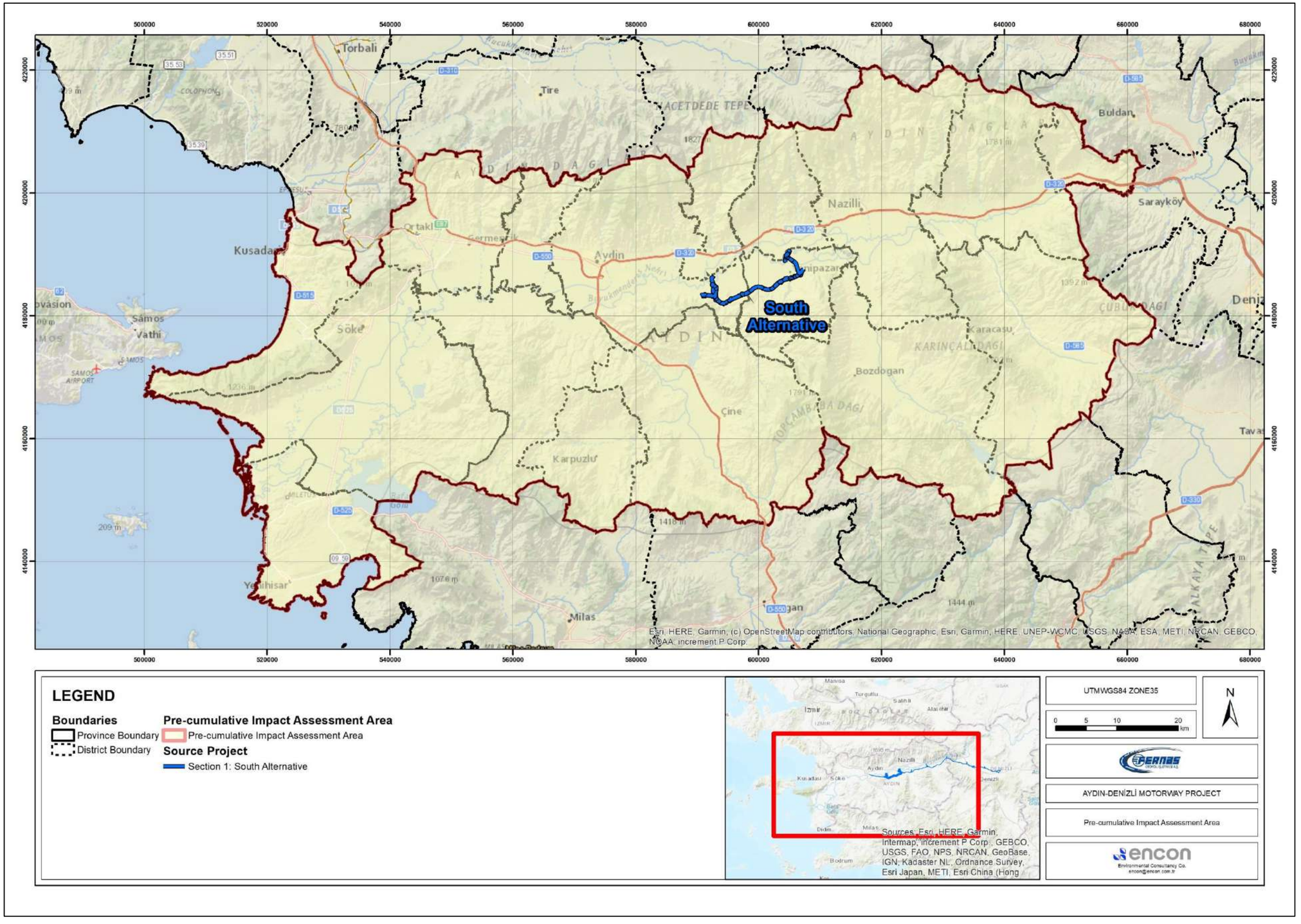


Figure 17.6 Pre-cumulative Impact Assessment Area

As mentioned in Chapter 4 ("ESIA Methodology"), The Area of Influence (AoI) for the South Alternative has been determined separately for each different environmental and social component. Study areas and AoI's for each environmental and social component are listed in Table 17.2. Accordingly, the Area of Influence (AoI) has been determined by considering the direct impact area of the Project activities. In this respect, the motorway width (35.5 m) and the minimum width of the expropriation corridor (100 m) had been considered. It should be noted that the expropriation corridor will extend up to maximum 350 m at the locations of interchanges, large embankment and cut sites, service areas, etc. In addition, some of the quarries and disposal areas are located out of the expropriation corridor. Thus, in consideration of such components, study area had to be expanded exceptionally as needed. The study area determined for Land Use and Property, Topography, Soil and Geology, Ecology and Biodiversity, Landscape and Visual Environment, Protected Areas and Cultural Heritage is 400 m.

The overall study area covering all sub study areas has been determined as 4,000 m corridor (2,000 m from each side of the Motorway axis) on the basis of the air quality and socio-economic environment components.

Table 17.2 Proposed Study Areas and Possible Area of Influence for the Motorway

Environmental and Social Component	Study Area **	Possible Area of Influence (AoI) **
Land Use and Property	400 m	100 m
Topography, Soils and Geology	400 m	100 m
Ecology and Biodiversity	400 m	100 m
Air Quality	4,000 m	2,000 m
Noise and Vibration	2,000 m	1,000 m
Landscape and Visual Environment	400 m	400 m
Protected Areas	400 m	100 m
Cultural Heritage	400 m	100 m
Socio-economic Environment *	4,000 m	2,000 m
Health and Safety	2,000 m	1,000 m
Cumulative Impact Assessment ***	10,000 m	10,000 m

** It should be noted socio-economic environment, due to its nature, propound a distinction in the ESIA approach; thus the study area specified in the table for socio-economic environment should be considered as the minimum study area. Settlements, whose lands extend beyond the proposed study area, have also been included in the scoping assessments, whenever if they are likely to be affected.*

*** Represents the total width. For example; a 400 m study area is composed of 2 x 200 m corridors (200 m located in the left side and 200 m located in the right side of the Motorway's axis, making a total of 400 m in total).*

**** Within the scope of cumulative impact assessment studies, an area of 5 km north and 5 km south from the Project area was determined.*

The area where the cumulative impacts are evaluated, apart from the study areas within the scope of the project, is defined as the area where the activities to be carried out in the project are likely to cause changes on the environmental and social components together with the activities within the scope of other nearby projects. This area is much wider than the direct impact area of the project and has been chosen to include impacts on different environmental and social components (air, water, socio-economics, etc.).

However, as a result of the preliminary evaluations made, considering the prevailing wind direction of the secondary projects around the project area, climatic characteristics, the distribution of the effects on air quality, the spread of the noise effect, the dimensions of the change to be observed on the flora and fauna, the project route should be 5 km in the north and south directions as a total of 10 km corridor cumulative impact assessment area has been selected. It is clear that this area is wide enough to allow appropriate assessment of the cumulative impacts that may be on VECs.

The study areas and cumulative impact assessment area determined within the scope of South Alternative are presented in Figure 17.7.

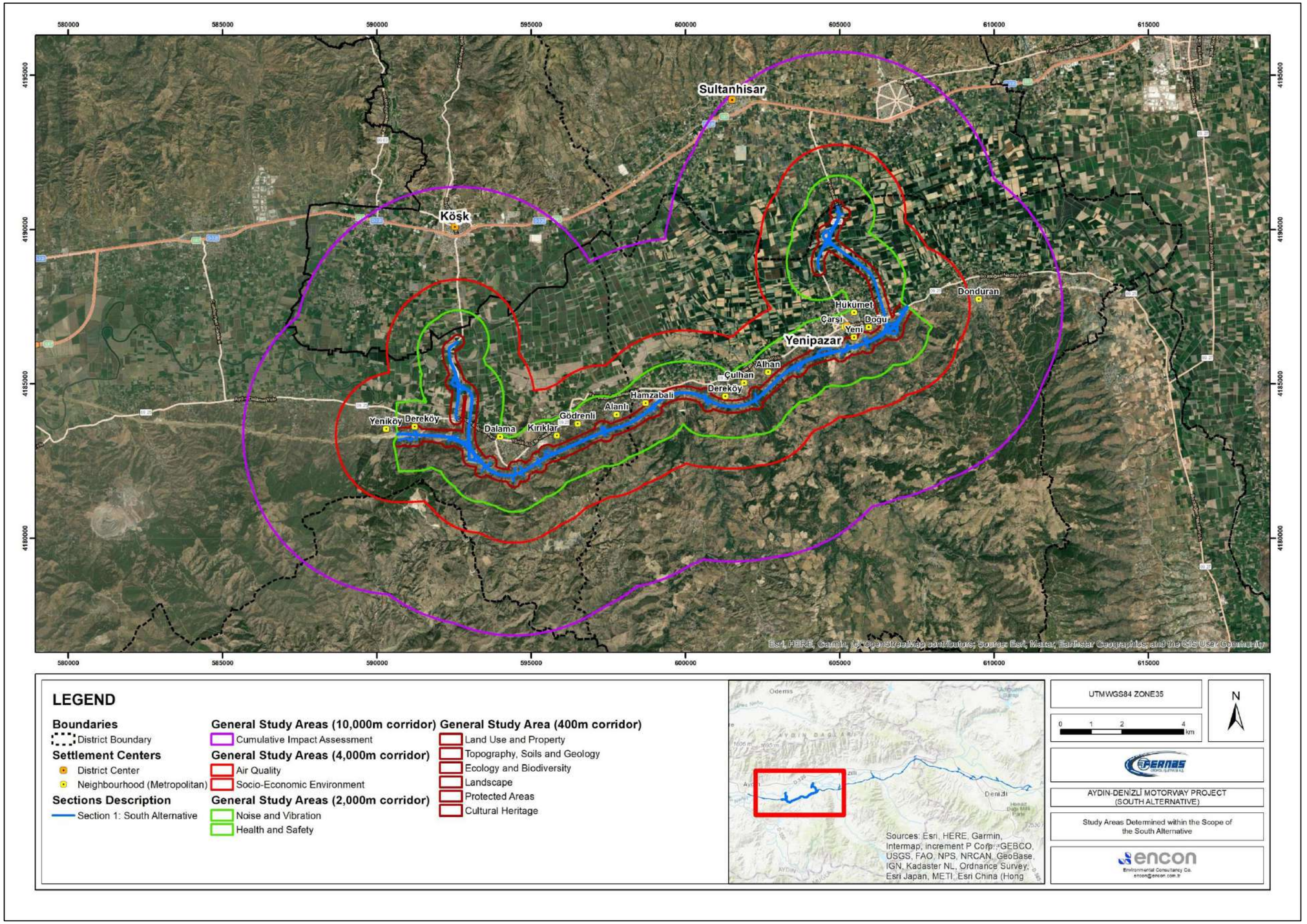


Figure 17.7 Study Areas Determined within the Scope of the South Alternative

Step 2: Scoping Phase II – Other Activities and Environmental Drivers

Within the scope of the project, other past, present and future (reasonably foreseeable) transportation infrastructure activities/developments located in Aydın province within the scope of pre-CIA studies at the first stage will affect the status of VECs selected desk based assessment of databases.

Ministry of Transport and Infrastructure and other available resources (e.g. Environmental Master Plans, EIA Positive Decisions for Projects, etc.) are as listed in Table 17.3.

It should be noted that the list given in Table 17.3 is a comprehensive list covering all major transportation projects in the region. The last column of the table describes the potential of other projects/activities/developments to influence selected VECs. The projects in Table 17.3 are the projects selected within the scope of the pre-CIA study in the first place. Secondary projects within the Pre-CIA Area are given in Figure 17.8.

Table 17.3 Other Projects/Activities/Developments in the Transportation Sector in Aydın Province

Transport Sub-sector	Province	Other Projects/Activities/ Developments	Status	Construction		Project Cost	Potential for Affecting the Selected VECs	
				Start	End		Yes	No
Road	Aydın-Denizli	Aydın-Denizli Motorway Project (Km:0+000 and Km:15+856 / Km:34+630 and Km:140+650)	Under construction	2021	2024	900,000,000 TL		
	Aydın-İzmir	Selçuk-Ortaklar-Aydın Road Project (Total Project Route Km:46+400)	Under construction	2013	2025	510,000,000 TL		
	Aydın	Söke-Koçarlı (Aydın-Çine) Divided Road Project (Total Project Route Km:42+300)	Under construction	2017	2024	503,000,000 TL		
	Aydın-Muğla	Didim (Akköy)-Milas Divided Road Project (Total Project Route Km:73+300)	Under construction	2017	2024	415,000,000 TL		
Railway	Aydın-Denizli	Alsancak-Eğirdir Line Between Aydın-Denizli II. Line Railway Project (Total: 135+250 Km; Removing 130+623 Km Existing Railway Line To Double Line And Construction Of 4+627 Km Double-Railed New Railways)	Under construction	2018	2023	824,000,000 TL		
	İzmir-Aydın-Denizli	Alsancak-Egirdir Line Between Selcuk-Aydın Line Railway Project (Km:44+086)	Under construction	2020	2023	395,000,000 TL		

Source: Ministry of Transport and Infrastructure Sectoral Projects (https://www.uab.gov.tr/projeler) and Transportation Projects (EIA Process completed) (https://eced-duyuru.csb.gov.tr/eced-prod/duyurular.xhtml)

As mentioned before, in the Cumulative Impact Assessment for the South Alternative, only the projects/activities/developments that have the potential to affect selected VECs are marked as “Yes” in the last column of Table 17.3. Cumulative Impact Assessment practices will be considered in accordance with the VEC-centered perspective. Since all transportation projects carried out in the past are currently in operation, there is no project to be considered “past” in this assessment. Projects in operation will be considered as existing projects within the scope of evaluation.

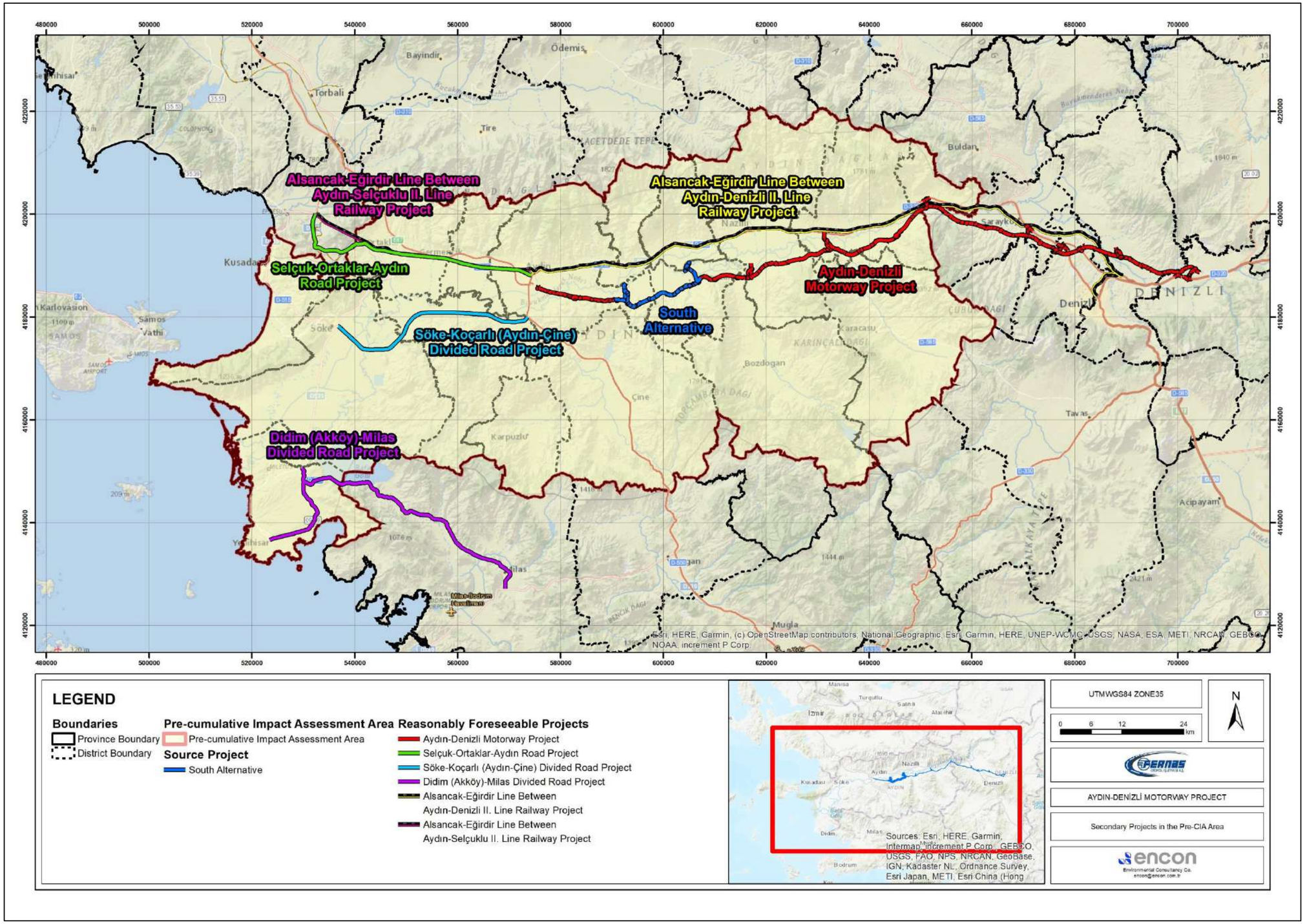


Figure 17.8 Secondary Projects in the Pre-CIA Area

Regarding the selection of Future Projects, the approach described in Step 2 of Section 17.1 ("Definitions, Methodology Assessment, and Data Sources") in this chapter has been adopted. In this context, projects that are under construction or in the design phase (as announced by the Ministry of Transport and Infrastructure) and that have the potential to affect selected VECs will be included in the evaluation as reasonably foreseeable projects. Projects to be included in the Pre-Cumulative Impact Assessment are listed in Table 17.4.

Table 17.4 Projects to be Included in the Pre-Cumulative Impact Assessment

Source Project (Project under Assessment)	**Reasonably Foreseeable Projects**
• South Alternative	• Aydın-Denizli Motorway Project (Km:0+000 and Km:15+856 / Km:34+630 and Km:140+650)
	• Selçuk-Ortaklar-Aydın Road Project (Total Project Route Km:46+400)
	• Söke-Koçarlı (Aydın-Çine) Divided Road Project (Total Project Route Km:42+300)
	• Didim (Akköy)-Milas Divided Road Project (Total Project Route Km:73+300)
	• Alsancak-Eğirdir Line Between Aydın-Denizli II. Line Railway Project (Total: 135+250 Km; Removing 130+623 Km Existing Railway Line To Double Line And Construction Of 4+627 Km Double-Railed New Railways)
	• Alsancak-Egirdir Line Between Selcuk-Aydın Line Railway Project (Km:44+086)

Within the scope of the cumulative impact assessment of the projects, the Aydın-Denizli Motorway Project and Alsancak-Eğirdir Line between Aydın-Denizli II. Line Railway Project are located within the corridor of 10 km in total, 5 km in the north and south directions of the South Alternative route, which was determined as the cumulative area of impact, and it is seen that the South Alternative route of this projects overlaps in certain parts. Therefore, this projects was included in the cumulative impact assessment studies. The map showing the secondary projects within the 10 km Cumulative Impact Assessment Area is given in Figure 17.9.

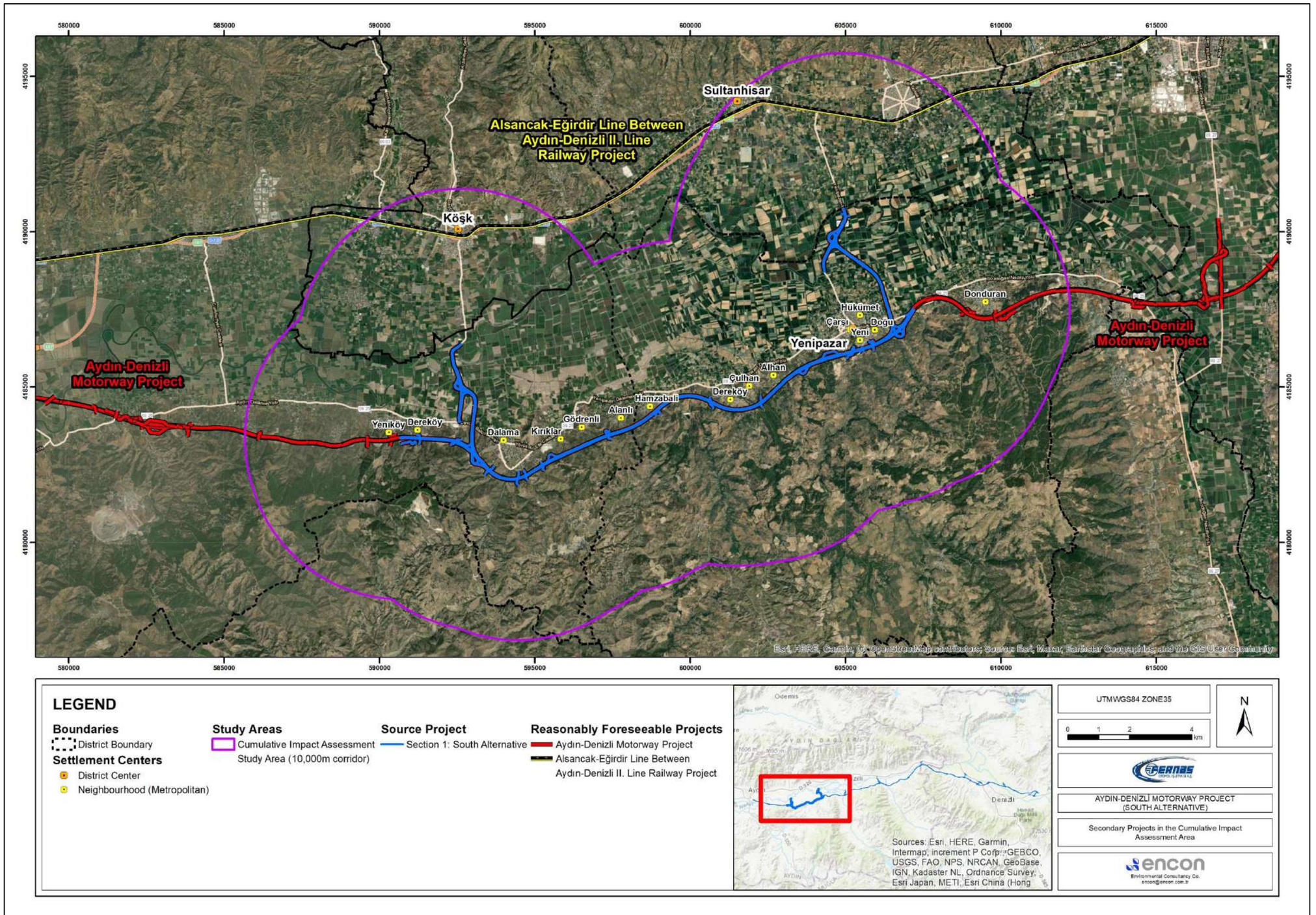


Figure 17.9 Secondary Projects in the Cumulative Impact Assessment Area

Step 3: Establish Information on Baseline Status of VECs

The baseline conditions for VECs to be evaluated in this study will be based on the information gathered for each environmental and social issue under the ESIA process. Relevant information on VECs is provided in the relevant sections of this ESIA Report.

Step 4: Assess Cumulative Impacts on VECs

The results of the evaluation of the cumulative impacts of the South Alternative on the selected VECs along with other projects/activities/developments identified in the region are summarized in Table 17.5. Evaluation is based on a qualitative approach. The interaction between the transportation projects and VECs covered in the Cumulative Impact Assessment is shown on the map in Figure 17.10.

Within the scope of the assessment, the cumulative impact potential on the VECs was evaluated by considering the ***"Alsancak-Eğirdir Line Between Aydın-Denizli II. Line Railway Project (Total: 135+250 Km; Removing 130+623 Km Existing Railway Line To Double Line And Construction Of 4+627 Km Double-Railed New Railways)"*** and ***"Aydın-Denizli Motorway Project (Km:0+000 and Km:15+856 / Km:34+630 and Km:140+650)"*** affecting the South Alternative.

In this context, the potential for cumulative impacts on each VEC has been classified as none, low, medium or high depending on the criteria described below:

- None; if the VEC will only be affected by the South Alternative;
- Low; if VEC will be affected by only 1 other project in addition to the South Alternative;
- Medium; if VEC will be affected by 2 more projects in addition to the South Alternative;
- High; if the VEC will only be affected by 3 or more projects in addition to the South Alternative.

As can be seen from the assessment, there are two projects interacting with the South Alternative and there is a VEC that causes a "medium" cumulative impact potential.

It should be noted that the assessment is limited to the level of technical knowledge currently available to practitioners of this Cumulative Impact Assessment. For example, if there are surface and underground components of railway/rail system projects, they could not be reflected in the evaluation. In addition, the assessment is based on currently known routes, so any changes to projects' route could change the impact status of VECs.

Table 17.5 Interaction of Projects with Selected VECs

VECs				Source Project	Future Projects / Reasonably Foreseeable Projects	Cumulative Impact Potential
Forest Areas						
South Alternative	Aydın	Efeler				Medium
		Yenipazar				Low
Agricultural Lands						
South Alternative	Aydın	Efeler				Medium
		Yenipazar				Low
Cultural Heritage Sites						
South Alternative	Charity Cube					None
	Aqueducts					None
	Martyrdom and Prayer Room					None
	Archaeological Items					None
	Aqueducts					None
	3rd Degree Archaeological Site					None
	Archaeological Site and Structural Elements					None
	Orthosia Ancient City					Low
Local Communities						
South Alternative	Aydın	Efeler	Yeniköy			Low
			Dereköy			None
			Dalama			None
			Kırıklar			None
			Gödrenli			None
			Alanlı			None
		Yenipazar	Hamzabali			None
			Dereköy			None
			Çulhan			None
			Alhan			None
			Yeni			None
			Çarşı			None
			Doğu			None
			Hükümet			None
			Donduran			Low

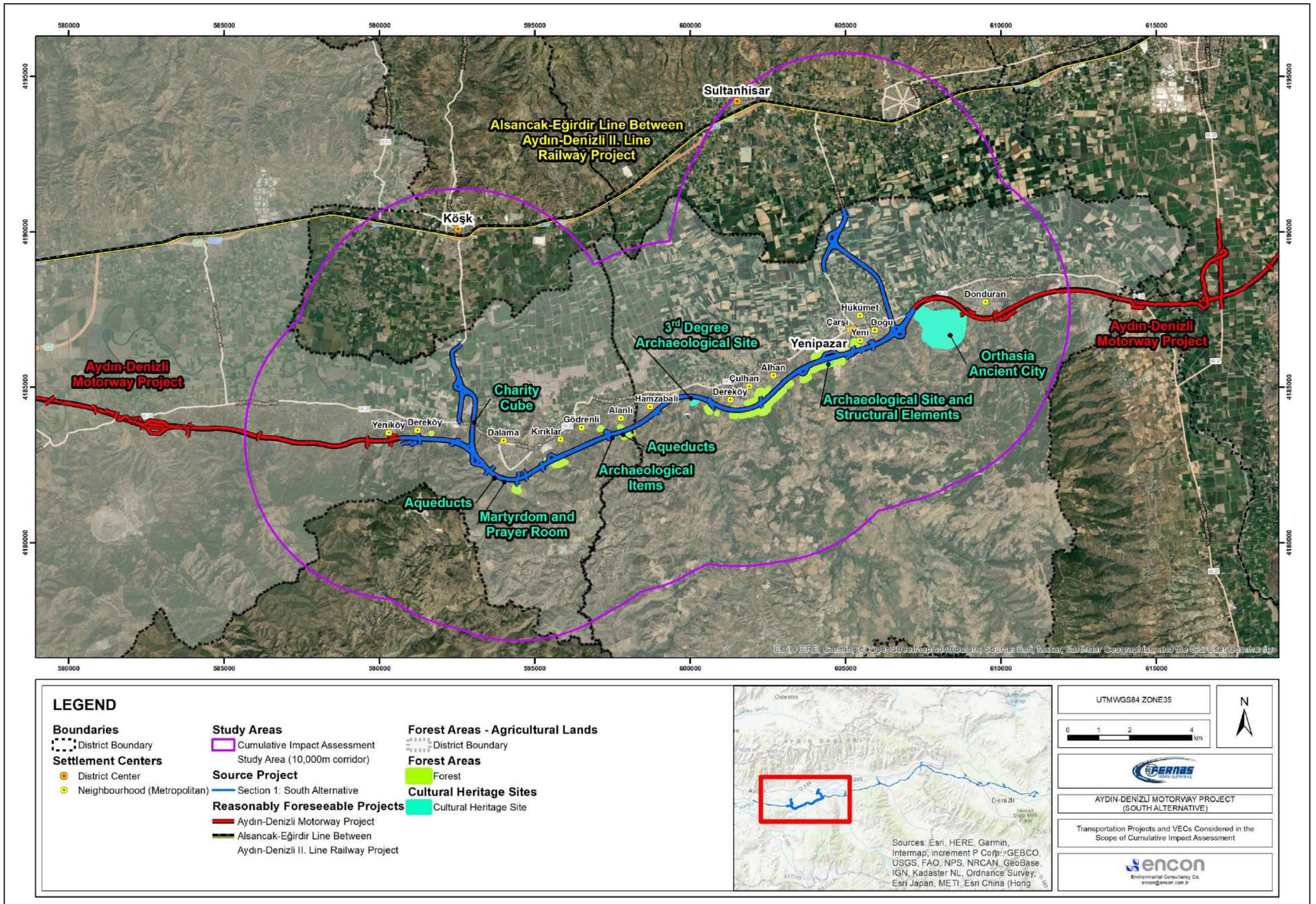


Figure 17.10 Transportation Projects and VECs Considered in the Scope of Cumulative Impact Assessment

Step 5 and Step 6: Assess Significance of Predicted Cumulative Impacts and Management of Cumulative Impacts – Design and Implementation

Table 17.6 lists VECs with low, medium, or high cumulative impact potential (as assessed in Step 4). The significance of the cumulative impacts was then determined according to the criteria given in Table 17.1.

Among VECs assigned to medium and low cumulative impacts; forest area and agricultural lands in Aydın province Efeler and Yenipazar districts are under the stress of more than one activity. Orthasia Ancient City are within the scope of more than one project. Aydın-Denizli Motorway route; Orthasia Ancient City passes through near the protection boundaries.

There are no sensitive habitats and protected areas on the route of the South Alternative. Similarly, sensitive habitats and protected areas are not included in other projects. Therefore, the cumulative impacts on this legally protected area are identified as none. However, cooperation with relevant authorities is essential and route and project optimization may be required to avoid/minimize cumulative impacts. Cumulative impacts on most settlements will be of local importance, but a few settlements will be under the special influence of more than one project. E.g.; as settlements are stuck between the infrastructure of two linear transportation projects (for example, where the railway route passes from the south and the motorway route passes from the north of the settlement).

Table 17.6 Significance of Potential Cumulative Impacts

VECs				**Cumulative Impact Potential**	**Significance of Cumulative Impact**
Forest Areas					
South Alternative	Aydın	Efeler		Medium	Moderate
		Yenipazar		Low	Moderate
Agricultural Lands					
South Alternative	Aydın	Efeler		Medium	Moderate
		Yenipazar		Low	Moderate
Cultural Heritage Sites					
South Alternative	Charity Cube			None	Minor
	Aqueducts			None	Minor
	Martyrdom and Prayer Room			None	Minor
	Archaeological Items			None	Minor
	Aqueducts			None	Minor
	3rd Degree Archaeological Site			None	Minor
	Archaeological Site and Structural Elements			None	Minor
	Orthosia Ancient City			Low	Moderate
Local Communities					
South Alternative	Aydın	Efeler	Yeniköy	Low	Minor
			Dereköy	None	Minor
			Dalama	None	Minor
			Kırıklar	None	Minor
			Gödrenli	None	Minor
			Alanlı	None	Minor
		Yenipazar	Hamzabali	None	Minor
			Dereköy	None	Minor
			Çulhan	None	Minor
			Alhan	None	Minor

VECs				Cumulative Impact Potential	Significance of Cumulative Impact
			Yeni	None	Minor
			Çarşı	None	Minor
			Doğu	None	Minor
			Hükümet	None	Minor
			Donduran	Low	Minor

Since cumulative impacts result from the actions of more than one stakeholder, responsibility for the management of these impacts encompasses all stakeholders. It is important that individual development requires individual actions to eliminate or minimize their contribution. The measures to be taken to minimize the impacts at the project level within the scope of South alternative have been explained in the previous sections of this Supplementary ESIA Report.

It is recommended that, the following specific actions that may be necessary to effectively manage cumulative impacts. Implementation of these measures will only be possible with the understanding, support and approval of the Ministry of Transport and Infrastructure as the owner of transport infrastructure projects and cooperation with other relevant planning and permitting authorities:

- Project design changes (location, timing, technology) to avoid cumulative impacts;
- Project mitigation to minimize cumulative impacts, including adaptive management approaches to project mitigation;
- Mitigation of project impacts by other projects (not under control of the proponent to further minimize impacts on VECs);
- Collaborative protection and development of regional areas to preserve biodiversity;
- Collaborative engagement in other regional cumulative impact management strategies;
- Participation in regional monitoring programs to assess the realized cumulative impacts and effectiveness of management efforts.

CHAPTER 18

ANALYSIS OF ALTERNATIVES

18. CHAPTER – ANALYSIS OF ALTERNATIVES

The project was put in the public investment program in 1994 by the former State Planning Organization with the number-91E040150. The preliminary projects and engineering services of the project were tendered in 1996, and final project reports were published in 2005 and 2007. Although the implementation of the project was tendered and the contracts were signed in 1998, the contracts were canceled due to the financing problems (credit supply for the project), and the project was excluded from the investment program in 2001.

The implementation of the project (for which an EIA positive decision was taken in 2017) was tendered out in the framework of the BOT model in July 2020. Following the signing of the BOT Contract, FOIAS has continued route, and project optimization and design work in cooperation with KGM and other related state authorities. For the South Alternative, Project Sponsor has an official letter from the related Aydın Provincial Directorate of the MoEUCC via KGM that, South Alternative is "out of the scope of the EIA Regulation", dated 27.04.2022.

As explained above, throughout the project history, the alternative routes were evaluated from a technical and economic point of view. In the following paragraphs, the criteria that affected the route selection during the feasibility and tender stages and optimization of the route in the scope BOT Contract are explained.

18.1 Route Selection

Route selection for the ADMP has been made in two stages. The first stage included the selection of the route by the KGM during the feasibility and tender stages. Following the BOT tender and appointment of the related company, Project Sponsor has conducted further work to optimize the route and the locations, numbers, and/or lengths of the road structures such as viaducts, interchanges, overpasses, underpasses, culverts, etc. to achieve the most suitable design in terms of technical, environmental and economic considerations. Any revision proposed by the Project Sponsor is subject to the approval of the KGM. Subsequently, at the construction phase of the ADMP, KGM, as the owner of the project, has submitted an order for a design change of the main carriageway between Km 15+856 and 34+630 in Section 1 ("South Alternative").

In the selection of the route by KGM at the feasibility and tendering stages, the following environmental, social, and economic criteria were taken into consideration to the extent the specified physical and geometric standards of the motorway specifications allowed:

- Avoidance of impacts on legally protected areas, including cultural heritage sites;
- Avoidance and/or minimization of impacts on ecologically sensitive forests;
- Avoidance and/or minimization of the crossing of residential and industrial areas;
- Keeping sufficient distance to the borders of the residential areas to the extent possible;
- Avoidance and/or minimization of the impacts on essential water resources (rivers, lakes, reservoirs, ponds, etc.) and their protection areas where available;
- Integration with existing transportation infrastructure so that the existing traffic loads/problems can be mitigated and potential needs of future industrial and residential developments;
- Geotechnical/geological conditions/risks (i.e., landslide sites, hills, seismicity)
- Minimization of the expropriation costs;
- Minimization of construction costs (i.e., need for soil works, optimized number and length of viaduct etc. requirements, costs for access roads);
- Operation costs (i.e., fuel, amortization, workforce losses, etc.);
- Interaction potential with existing infrastructure (e.g., energy transmission lines, water supply/distribution, sewerage system, oil and gas pipelines, water channels, telecommunication lines, railways, etc.);
- Local climate conditions that may affect winter maintenance and operation of the Motorway;
- Existing and planned zoning plans within the municipality borders.

Optimization of the Route in terms of Cultural Heritage Sites

As explained in Chapter 13, the “archaeological and immovable cultural assets” are regarded as one of the most critical high-risk groups which will be adversely affected by the South Alternative. The risk is not only attributed to the construction activities but other adverse effects such as vibration due to traffic during the operation phase.

With the participation of the relevant Museum Directorate, a field walking had been organized by Project Sponsor to understand the archeological background of project RoW. In this context, the existing and new sites and tangible assets were classified and relevant mitigation measures have been taken. The following section summarizes the findings and the relevant measure to be taken.

- ***Charity Cube***

Charity Cube, which is located on the access road of Yörük Ali Efe Interchange at Km 19+700, was registered by the Board for Conservation of Cultural Assets in 2011 and remains under a fill section of the motorway (see Figure 18.1). The survey and relocation project prepared for the relocation of the building was submitted to the Board for Conservation of Cultural Assets and the relevant study was approved. It is planned to be moved within the boundaries of expropriation area within the appropriate time.

Figure 18.1 Charity Cube (Km 18+000)

- ***Aqueducts***

Two aqueducts at Km 23+700 were identified by the Board for Conservation of Cultural Assets during on-site examination (see Figure 18.2). Retaining wall project prepared for the area and was submitted to the Board for Conservation of Cultural Assets and the relevant study was approved.

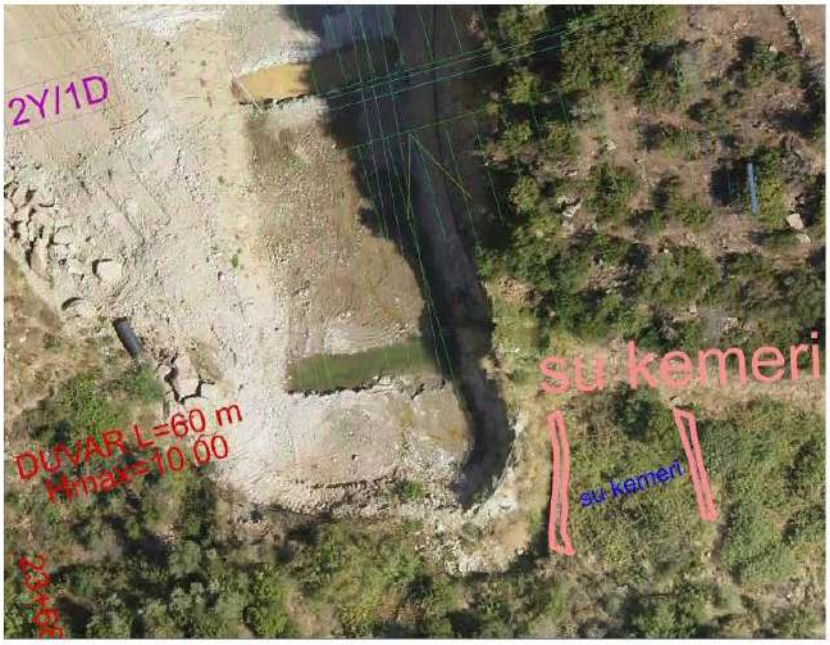


Figure 18.2 Aqueducts (Km 23+700)

- ***Orthosia Ancient City***

The ancient city at Km 33+150 is declared to be Degree 1 and 3 Archaeological Site according to the decree of the Board for Conservation of Cultural Assets dated (see Figure 18.3).

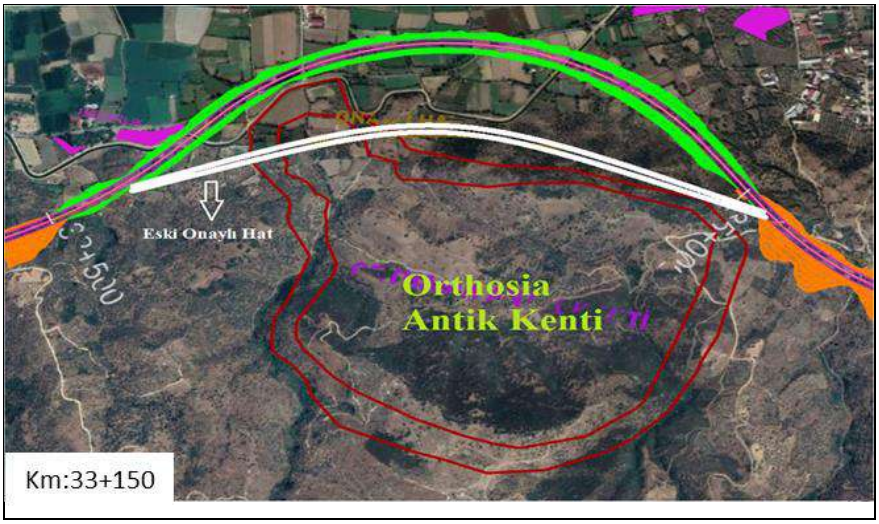


Figure 18.3 Orthosia Ancient City (Km 33+150)

Optimization of the Route and Project Design in the scope of BOT Contract (by Appointed Company with the Approval of KGM)

Following the finalization of the tendering stage, the Project Sponsor's design team has continued the optimization studies along the South Alternative.

The comparative demonstration of the South Alternative's route at the tender stage and the current route is shown in Figure 18.4.

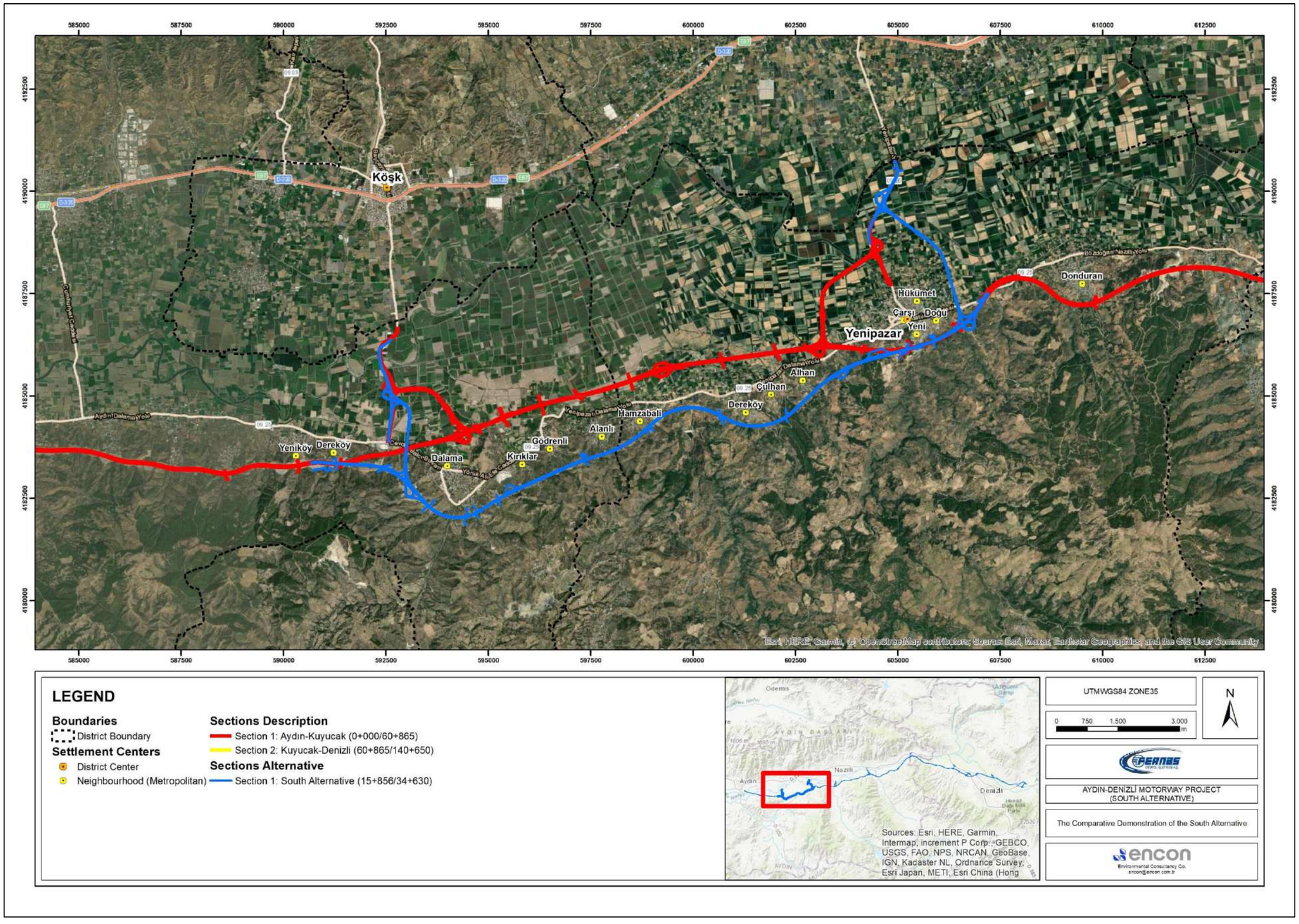


Figure 18.4 The Comparative Demonstration of the South Alternative

18.2 Motorway Design

Motorways are access-controlled highways with two or more traffic lanes in each direction and provide an uninterrupted flow. A median and collection of tolls that separate opposing traffic are performed at designated points. Some of the ideal design conditions for the motorways are specified in the Highway Capacity Manual 2000 (HCM 2000) as follows (*KGM, August 2010*):

- The maximum capacity for each traffic lane shall be 2.400 passenger vehicles/hour;
- The minimum width of each traffic lane shall be 3,6 m;
- Speed of the free flow shall be 100 km/hour or more;
- Distance between interchanges shall be 3 km or more;
- Terrain shall be completely flat.

South Alternative has been designed in accordance with the KGM's technical specifications for motorways. The design speed for the motorway has been determined as 120 km/hour along the main carriageway, while the design speed for the access roads will be 100 km/hour. In the current design, the width of the lanes is 3.75 m, whereas the lane width drops to 3.50 m on the access roads. The number of the traffic lanes will be 2x3 in all sections along the main carriageway. On the other hand, the number of traffic lanes for access roads will be 2x2.

In the South Alternative, siting the route on flat terrain has been the priority to the extent feasible, however, where the environmental and/or social (i.e., topography, geology, geotechnics, ecological sensitivities, important water bodies, protected areas, cultural heritage sites, etc.) conditions did not allow, road structures such as viaducts, bridges, overpasses, underpasses, etc. have been added to the design to cross non-flat terrains.

18.3 No Project Alternative

The urbanization rate of the Aegean region is high. As a result of the rapid population growth, which brings together an increased number of vehicle ownership, traffic problems (i.e., chronic congestion, frequent traffic jams) occur in the peak hours of the traffic, especially in the large cities. Therefore, there is always an intense demand for transportation both throughout and to the region. ADMP aims to facilitate and accelerate transportation in the area in the most efficient way possible. The primary aim of the ADMP is to ensure the provision of comfortable transportation services by means of balancing the intense traffic stress that prevails on the existing road transportation infrastructure of the Aegean Region, and hence provide a transit corridor (i.e., for freight transportation) that bypasses the busy city centers and enable connection of the roads between Aydın province and Denizli province in the region.

As a result of the anticipated reduction in the current traffic density due to the shift of a particular part of the vehicles to the new motorway route, the vehicle speeds on the existing arteries would increase, resulting in reduced fuel consumption rates, reduced air, and noise emissions and reduced time and workforce losses. In return, the vehicles that will move to the new motorway will be another source of fuel consumption, air and noise emissions, and road accidents. Still, the rates would be different compared to the existing roads as the design speed, and geometric standards of the Aydın-Denizli Motorway will be more advanced.

The new motorway is anticipated to cause a decrease in the number of traffic accidents. In the scope of the assessment of the benefits to be created as a result of the reduced number of casualties, it has been assumed that the accident rates will drop by 25% with the construction and operation of the Aydın-Denizli Motorway. Benefits such as reduced material damage and associated costs for repairers and reduced number of accidents ending up with deaths or severe injuries would be gained from the construction and operation of the Aydın-Denizli Motorway.

As the physical and geometric standards of the existing arteries and the Aydın-Denizli Motorway are similar, no considerable change/benefit could be identified in the vehicle operating costs due to the assessments done through Highway Development and Management Tool. Nevertheless, time, workforce, and fuel savings would be made as a result of the improvement of the traffic flow conditions.

As stated before, during the construction phase, considering the demands of local administrations and the local public mainly, the motorway should pass outside the fertile agricultural lands and settlements, a large-scale design changes have been made by KGM, as horizontally and vertically by the alternative route studies for a specific section of the motorway, which might bring changes in the existing project components of said section and thus environmental and social impacts. Also two interchanges have been redesigned.

The Aydın-Denizli Motorway Project is almost complete except for the South Alternative section and if the South Alternative project is not implemented as it is part of the ADMP, all the work done/to be done will have been wasted.

If the South Alternative is not constructed, the potential environmental and social impacts identified and assessed in this Supplementary ESIA Report would not be created. In this scenario, the changes foreseen on the land use character (i.e., forest, agricultural) and habitat types along the planned motorway route would not occur.

The socio-economic impacts on local communities due to land expropriation would not be realized in the "No Project" alternative. At the same time, local people would not benefit from expropriation compensation or employment opportunities.

There would be no additional emissions along the new motorway route as there would be no shift from existing arteries to the new motorway route. In contrast, there will be no improvement on existing roads and emissions will intensify as existing traffic problems are expected to increase.

CHAPTER 19

PUBLIC CONSULTATION

19. CHAPTER – PUBLIC CONSULTATION

19.1 Introduction

According to the current design the South Alternative has a length of 26 km, including the main carriageway and access roads. Table 19.1 provides the actual design of the South Alternative that formed the basis of assessments.

Table 19.1 The Actual Design of the South Alternative that Formed the Basis of Assessments

Section	Name	Location		Length (Km)		
		Start	End	Main Road	Access Road	TOTAL
Section 1	South Alternative	Km 15+856	Km 34+630	18.774	7.242	26.016

Ministry of Transportation and Infrastructure (MoTI), General Directorate of Highways ("KGM" or "the Administration"), as the owner of the ADMP, has tendered for a contract in July, 2020 in accordance with the Law on Implementation of Some of the Investments and Services in the Framework of Build, Operate and Transfer Model (Law No: 3996). As a result of this tender, KGM has commissioned a special purpose entity (SPV) for the implementation of the Project under the related Build, Operate and Transfer (BOT) contract. In this regard, Fernas Group of Companies (Fernas Otoyol Işletmesi A.Ş. - FOIAS) has been awarded with a BOT Contract for the implementation of the ADMP.

In accordance with the terms of the BOT Contract signed between the KGM and the Project Sponsor, the ADMP includes financing, planning/design, building/construction, operation, full range of maintenance and repair works during the operation period and transfer of the motorway to the KGM at the end of the Contract Duration free from any debt or commitment and in a well-maintained, operating, in-service condition, without any charge. The rights of the Project Sponsor to operate maintain and repair the motorway will expire at the end of the Contract Duration.

FOIAS sought for potential financing for the ADMP, and granted the required finance from Ziraat Bankası, İş Bankası, Yapı Kredi Bankası and Akbank (four together, Lenders). To meet the environmental and social requirements of the lenders, who have required international environmental and social standards and guidelines to be adopted in the implementation of the projects that would be financed by them, a full-scale ESIA process has been completed for the ADMP in April, 2022.

However, after completion of the ESIA study, it was stated by the Project Sponsor that there was an order from Administration for a change in the route design which might bring changes in the existing project components of the route and so that environmental and social impacts. Thus, this Supplementary ESIA study has been conducted for the South Alternative in the scope of SLIP.

19.2 Regulatory Requirements

19.2.1 National Requirements

Environmental Law, which is ratified in August 1983, is one of the principal legislation related to the project. Several by-laws and decrees are enforced under the Environmental Law. According to the repealed Environmental Impact Assessment Regulation (Official Gazette date: November 25, 2014, Number: 29186) defines the administrative and technical procedures and principles to be followed throughout the Environmental Impact Assessment (EIA) process. When an activity (a Project) is planned, the Project developer is responsible for preparing an EIA report along with many other permits required to realize the Project. However, facilities are subject to the preparation of an EIA Report depending on the type of the facility, its capacity, or the location of the activity. The activities that are subject to the provisions of the Environmental Impact Assessment Regulation are listed in Annex 1 and Annex 2 of the Regulation. For Annex 1 activities a full EIA report is required and those Projects go through the full EIA process. Since the project is included in the Annex 1 list of the Turkish EIA legislation, the required EIA report was completed in January 2017 and approved by the Ministry of Environment, Urbanization and Climate Change (MoEUCC) on February 2017. EIA report is still valid as per the new EIA Regulation published in the Official Gazette dated July 29, 2022 and numbered 31907.

The main Turkish Regulation requiring public consultation and stakeholder engagement for development/investment/infrastructure projects is the Environmental Impact Assessment Regulation. The 1st Clause of the 9th Article of the Turkish EIA Regulation defines the stakeholder participation process. In accordance with the related article, it is the legal responsibility of a project owner to organize an official Public Participation Meeting for the Projects that are included in Annex 1 of the Regulation (as the case in the EU EIA Directive).

Turkish national policy on protection of environment, cultural heritage and conservation of biological resources has been constituted on the base of relevant international agreements that Türkiye has signed or ratified.

19.2.2 International Requirements and Standards

19.2.2.1 Related Equator Principles IV

Principle 5: Stakeholder Engagement

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.

Principle 6: Grievance Mechanism

For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the Environmental and Social Management System, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user.

The proposed project is intended to meet applicable international standards. This document and SEP (see Annex 9 – Stakeholder Engagement Plan) has been prepared in accordance with the guidance of the applicable IFC Performance Standards.

Where a project and a Project Owner receives project financing from IFC, or another financial institution adopting IFC requirements, IFC Performance Standards must be applied for the duration of that project finance. As of 1 January 1th, 2012, the following eight IFC Performance Standards are applicable to the Project as a whole:

19.2.2.2 IFC's Standards and Guidelines

Performance Standard 1:	Social and Environmental Assessment and Management System
Performance Standard 2:	Labor and Working Conditions
Performance Standard 3:	Pollution Prevention and Abatement
Performance Standard 4:	Community Health, Safety and Security
Performance Standard 5:	Land Acquisition and Involuntary Resettlement
Performance Standard 6:	Biodiversity Conservation and Sustainable Natural Resource Management
Performance Standard 7:	Indigenous Peoples
Performance Standard 8:	Cultural Heritage

Performance Standard 1[1] specifically relates to stakeholder engagement on the basis that it establishes the importance of: (i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) management of social and environmental performance throughout the life of the Project. The objectives of this standard are as follows[2]:

- To identify and assess social and environment impacts, both adverse and beneficial, in the Project's Area of Influence;
- To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment;
- To ensure that affected communities are appropriately engaged on issues that could potentially affect them; and
- To promote improved social and environment performance of companies through the effective use of management systems.

To meet these objectives, a Stakeholder Engagement Plan (SEP) is designed to guide stakeholder consultations leading up to and during the period of the Supplementary ESIA studies, as well as during the further stages of project implementation, i.e. excavation, construction and operation (see Annex 9 – Stakeholder Engagement Plan).

19.3 Public Consultation Meetings

Within the scope of the EIA studies, two public consultation meetings were held alongside the route. The aim of the public participation meeting is to inform people who may be potentially affected about the Project and to understand their concerns, opinions and suggestions about the project. This process is the only formal requirement for stakeholder participation according to Turkish legislation.

[1] PS1 is specifically relevant, because it contains clear requirements for community engagement, disclosure of information and consultation. These requirements are the main concerns of this Chapter.
[2] IFC Performance Standards, January 2012.

A more comprehensive program of Public Consultation Meetings (PCMs) was held in February 2022 in the scope of the Aydın Denizli Motorway Project ESIA Studies. As a part of this program, 5 PCMs were held along the entire motorway route between Efeler district of Aydın province and Pamukkale district of Denizli province.

In the scope of the Supplementary ESIA Studies for South Alternative, 2 Public Consultation Meetings (PCMs) were held along the motorway route between Efeler and Yenipazar districts. Selection of the PCM locations is completed during the scoping stage of the Supplementary ESIA process based on the findings of the key informant questionnaires and focus group meetings conducted in the region by the social expert team of the project. As known, the South Alternative has a length of 26 km, including the main carriageway and access roads. Thus, it would not be possible to organize meetings in every settlement within the study area, the selection of settlements where public consultation meetings are planned aims to identify a meeting location every 10 km (plus - minus 5 km) along the route to ensure that the meeting location is as accessible as possible for local people from surrounding settlements.

Principally, local neighborhood teahouses were preferred as the meeting venue, where they have the proper capacity and physical conditions due to the fact that participation levels have been generally higher in such local venues in the previous experiences. On the other hand, due to seasonal conditions, meetings have been held open-air.

First Public Consultation Meeting (PCM) was held in Gödrenli (Efeler, Aydın) on 22.08.2023. Approximately 45 people attended the meeting including officials of the relevant official institutions and the local people. The Second Public Participation Meeting was held in Dereköy (Yenipazar, Aydın) on 23.08.2023. Approximately 35 people attended this meeting. During the meetings, presentations were made to inform the public about the project. After the presentations, the questions asked by the local people about the project were answered by ENCON, FOIAS and KGM 2nd Regional Directorate officials. These issues were generally about the project route, noise, air quality, the private properties on the route and the views of the owners of these properties. Valuation of the lands and other issues related to expropriation process were also the main topics discussed at these meetings.

The map of PCM locations is presented in Figure 19.1.

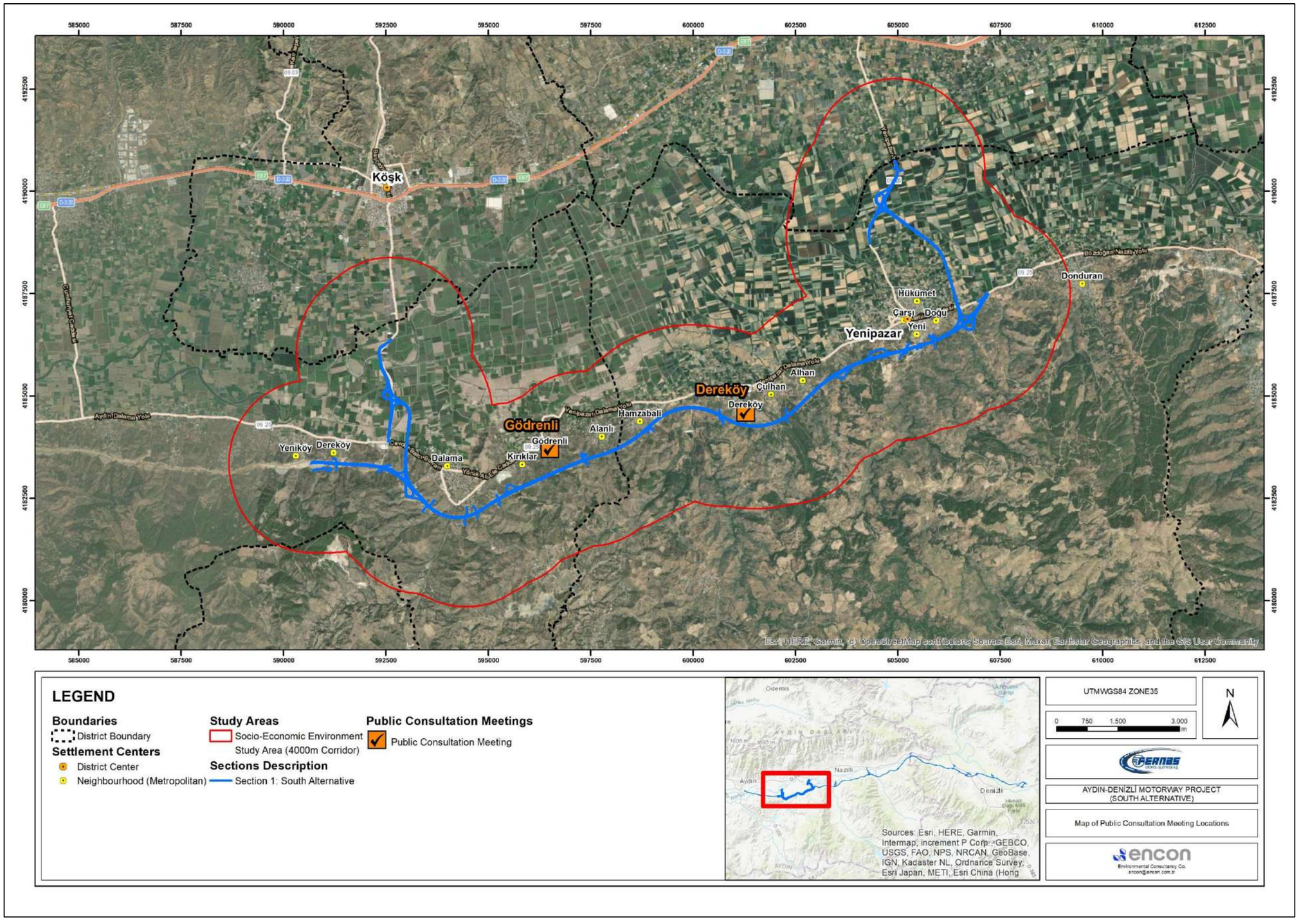


Figure 19.1 Map of Public Consultation Meeting Locations

Settlements included as PCM locations to this planned Road Trip in order to get more comprehensive and inclusive approach towards stakeholders. In the selection of the settlements the following criteria were considered.

- Distance between the settlements and the project components;
- Population of the settlements;
- Effects of the project on livelihoods such as agricultural and pasture lands and business;
- Sensitivity to environmental impacts;
- Land acquisition impacts;
- Cumulative impacts potential;
- Level of impacts on infrastructures such as access roads, power supply etc.;
- Cultural and social aspects of the settlements;
- Economical condition of the residential place;

The public consultation activities planned within the scope of the Supplementary ESIA Studies are given in Table 19.2.

Table 19.2 Consultation Activity/Method/Timing

Activity	Method	Timing
Field Study	Key informant interviews, focus group discussions etc.	July, 2023
Road Trip	Two Public Consultation Meetings alongside the motorway route	August, 2023

Prior to PCMs several information methods were used to inform the related public authorities, neighborhood headmen and local people, local media agencies. Moreover, a list demonstrating when and with which communication method was established a contact with the mukhtars of the project affected locations is shown in Table 19.3.

Table 19.3 Stakeholder Notification Methods for Public Participation Meetings

Stakeholder Group	Shared Project Documents	Means of Notification
Governorship of Aydın	Program of Meetings	Official Letter
Dereköy Neighborhood	Project information Brochure	Visit / Newspaper Announcement
Dalama Neighborhood		Phone Call / Newspaper Announcement
Kiriklar Neighborhood		Phone Call / Newspaper Announcement
Gödrenli Neighborhood		**Visit / Official Letter / Newspaper Announcement**
Alanlı Neighborhood		Phone Call / Newspaper Announcement
Hamzabali Neighborhood		Phone Call / Newspaper Announcement
Dereköy Neighborhood		**Visit / Official Letter / Newspaper Announcement**
Çulhan Neighborhood		Phone Call / Newspaper Announcement
Alhan Neighborhood		Phone Call / Newspaper Announcement
Carşı Neighborhood		Phone Call / Newspaper Announcement
Yeni Neighborhood		Phone Call / Newspaper Announcement
Hükümet Neighborhood		Phone Call / Newspaper Announcement
Doğu Neighborhood		Phone Call / Newspaper Announcement

During the information process in advance of the PCMs, initially, an announcement was published in a local newspaper on August 10th, 2023, which is provided in Figure 19.2. In addition, relevant provincial governorate was informed of the program by means of an official letter, which is provided in Figure 19.3.

Following the information process, PCMs for the South Alternative were conducted on August 22nd – 23rd, 2023 at Gödrenli (Efeler, Aydin), and Dereköy (Yenipazar, Aydın) neighborhoods. Organizational details of the meetings are summarized in Table 19.4. Moreover, a Project Information Brochure have been prepared and delivered to neighborhood headmen and participants prior to the meetings. Information documents used in the overall process are provided in Figure 19.4 and Figure 19.5.

The meetings were held with the participation of representatives of Project Sponsor (senior officials and technical project team members including design and expropriation), the Independent Environmental and Social Impact Assessment (ESIA) Consultant (ENCON Environmental Consultancy Co.), representatives of design and expropriation consultant of KGM (EMAY), and authorities from 2nd Regional Directorate of KGM.

The Independent ESIA Consultant performed the moderation of the meetings. The meetings started with an introduction and explanation of the purpose and scope of the meeting and followed by a presentation demonstrated by the Independent ESIA Consultant and a final discussion session where questions, concerns, and suggestions were received and responded. The main topics covered in the presentations were as follows:

- What is the Aydin - Denizli Motorway Project and South Alternative?
- Who are the Project Owner and the Project Sponsor?
- What are the Anticipated Benefits of the Project?
- What is the Environmental and Social Impact Assessment Process?
- Stakeholder Engagement: How to Participate into the Process?
- Discussion (Questions and Answers)

Table 19.4 Organizational Details of the Public Consultation Meetings conducted in Aydın Province

PCM No	District	Neighborhood	Population	Km Chainage	Date	Time	Venue	Number of Participants
1	Efeler	Gödrenli	336	Km 21	22.08.2023	11:00	Gödrenli Neighborhood Teahouse	About 45
2	Yenipazar	Dereköy	404	Km 27	23.08.2023	11:00	Dereköy Güven Neighborhood Teahouse	About 35

The presentation template used during the PCMs is provided in Figure 19.6. In addition the presentation, the large-scale (in A0 format) map showing the South Alternative in each meeting were posted on the walls of the meeting venue since people can inspect the route. As a result of the information efforts, participation levels were as expected, especially at the meetings held at local neighborhood teahouses. Attendance of different parties, including state officials or adjacent neighborhoods (significantly), was achieved as summarized in Table 19.5. A participation list was not kept at the meeting.

Table 19.5 Summary of Participants Profiles

PCM No	Meeting Location	Adjacent Neighborhoods from which Representatives (Headmen or Local People) had Participated in the Meeting	Other Parties Participated in the Meeting (Public Authorities, Media, etc.)
1	Gödrenli	Kırıklar, Alanlı, Hamzabalı	Local business owners
2	Dereköy	Alhan, Çulhan, Çarşı	Local business owners

Each meeting lasted approximately one hour, as expected. Following the official meeting durations, questions of the participants were continued to reply at the unofficial conversations in the open air. Photographs taken during the meetings are presented in Section 19.4.2.

The participants' questions, issues, concerns, and suggestions during the PCMs are provided in Table 19.6.

Table 19.6 Summary of the PCM Findings for the South Alternative

PCM No	Party who Raised the Question/ Issue/Concern/ Suggestion	Category	Sub-category	Question/Issue/Concern/Suggestion Raised	Response of Project Sponsors/Environmental Consultant
Aydin, Efeler, Gödrenli Neighborhood (22.08.2023)					
1.1	Participant*	Socio-economy	Construction Impact/ Infrastructure	It was asked that whether the existing fountains would be reconnected after the construction process.	It was stated that after the completion of the construction phase, the fountains will be reconnected.
1.2	Participant*	Socio-economy	Urgent Expropriation Construction Impact	There are some of the parcels which expropriation payments have been partially paid yet. Information about when the remaining payment will be made was requested.	The main framework of Expropriation Law and the Urgent Expropriation process were explained. It has been stated that the amounts received do not reflect the entire expropriation value, since the expropriation processes have not been completed at the moment, and that the price will reach a reasonable amount at the end of the process.
1.3	Participant*	Socio-economy	Urgent Expropriation Construction Impact	It was asked the centuries-old trees in the pasture belonged to participant's family and whether they could receive product price/compensation	It was stated that legally they do not have rights regarding the centuries-old trees in the pasture, but compensation/product price can be paid if a registration letter is obtained from the Provincial Directorate of Agriculture.
1.4	Headmen of Gödrenli Neighborhood	Socio-economy	Urgent Expropriation Construction Impact	There are a few trees that are outside the expropriation corridor. These trees are currently not accessible. The condition of the trees was asked.	Within the scope of the project, it was informed that a field crossing roads would be provided and trees would be accessible.
1.5	Participant*	Environment	Construction and Operation Phase Impact	It was asked whether noise-preventing measures would be taken.	It was stated that noise measurement studies were implemented throughout the project and that the noise barrier method would be applied if necessary after KGM's approval.
1.6	Resident of Gödrenli Neighborhood	Socio-economy	Construction Impact	It was stated that there were deformations on the existing roads used, and it was asked if remediation would be made.	It was stated that the remediation are being made to existing roads and will be made again if the deformations are repeated.
1.7	Resident of Gödrenli Neighborhood	Socio-economy and Environment	Traffic, Road Community Health and Safety	It was stated that the truck drivers working on the project were driving fast and carelessly. It was also stated that there was no change despite complaints. It was also stated that the heavy trucks had damaged the neighborhood roads and that truck traffic created a security problem in the neighborhood.	It was informed that truck drivers were first given a warning and if the complaint continued, their employment contract was terminated. However, it was also stated that this situation is not only about discipline and that public consciousness is needed. It was stated that relevant impacts are being considered in the ESIA studies. Local people have also been recommended to submit their complaints through Project's grievance/comment mechanisms so that they would be considered.
1.8	Participant*	Socio-economy	Construction Impact	There are 10-15 trees that need to be cut on the service roads. It was asked whether they could take it as wood when the trees were cut down.	It was stated that it depends on the locations of the trees whether they were in the expropriation corridor on not, and detail information was given about the expropriation corridor.
1.9	Resident of Gödrenli Neighborhood	Socio-economy	Construction Impact	It was demanded to spread the gravel on the field roads.	It was noted that gravel will be supplied for the field crossing roads.
Aydin, Yenipazar, Dereköy Neighborhood (23.08.2023)					
2.1	Resident of Dereköy Neighborhood	Environment	Road	It was stated that the vehicles were damaged due to the deformed roads.	It was stated that relevant impacts are being considered in the ESIA studies. Local people have also been recommended to submit their complaints through Project's grievance/comment mechanisms so that they would be considered.
2.2	Resident of Dereköy Neighborhood	Environment	Energy Transmission Lines	It was stated that the energy transmission line was destroyed and demanded that it be fixed.	Parcel numbers have been and contact details of related persons noted down for further evaluation and feedback.
2.3	Resident of Dereköy Neighborhood	Socio-economy	Expropriation	It was stated that due to the fact that half of the land is private and half is pasture, incomplete compensation was received.	The main framework of Expropriation Law and the Urgent Expropriation process were explained. In this context, it was stated that the expert determined the land prices, and the payments were made according to this determination. It was noted that the determined value was determined according to the data of the date when the expropriation case was filed. It was stated that legally they do not have rights regarding in the pasture, but compensation/product price can be paid if a registration letter is obtained from the Provincial Directorate of Agriculture.
2.4	Resident of Dereköy Neighborhood	Socio-economy	Construction Impact	It was stated that the motorway divides the olive groves and the living area, and it was asked whether there would be any underpass.	It was informed that under and overpasses, culverts and field crossing roads will be implemented within the scope of the project.
2.5	Resident of Dereköy Neighborhood	Environment	Afforestation	It was asked whether afforestation will be carried out within the scope of the project.	It was stated that afforestation works were carried out within the scope of the project.
2.6	Headman of Dereköy Neighborhood	Socio-economy	Construction Impact	It was stated that the roads were rough and the heavy truck drivers were driving fast. It was asked whether heavy tonnage truck drivers were psychologically tested.	It has been stated that the roads will be repaired. It has been stated that heavy truck drivers must have a SRC certificate in recruitment.
2.7	Resident of Dereköy Neighborhood	Environment	Construction and Operation Phase Impact	It was asked whether noise-preventing measures would be taken.	It was stated that noise measurement studies were implemented throughout the project and that the noise barrier method would be applied if necessary after KGM's approval.
2.8	Participant*	Socio-economy	Urgent Expropriation Construction Impact	There are some of the parcels which expropriation payments have been partially paid yet. Information about when the remaining payment will be made was requested.	The main framework of Expropriation Law and the Urgent Expropriation process were explained. It has been stated that the amounts received do not reflect the entire expropriation value, since the expropriation processes have not been completed at the moment, and that the price will reach a reasonable amount at the end of the process.

* Information about which neighborhood the participant lived in could not be obtained

The requests of the meeting participants to strengthen their participation in the process were recorded. In addition, other tools such as the grievance mechanism were mentioned in order to maintain the stakeholder engagement process more effectively.

During the Public Consultation Meetings, the meeting participants' suggestions and complaints have been handled as soon as possible within the scope of the project's grievance-suggestion mechanism. The feedback about the project has been examining and closing at an appropriate time.

19.4 Documents Related to the Public Consultation Meetings and Stakeholder Engagement Activities

Various documents and information tools were used within the scope of Public Consultation Meetings and Stakeholder Engagement Activities such as: brochures, invitation letters, newspaper announcements, presentations etc. These documents are presented under this section with pictures from the PCMs.

19.4.1 Information Documents

Information documents and evidences of the meetings that were used within the scope of Public Consultation Meetings are presented between Figure 19.6 and Figure 19.11.

HİZMETİ NORMALDE HERKES ALAMIYOR

Tırı ziyaret eden öğrencilerden Abdül Samet: "Uçak mühendisi olmayı düşünüyorum. Bu hizmeti normalde herkes alamıyor. O bakımdan bu hizmetin olması tabi ki çok faydalı" dedi.

SOSYAL MEDYADAN DUYDUK

Kardeşi için tercih tırına gelen İstanbul Üniversitesi Almanca Öğretmenliği mezunu Merve Bahar: "Belediyenin böyle bir hizmet sağlaması gayet güzel. Ben buraya kardeşim için geldim. Annem burayı sosyal medya üzerinden duymuş. Memnun kaldık. Da-

27 TEMMUZ
08 AĞUSTOS 20

AYDIN – DENİZLİ OTOYOLU PROJESİ HALKIN KATILIMI TOPLANTILARINA DAVET

Fernas Otoyol İşletmesi A.Ş. tarafından, Aydın – Denizli il sınırları içerisinde Yap – İşlet – Devret (YİP) modeli ile projelendirme ve yapım çalışmaları devam eden Aydın – Denizli Otoyolu Projesi" ne ait Güney Alternatifi için Çevresel ve Sosyal Etki Değerlendirmesi çalışmaları kapsamında halkı bilgilendirmek, görüş ve önerilerini almak, yatırım ve işletme dönemlerinde paydaşlar ile iş birliği tesis etmek üzere, planlanan otoyol güzergâhı üzerinde aşağıda detayları verilen "Halkın Katılımı Toplantıları" düzenlenecektir.

Halkımıza saygı ile duyurulur.

Toplantı Yerleri ve Tarihleri

BAĞLI İLİ/İLÇESİ	YER	TARİH	SAAT
Aydın / Efeler	Gödrenli Köy Kahvehanesi	22.08.2023	11.00
Aydın / Yenipazar	Dereköy Güven Köy Kahvehanesi	23.08.2023	11.00

Proje Sahibi : Fernas Otoyol İşletmesi A.Ş.
Telefon : +90 (256) 221 18 70
E – posta : bilgi@aydindenizliotoyolu.com.tr

ÇSED Raporu Hazırlayan Kuruluş : ENCON Çevre Danışmanlık Ltd. Şti
Telefon : +90 (312) 447 71 23

Resmi İlanlar Basın 1875039

Jandar

Nazill ma el turu yöneli opera şüphe turucu yapım nılan birlikt

ADL39

Figure 19.2 Local Newspaper Announcement

encon

ÇEVRE DANIŞMANLIK LTD. ŞTİ.

09.08.2023
Sayı: E23-017

KONU: Halkın Katılımı Toplantısı ilanının yayınlanması Talebi hk.

BASIN İLAN KURUMU
ANKARA ŞUBE MÜDÜRLÜĞÜ
ANKARA

"Fernas Otoyol İşletmesi A.Ş." tarafından projelendirme ve yapım çalışmaları devam eden "Aydın-Denizli Otoyolu, Güney Alternatifi Projesi" için Çevresel ve Sosyal Etki Değerlendirilmesi çalışmaları kapsamında 22.08.2023 tarihinde saat 11:00'de Efeler/Gödrenli, Köy Kahvesi'nde ve 23.08.2023 tarihinde saat 11:00' de Yenipazar/Dereköy, Güven Köy Kahvesinde "Halkın Katılımı Toplantıları" yapılacaktır.

Yazı ekinde yer alan toplantı davetine ait ilanımızın; **10.08.2023** tarihinde **Nazilli Adalet Gazetesi**'nde (yerel) yayınlanması hususunda gereğini arz ederiz.

Saygılarımızla,

encon
ENCON ÇEVRE DANIŞMANLIK LİMİTED ŞİRKETİ
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Ticaret Sicil No: 102979

ENCON Çevre Danışmanlık Ltd. Şti.

Ek:

1- Gazete İlanı

KALİTE YÖNETİM SİSTEMİ
ISO 9001
TÜRKAK
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Figure 19.3 Official Letter Sent to Aydın Governorate

(ÇSED) - ÇEVRESEL ve SOSYAL ETKİ DEĞERLENDİRMESİ ÇALIŞMALARI

Güney Alternatifi için ÇSED süreci başlamıştır. ÇSED raporunun tamamlanması sonrası yayınlanarak geniş bir paydaş topluluğuna sunulması planlanmaktadır.

Fernas Otoyol İşletmesi A.Ş., ÇSED çalışmasını yürütmek üzere ENCON Çevre Danışmanlık Ltd. Şti.'ni görevlendirmiştir. Bu çalışma kapsamında projenin çevre ve sosyal hayat üzerindeki olası etkileri tespit edilerek değerlendirilecek ve bu etkilere yönelik alınacak önlemler belirlenecektir.

ÇSED çalışmaları kapsamında daha detaylı olarak ele alınacak ve geliştirilecek olan çevresel ve sosyal tedbirlere ait bazı temel konular aşağıda özetlenmektedir:

- ✓ Mevcut arazi kullanımı
- ✓ Gürültü ve hava kalitesi
- ✓ İnşaat faaliyetleri nedeniyle oluşabilecek rahatsızlıklar
- ✓ İnşaat malzemelerinin temini ve atık bertarafı
- ✓ İşçi sağlığı ve iş güvenliği
- ✓ Doğal habitatlar ile bu habitatlarda bulunan hayvanlar ve bitki örtüsü
- ✓ Nehir ve dere geçişlerinde sucul alanlar ve su kaynakları
- ✓ Kültürel miras açısından önemli yerler ve bilinmeyen arkeolojik kalıntıların keşif potansiyeli

GÖRÜŞ BİLDİRME FIRSATI

Bir projeden etkilenebilecek ya da proje ve etkileri ile ilgilenen kurum ve şahıslarla (paydaşlar olarak anılmaktadır) projenin erken dönemlerinde iletişime geçmek ÇSED süreci için önem taşımaktadır. Paydaşlar arasında, ulusal ve yerel seviyede kamu kurum ve kuruluşları; çevresel, sosyal ve ekonomik konularla ilgilenen sivil toplum kuruluşları, projeden doğrudan etkilenebilecek kişiler ve daha geniş bir kamu kesimi yer almaktadır. Bu broşür, paydaş katılım sürecinin bir parçasıdır ve planlamanın erken döneminde mümkün olduğunca çok sayıda paydaşa yorum yapma fırsatı sunmak ve böylece öneriler geliştirilirken ve etki azaltma önlemleri tespit edilirken, onların görüşlerini de değerlendirmeye alabilmek ve Güney Alternatifi için ÇSED çalışmalarının başladığına dair bilgi vermek amacıyla hazırlanmıştır. Ayrıca proje ile ilgili yerel halkın görüşlerini almak amacıyla güzergah boyunca Halkın Katılımı Toplantıları düzenlenecektir ve bu toplantılarla ilgili detaylar medya araçları vasıtasıyla halka duyurulmuştur.

Görüş, öneri ve fikirlerinizi yerleşim birimlerinde bulunan şikayet ve öneri kutuları ve aşağıdaki kanallar vasıtası ile bize iletebilirsiniz.

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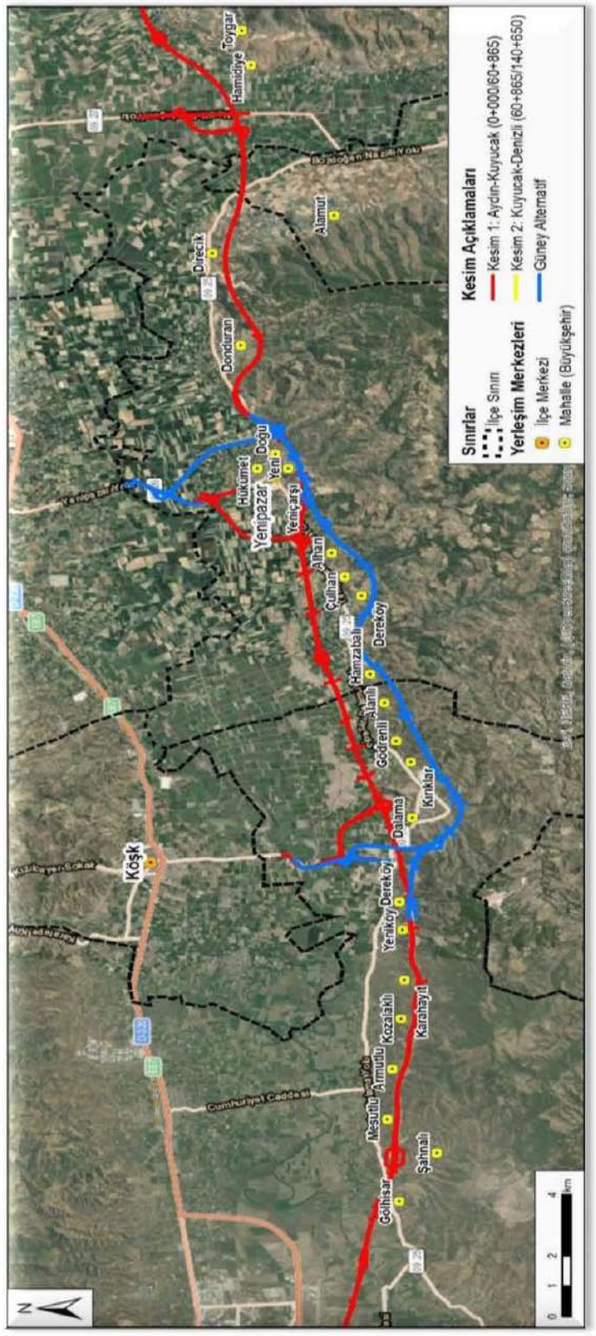
FERNAS OTOYOL İŞLETMESİ A.Ş.

AYDIN-DENİZLİ OTOYOLU

GÜNEY ALTERNATİFİ

Figure 19.4 Brochure distributed during PCMs



PROJE' NİN BİLEŞENLERİ NELERDİR?

- ✓ Viyadükler
- ✓ Kavşaklar
- ✓ Köprüler
- ✓ Altgeçitler
- ✓ Üstgeçitler
- ✓ Menfezler
- ✓ Gişeler
- ✓ Servis Alanları
- ✓ Bakım ve İşletme Merkezleri

PROJE HANGİ AŞAMADADIR?

Proje kapsamında kamulaştırma planları çıkarılmış ve belirli bölgelerde kamulaştırma çalışmalarına başlanmıştır.

İnşaat faaliyetlerine başlanmış ve ilgili kesimlerde şantiyeler kurulmuştur.

PROJE' NİN BEKLENEN FAYDALARI NELERDİR?

✓ **Ulaşım Ağlarına ve Kullanıcılara Sağlayacağı Faydalar:**

Ege Bölgesi'nin mevcut kara yolu ulaşım alt yapısı üzerinde hâkim olan yoğun trafik akışını dengeleyerek rahat ulaşım hizmeti sunulması

Gelecekte öngörülen trafik yükünü karşılamak için gerekli olacak kapasiteyi karşılaması

Ege Bölgesi'ndeki ana ulaşım hatlarının yakınında gelişen kentleşme ve sanayileşmenin neden olduğu yerel trafiğin mümkün olduğunca şehirlerarası ve uluslararası trafikten ayrıştırılması

✓ **Sosyal ve Ekonomik Faydalar:**

İstihdam sağlanması

Yerel ve bölgesel kalkınma, istihdama, eğitime ve sağlık alanlarına katkı sağlanması

Kültür ve turizm tesislerine erişimin artırılması

Ulusal bütçeye ve ulusal güvenliğe katkı sağlanması

Trafik kaynaklı enerji tüketimi, hava emisyonları, zaman kaybı gibi unsurların azaltılması

Figure 19.5 Brochure distributed during PCMs (Continue)

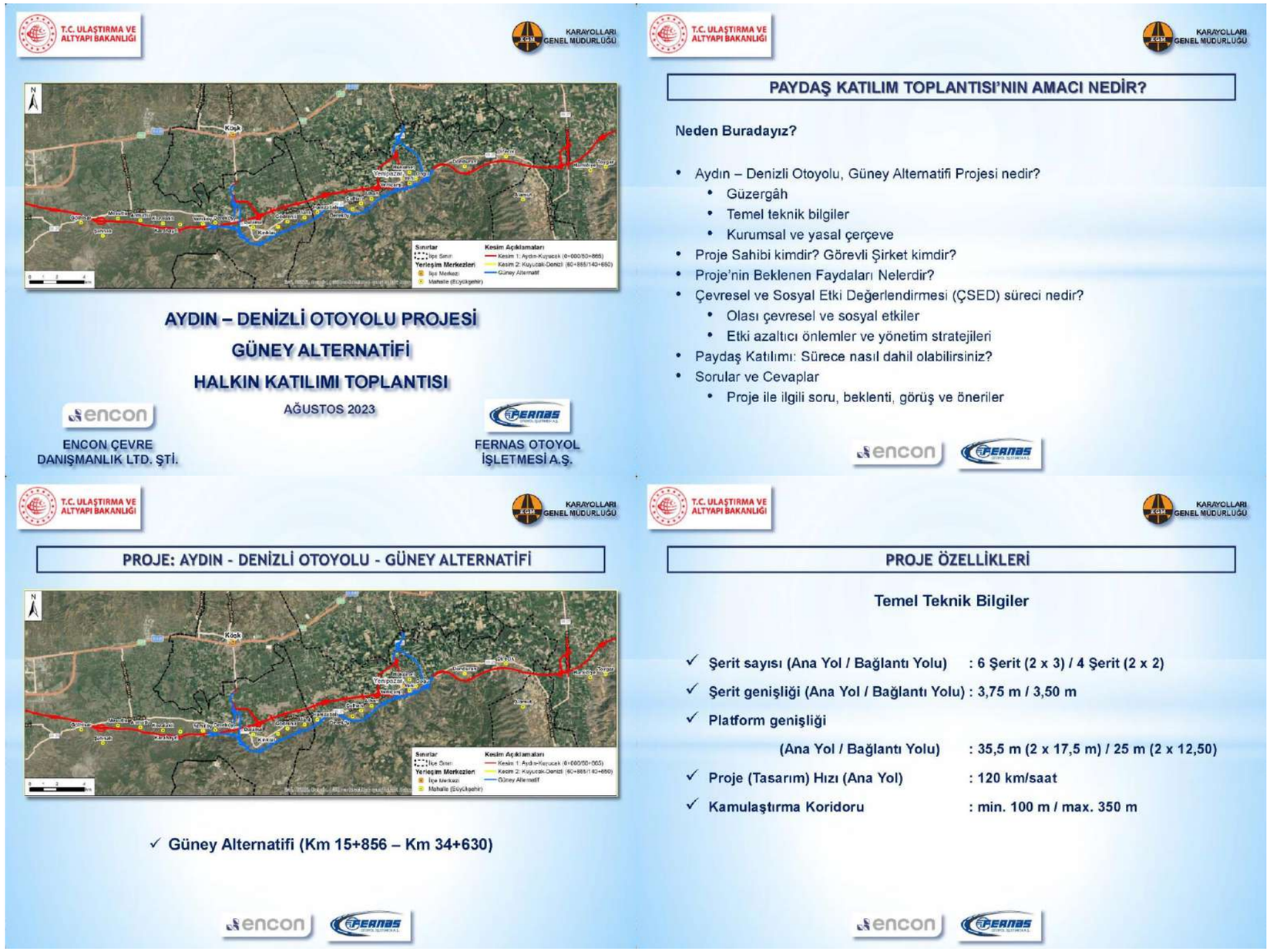
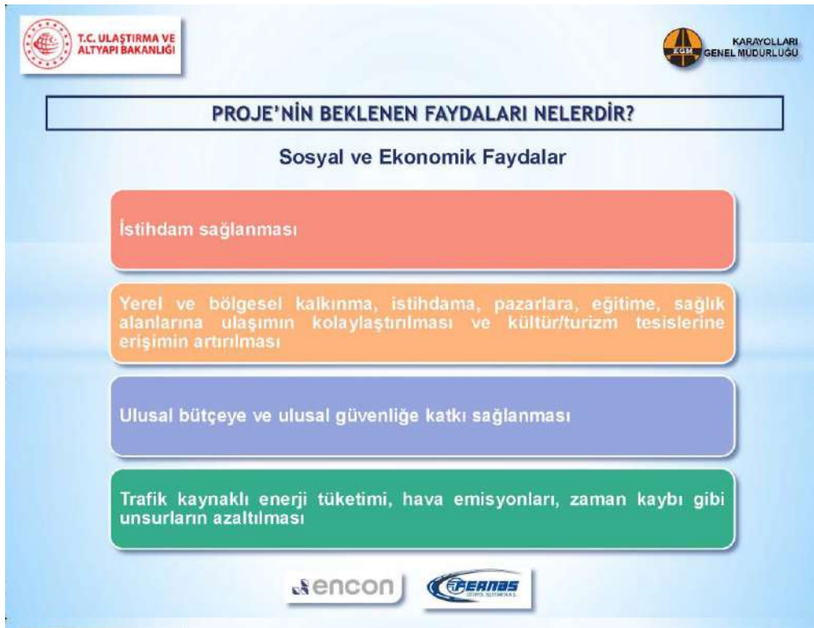


Figure 19.6 Project Information Presentation

Figure 19.7 Project Information Presentation (Continue)



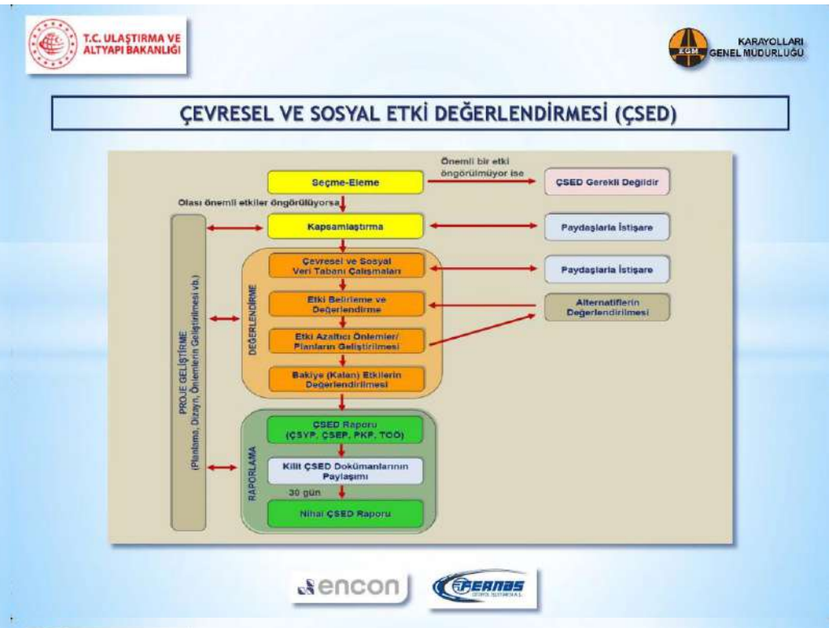


Figure 19.8 Project Information Presentation (Continue)

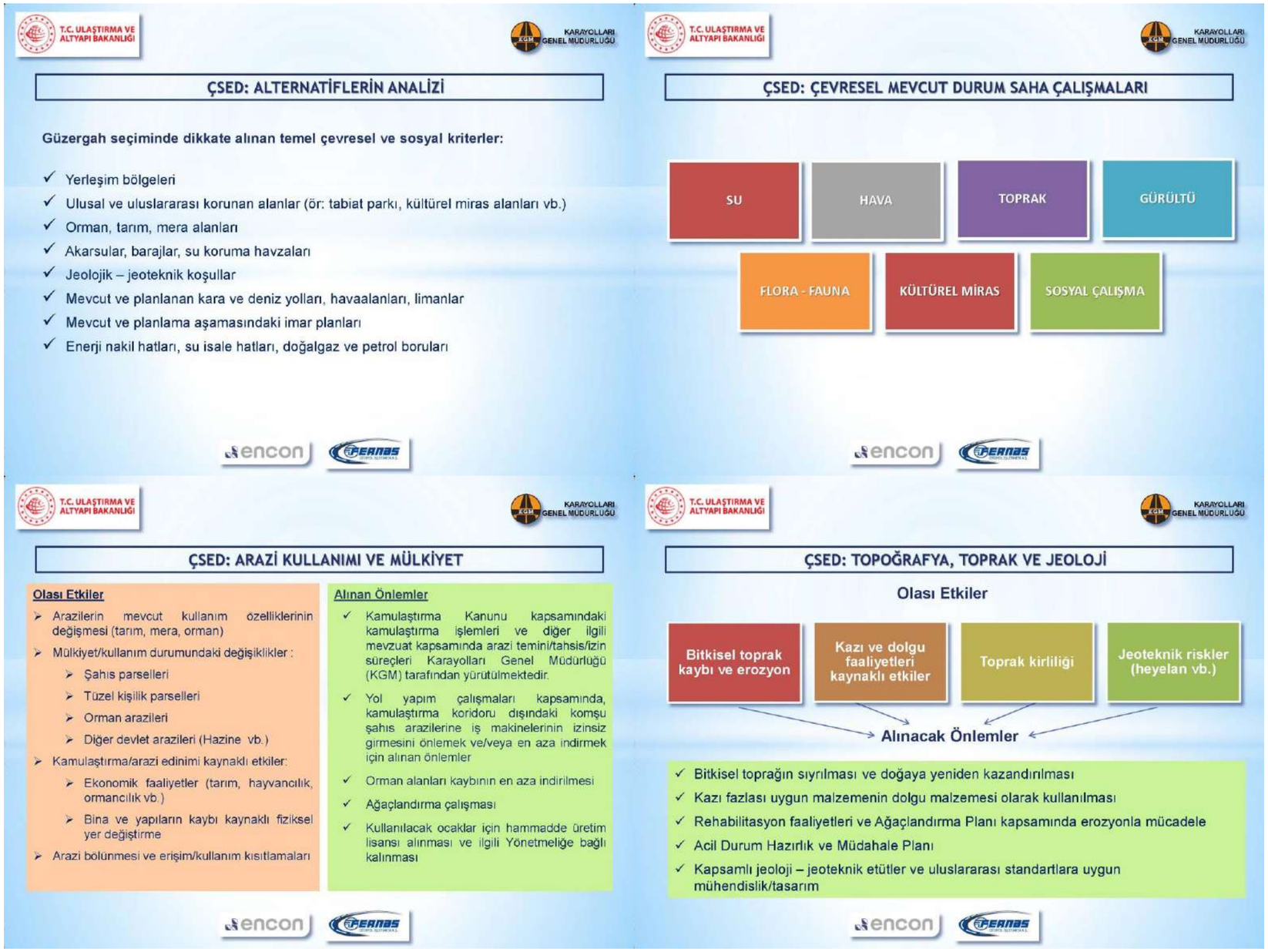


Figure 19.9 Project Information Presentation (Continue)

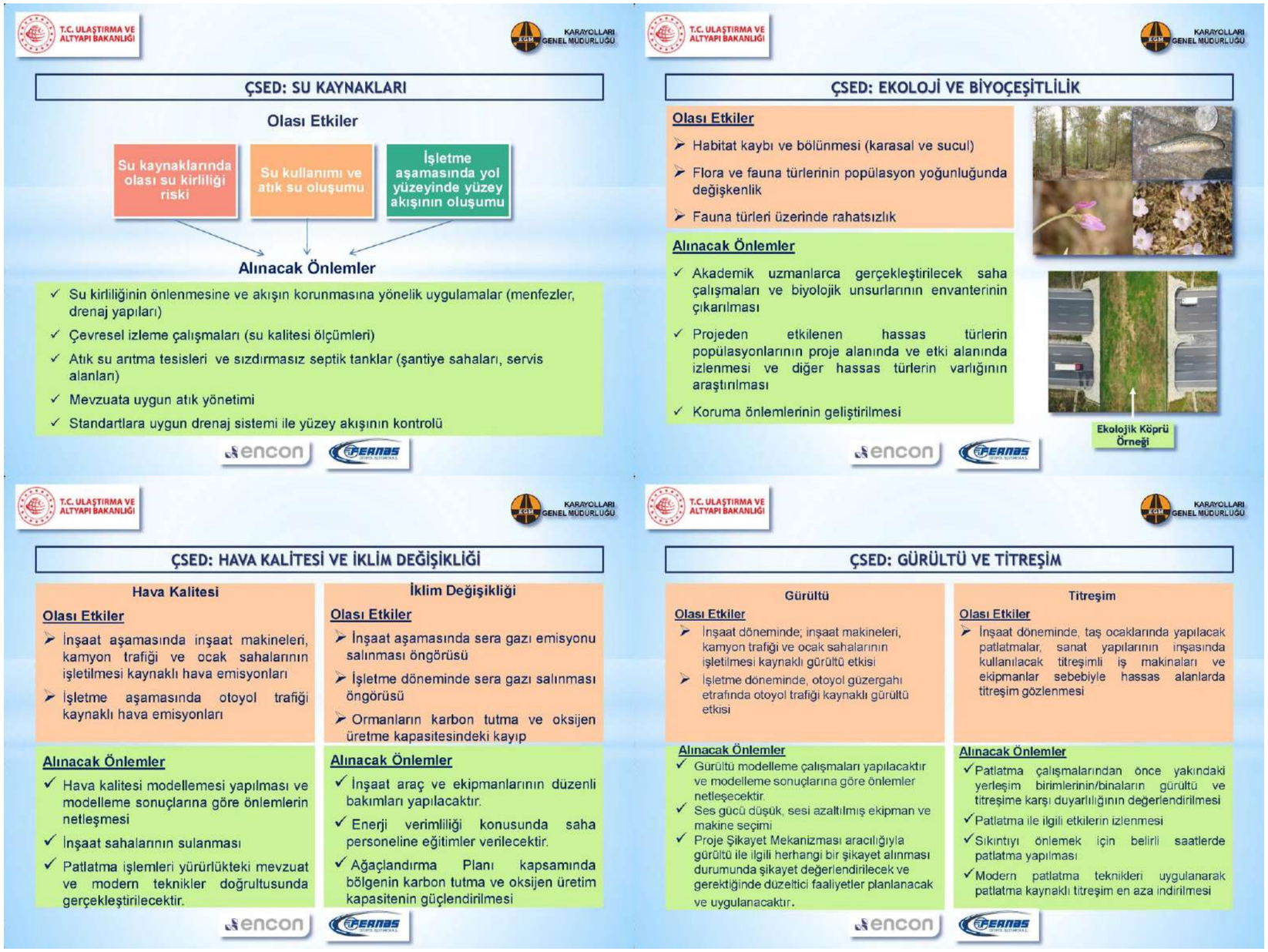


Figure 19.10 Project Information Presentation (Continue)

Figure 19.11 Project Information Presentation (Continue)

19.4.2 Public Participation Meetings Photos

Photographs from PCM are presented below:

PCM 1: Gödrenli Neighborhood – 22.08.2023 (Efeler / AYDIN)

Photo 19.1 Preparations for the PCM

Photo 19.2 Introduction

Photo 19.3 Introduction

Photo 19.4 Presentation

Photo 19.5 Presentation

Photo 19.6 Question and Answer Session

Photo 19.7 Question and Answer Session

PCM 2: Dereköy Neighborhood – 23.08.2023 (Yenipazar / AYDIN)

Photo 19.8 Preparations for the PCM

Photo 19.9 Preparations for the PCM

Photo 19.10 Introduction

Photo 19.11 Introduction

Photo 19.12 Presentation

Photo 19.13 Presentation

Photo 19.14 Question and Answer Session

Photo 19.15 Question and Answer Session

CHAPTER 20

ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)

20. CHAPTER – ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

In accordance with the Technical Specifications of KGM, FOIAS will establish certified (ISO 9001, ISO 14001 and OHSAS 18001) Quality Management Systems. These systems will aim to ensure that all the construction activities and the services to be provided would cover quality assurance aspects. In addition to providing quality assurance, the ADMP and so that South Alternative will be implemented in accordance with the requirements of the national environmental legislation, international agreements and protocols and international environmental and social standards including the Equator Principles (EPs) and International Finance Corporation's (IFC) Policy (2012) and related Performance Standards (PSs) on Environmental and Social Sustainability that would be applicable to. This "Environmental and Social Management System" (ESMS) has been reviewed as a part of the ADMP and South Alternative's ESIA and Supplementary ESIA process in order to generate a systematic approach for daily implementations within the South Alternative.

This ESMS consists of the following elements:

- **(i)** Project's policies on environmental, health, safety and labor aspects;
- **(ii)** Organizational structure of the project;
- **(iii)** An integrated Environmental and Social Management Plan (ESMP) defining the main management approaches and mitigation measures for relevant environmental and social subjects;
- **(iv)** Framework for the monitoring and review of the ESMP

In addition, the reviewed Emergency Preparedness and Response Plan (see Annex-3) and the reviewed Stakeholder Engagement Plan (see Annex-9) prepared as a part of the Supplementary ESIA Report, will be complementary parts of the project's ESMS.

The project's ESMS has been established to ensure that all the implementations within the South Alternative will be carried out in an environmentally sound manner. The reviewed ESMS will also provide the main framework for implementation of health and safety measures for the employees and the affected communities.

As a part of the ESMS, the reviewed ESMP (see Annex-6) will consist of procedures indicating the good practices, mitigation measures and monitoring plan. However the system will not be limited with the provisions laid out in the document since continuous improvement will be carried out through an ongoing process of reviewing, correcting and improving. The ESMS will be implemented by the FOIAS and all the subcontractors involved. With effective implementation of the ESMS, compliance with the applicable national and international legislation and standards will be guaranteed.

20.1 Environmental and Social Policy Framework

Fernas Group of Companies (Fernas Otoyol İşletmesi A.Ş. - FOIAS) is committed to implement the project in line with the commitments and measures contained in this Supplementary ESIA, which have been developed/reviewed and proposed on the basis of the Equator Principles and the relevant requirements of the IFC performance standards and EHS Guidelines. In this context, the project will follow the principles defined in this ESMS (including the ESMP) and establish ISO 9001, ISO 14001 and OHSAS 18001 Quality Management Systems. Based on the framework provided in this ESMS, a project-specific Environmental and Social Policy which had been developed for ADMP before will be reviewed and implemented by the FOIAS including but not limited to the main principles that are defined below.

20.1.1 Environmental Policy

The objective for setting out an environmental policy is to follow sustainability principle by implementing all the project activities in accordance with national and international environmental requirements. Within this context, environmental compliance will be taken into account in all phases of the project.

The potential impacts of the project and the mitigation measures to be taken are defined in this Supplementary ESIA Report and the ESMP. FOIAS will be the responsible party for taking all necessary measures in order to prevent or at least minimize these impacts to environment. Key areas of impact related to the project have been identified as; air quality, water quality and wastewater, solid and hazardous waste, noise and habitat fragmentation. The following environmental principles will be followed by the FOIAS in order to develop an environmental policy:

- An environmental responsible/officer will be in charge in all phases of the project.
- Environmental protection measures will be integrated in planning and design phases of the project.
- Environmentally friendly materials and technologies that avoid or at least minimize the negative environmental impacts will be selected for both construction and operation phases of the project.
- All activities will be carried out in accordance with national environmental legislation, international agreements and protocols, and international environmental standards.
- Necessary general and job specific training will be provided for all the employees and subcontractors to be working on site in order to increase their environmental awareness.
- Affected community will be informed about the environmental policy and implementations on site.
- All necessary measures will be taken in order to avoid any pollutant releases in receiving environment.
- Minimization of waste generation will be promoted through raising awareness via visual aid and trainings. Reusing and recycling methods will be placed for solid waste.
- The reviewed “Emergency Preparedness and Response Plan” will be implemented in order to minimize the reaction time and adverse effects in cases of environmental accidents/incidents.
- Conservation of the biodiversity elements within the project area, minimizing the impacts on ecology, biodiversity and habitats will be taken into consideration during policy development.

20.1.2 Health and Safety Policy

The working environment should not pose any health risks and it should be safe for employees and also the local communities which the South Alternative will be in interaction. Thus, the FOIAS will develop and review and implement a Policy for occupational and community health and safety in order to ensure that the risks of accidents/incidents will be avoided or at least minimized and all project activities are undertaken in accordance with the requirements of relevant national and international regulations on health and safety aspects.

The Health and Safety Policy will address the importance of health and safety in both construction and operation phases of the South Alternative. Through this Policy, FOIAS will be committing that all legislative requirements will be met with best practices and international standards, and convention provisions will be acknowledged, integrated into the policy and implemented. The Policy will be implemented by the employees and also the subcontractors to be employed by the FOIAS during construction and operation phase activities. Commitment will be the main principle in implementation of health and safety policy and will cover all employees at all roles.

FOIAS will be the responsible party for taking all necessary measures for avoiding/minimizing health and safety impacts/risks. Key areas of impact/risk have been identified as; physical hazards, chemical hazards, training needs, noise exposure, usage of personal protective equipment (PPEs) under the occupational health and safety subject and traffic and fire safety under the community health and safety aspect. The following principles will be followed by the FOIAS in order to develop a health and safety policy:

- All necessary measures will be taken in order to avoid any hazards to employees caused by the working environment, working equipment or to local communities or wider public due to the construction or operation activities planned in the scope of the project.
- All necessary precautions to control hazards will be taken with a risk management approach and proactive perspective.
- Necessary measures will be taken in order to prevent or at least minimize risks related to health and safety.
- Health and safety procedures will be developed, periodically updated and maintained on an easily accessible media based on the requirements of working environment and the nature of the job.
- FOIAS will provide and promote PPE usage, and supply all necessary equipment to all employees in accordance with the work to be performed.
- FOIAS will provide all necessary information, training and direction to all employees.
- FOIAS will establish communication channels with the project personnel and local communities regarding to emergency response.
- FOIAS will evaluate the risks and impacts of the project to the health and safety of local communities, and take preventive measures to eliminate or at least minimize the identified risks and impacts.
- FOIAS will avoid or minimize the potential for community exposure to health risks such as accidents, pollution and diseases that could result from project activities.
- FOIAS will inform the close community regarding to health and safety policies and potential risks.
- FOIAS will take all necessary measures to eliminate or at least reduce the risks arising from the traffic load generated by the project.
- A project-specific “Emergency Preparedness and Response Plan” has been reviewed based on the framework provided in the Supplementary ESIA Report (see Annex-3) in order to minimize reaction time and adverse effects in cases of health and safety accidents/incidents.

20.1.3 Labor and Employment Policy

FOIAS will take all necessary actions and measures related to labor and employment in order to be in compliance with national legislation and international standards. For this purpose, a Labor and Employment Policy will be developed and reviewed by the Project Sponsor.

National labor law and related regulations covers the basic principles of international labor standards and the IFC Performance Standard 2 in the issues of equal treatment of employees, restrictions on the working age and employment of children, avoidance of forced labor and ensuring occupational health and safety at the workplaces. In this regard, the following measures to be taken by the FOIAS will underlie the Labor and Employment Policy of the project, while all other requirements of the national legislation will be strictly fulfilled.

- No discrimination based on gender, language, belief, sexual orientation, ethnicity/race, social/economic status, disability, political opinion, participation and membership in union activities or similar reasons will be permitted by the FOIAS in the employment relationship.

- Awareness of the employees will be increased by informing them about company rules, working conditions and their personal rights during the recruitment phase and at certain periods during their employment.
- Rights of migrant, contract or temporary workers will be protected.
- Reporting of human rights violations and frequent monitoring of potential problems and concerns regarding the effective implementation of the policy statements will be encouraged.
- Working age restrictions of the Turkish Labor Law will be complied.
- The employee's consent will be taken for overtime work and the overtime work arrangements will be done in accordance with the Turkish Labor Law.
- FOIAS will take all the necessary measures and maintain all the needed means and tools in full; and ensure that those measures taken in the field of occupational health and safety are strictly obeyed by all employees.
- Retrenchment of the construction workforce following the completion of construction activities will be done in compliance with all legal and contractual requirements. Retrenchment activities will be conducted under a plan that will be in compliance with IFC PS2.

20.2 Organization Capacity and Competency

The Aydın-Denizli Motorway is a Project planned by the Ministry of Transportation and Infrastructure (MoTI), General Directorate of Highways ("KGM" or "the Administration") in accordance with the Law on Implementation of Some of the Investments and Services in the Framework of Build, Operate and Transfer Model (Law No: 3996). KGM, as the ADMP's owner and administrative authority, has commissioned a special purpose entity (SPV) for the implementation of the project under the related Build, Operate and Transfer (BOT) contract. In this regard, Fernas Group of Companies (Fernas Otoyol Işletmesi A.Ş. - FOIAS) has been awarded with a BOT Contract for the implementation of the ADMP. This entity referred as Project Sponsor in the scope of the ESIA/Supplementary ESIA studies. All the commitments presented in this report will be owned by the FOIAS.

As the Project Owner, key responsibilities of KGM will include the approval of motorway route and design; execution of the expropriation works in line with the relevant provisions of the Expropriation Law, acquisition of other land use (forestry, agricultural, pasture, etc.) permits, easement rights, etc. in accordance with relevant Turkish legislation and ensuring minimum traffic guarantee. Technical and legal supervision and control of the construction and operation works will also be executed by the personnel or independent consulting firms to be assigned by the KGM.

FOIAS will be the main responsible party for the implementation of the ESMS including the ESMP, while it will also have a coordinating role in the actions to be undertaken by the third parties (i.e. sub-contractors, Provincial Directorate of Environment, Urbanization and Climate Change, other related authorities), as required. FOIAS does not have any responsibility or authority regarding the execution of expropriation works.

The detailed organizational structure had been/to be developed by the FOIAS for the construction and operation phases of the Project will assign specific personnel(s) (e.g. Environmental Officer/Expert, Environmental and OHS Expert) who has the required knowledge, skills and experience for the environmental and health and safety tasks (i.e. compliance with legislative environmental requirements, taking mitigation/corrective actions, monitoring, etc.) to be conducted under this ESMS. Mechanisms will be established to inform the top management about the environmental and social performance of the project.

20.2.1 Construction Phase

During the construction phase, workforce requirements of the project will be large-scale (including the sub-contractors, anticipated to reach up to one thousand during the peak phase of the activities). According to the BOT Contract, Contract Duration covers both the construction and operation phases. Contract Duration for the ADMP including South Alternative has been specified as 20 years, within which construction phase will be completed in maximum 3 years. Though the construction phase will be temporary, FOIAS will ensure that an organizational capacity sufficient for the implementation of the ESMS is established and maintained throughout the construction phase.

Within the organizational structure, several directorates serve for the execution of works. An Environmental and Social Interaction Department, which is responsible for the performance of environmental and social tasks, has already been established by the FOIAS under the Project Manager. The Environmental and Social Interaction Department is led by an Environmental and Social Interaction Manager and supported by a Public Relations Agency/Expert, a Cultural Heritage Chief, a Cultural Heritage Expert, a Public Relations Chief, a Public Relations Specialist, one Environmental Chief and two Environmental Engineer, one Education Coordinator, and one Environmental Engineer (under graduate). Separate Occupational Health and Safety Department is also serving under the Project Manager. The current organizational structure is presented in Figure 20.1.

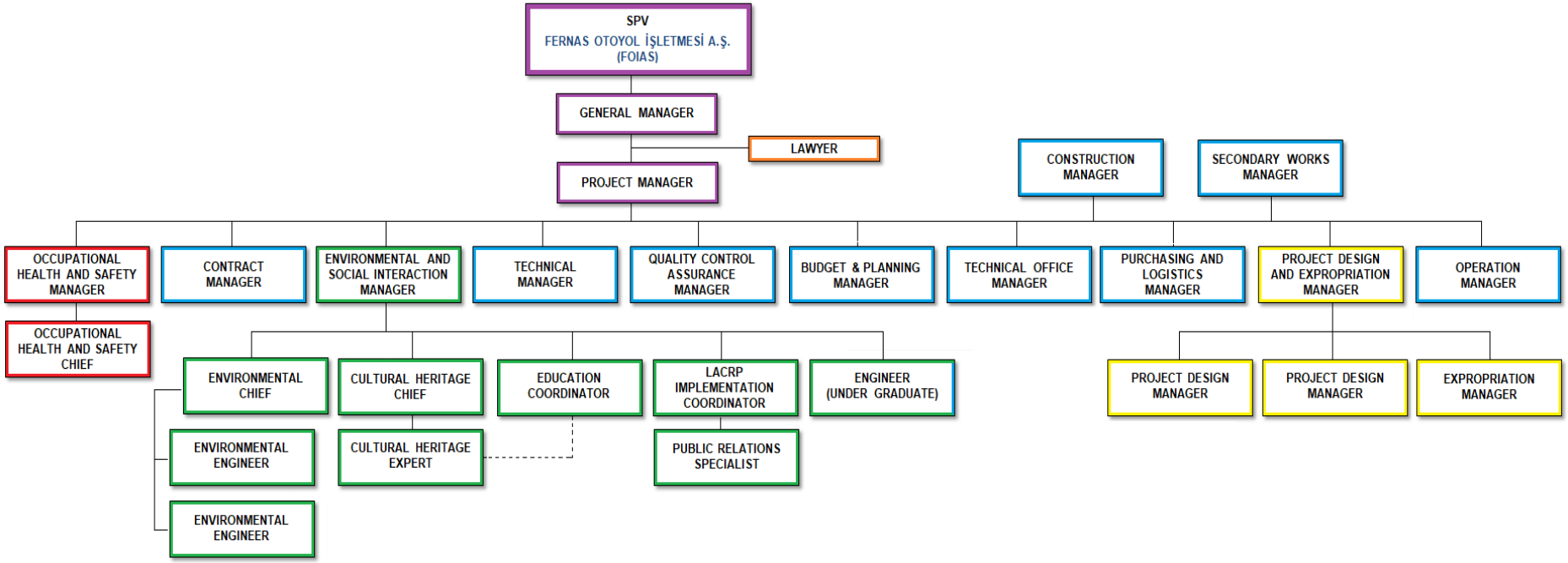


Figure 20.1 The Current Organization Chart of FOIAS

Relevant procedures of the ESMP will be implemented throughout the construction phase under the direction of the Environmental and Social Interaction Department. The Environmental and Social Interaction Manager will clearly define the responsibilities in the scope of the ESMS and communicate these responsibilities to the relevant personnel. Provision of sufficient human and financial resources required for the effective implementation of the ESMS will be ensured by the FOIAS through the Project Manager who will control and confirm the considerations of managers that are affiliated to him/her. Key responsibilities of the Environmental and Social Interaction Manager are given below and these responsibilities will be expanded throughout the project, as needed:

- Supervising the proper fulfillment of all environmental measures as set out in the ESMP or which may further be added.
- Liaison with regulatory government agencies and communicating with local communities and responding to any complaints that may arise, as required.
- Delivering environmental training and awareness programs to Project personnel prior to and during on-site works.
- Providing technical assistance on environmental subjects to Project personnel and government auditing officers.
- Carrying out monitoring activities as required and preparing reports at regular frequencies which summarize activities and actions taken, and submitting these reports to the appropriate organizations.
- Supervising implementation of general good environmental practice.

The Environmental and Social Interaction Manager will identify requirements for the ESMP changes (i.e. certain changes in the project, technology, legislation, etc.) and make the relevant revisions in the ESMS and the ESMP accordingly. In case of a need for such a change or revision, related authorities will be informed by the Environmental and Social Interaction Manager on behalf of the FOIAS, in a written format regarding the changes/revisions to be made and their reasons. The environmental responsibilities and the relevant ESMP requirements will also be included in the contracts that will be signed with the subcontractors, if there is any.

20.2.2 Operation Phase

Following the completion of construction, the operation phase of the Contract Duration which is specified as 17 years, will start. If the construction period, which is specified as maximum 3 years, exceeds 3 years, the delay time (the time after 3 years) will be deducted from the operation period. If the construction of the motorway is completed before the end of foreseen construction period (3 years), the remaining time will be added to operation period. In the operation phase, relevant personnel will be directly and indirectly employed at the operation and maintenance buildings/facilities as well as the service areas. FOIAS will continue to ensure that an organizational capacity sufficient for the implementation of the ESMS is maintained throughout the operation phase under the BOT Contract Duration. At the end of the contract duration, the motorway will be transferred to the KGM.

The organizational structure of the FOIAS will be adapted to the requirements of the operation phase prior to start of motorway's operation. To ensure competency, FOIAS will ensure that the operation and maintenance personnel are properly trained in their specialty and successfully completed the necessary security investigations in accordance with the related terms of the BOT Contract. For the same purpose, trainings on the aspects related with the operation and maintenance of motorway will be provided by FOIAS to KGM's designated operation and maintenance personnel one year ahead of the end of the contract duration.

The Project/Operation Manager on behalf of the FOIAS will coordinate the relations with the Provincial Directorate of Environment, Urbanization and Climate Change and other related authorities.

20.3 Environmental and Social Management Plan (ESMP)

Environmental and Social Management Plans (ESMP) are set forward to implement principles that are required to prevent, control and minimize potential impacts of the project on the natural environment, wildlife and local communities. The idea is to apply environmentally sound management strategies in line with related national legislation, international agreements and protocols, and international standards to carry out project activities conserving the integrity of natural systems without negatively affecting the surrounding environment. As a part of the ESMS, an ESMP, consisting of sub-procedures on the management of environmental (e.g. water and wastewater, waste, hazardous materials, wildlife, etc.) and health and safety (occupational and community related) aspects of the project has been prepared.

Under the ESMP, several subject specific procedures, laying out the main management approaches and mitigation measures together with a monitoring scheme in order to assess the effectiveness of mitigation measures to be implemented, have been developed. The project ESMP including those procedures, as listed below, is presented in reviewed Annex-6 of the Supplementary ESIA Report.

- Environmental Management Plan
  - Air Quality and Emissions Management Procedure
  - Water Quality, Wastewater and Stormwater Management Procedure
  - Solid Waste Management Procedure
  - Hazardous Waste Management Procedure
  - Noise Management Procedure
  - Habitat Alteration, Fragmentation and Wildlife Management Procedure
  - Quarry Management Procedure
- Occupational Health and Safety Management Plan
  - Physical Hazards Management Procedure
  - Chemical Hazards Management Procedure
  - Noise Management Procedure
  - Personal Protective Equipment (PPE) Management Procedure
  - Communication and Training Management Procedure
  - Workers Accommodation Procedure
- Community Health and Safety Plan
  - Fire Management Procedure
  - Traffic Management Procedure
- Subcontractor Management Plan
- Change Management Procedure

In addition, the reviewed Emergency Preparedness and Response Plan (see Annex-3) and the reviewed Stakeholder Engagement Plan (see Annex-9; includes Grievance Mechanism) prepared as a part of the Supplementary ESIA Report will be complementary parts of the project's ESMS.

20.4 Monitoring and Review

The effective implementation of the ESMS/ESMP will be monitored through appropriate tools such as site audits, environmental monitoring efforts, checking of related documents, etc. In this regard, an Environmental and Social Monitoring Plan has been developed for the project as presented in Table 20.1. This program will be used as a tool to support the ESMP monitoring. Within this regard, internal and external monitoring will be carried out. Costs associated with the environmental monitoring will be supplied by FOIAS from the Project Budget.

The ESMS is a living system which needs to evolve with the project and should be reviewed and revised by the Environmental and Social Interaction Department of the FOIAS, if necessary, to do so. In this case, the supplementary documents should be submitted to Lenders for their approval as well.

Detailed representations of land preparation and construction phase monitoring locations are provided in Figure 20.2 and operation phase monitoring locations are provided in Figure 20.3.

20.4.1 Internal Monitoring

Environmental and Social Interaction Manager of FOIAS will conduct internal inspections and audits to verify compliance with the desired ESMS/ESMP outcomes. The frequency of the monitoring will be as follows:

- Quarterly during the construction phase;
- Annually during the operation phase throughout the BOT Contract Duration.

The results of the environmental and social monitoring activities will be compiled in “ESMP Performance Review and Monitoring Reports (Monitoring Reports)” to be prepared on quarterly basis. The Monitoring Reports will include documentation of project’s compliance against Supplementary ESIA commitments. Based on the monitoring results, necessary corrective and preventive actions will be identified and amendments will be made on the ESMS and the ESMP accordingly. Such amendments will be included in the monitoring program and followed up in the upcoming monitoring studies to ensure effective implementation. The monitoring program for the South Alternative will be carried out together with the Aydın-Denizli Motorway monitoring program. New monitoring points for the South Alternative have been identified and included in the Aydın-Denizli Motorway monitoring program. If requested the monitoring reports will also be shared with the governmental authorities.

The Environmental and Social Interaction Manager will also share the key monitoring results and performance review of the ESMS with the senior management (i.e. Project Manager, General Manager) and plan the necessary measures to be taken to ensure effective implementation of environmental and social measures.

20.4.2 External Monitoring

In addition to internal monitoring, external monitoring activities will be carried out quarterly in the construction phase and annually during the operation phase of the project by external/independent third party experts to verify environmental and social monitoring information and perform monitoring services. The monitoring program for the South Alternative will be carried out together with the Aydın-Denizli Motorway monitoring program. New monitoring points for the South Alternative have been identified and included in the Aydın-Denizli Motorway monitoring program. The environmental and social monitoring plan for the South Alternative is presented in Table 20.1. Within the scope of external monitoring, final external evaluation will be carried out to assess if the outcome of the ESMS/ESMP implementation is in conformity with the requirements of the national environmental legislation, international agreements and protocols and international environmental and social standards including the Equator Principles and IFC Policy (2012) and related Performance Standards on Environmental and Social Sustainability that would be applicable to the Aydın-Denizli Motorway Project and so that South Alternative.

Besides, local authorities and the Ministry of Environment, Urbanization and Climate Change (MoEUCC) has the authority to execute monitoring and inspection activities to follow-up the conformity of the project activities with the environmental requirements as per the relevant legislation.

Table 20.1 Environment and Social Monitoring Plan for South Alternative

No	Subject	Sub-topic	Monitoring Parameter	Monitoring Station/Location	Monitoring Method	Monitoring Frequency	Responsibility
Land Preparation and Construction							
C1	Environmental and Social Management System (ESMS)	C1.1. Policy and ESMP	-Project-specific Environment and Social Policy -Organizational Structure (number and CVs of the personnel employed under the Environmental and Social Interaction Department) -Periodical ESMP Performance Review and Monitoring Reports -Number of non-compliant situations -Project-specific Emergency Preparedness and Response Plan -Existence and validity of the legal environmental and health and safety permits -Budget allocated/spent for ESMP implementation -Number and scope of trainings, number of participants, training hours per employee, training materials, trainings provided to sub-contractors, etc. -Measures taken to ensure compliance of sub-contracts with ESMP measures	Project office	Document review	Quarterly	-FOIAS -Independent experts
C2	Land Use and Property	C2.1. Forest lands	-Forestry permits/applications -Afforestation protocols made with the Ministry of Agriculture and Forestry -Area of lost forestland (in hectare) -Number of the trees cut -Records on forest fires (if any)	Project office	Document review	Quarterly	-FOIAS -Independent experts
			Locations and length of viaducts	Locations of viaducts	Site audit Document review	Quarterly	-FOIAS -Independent experts
		C2.2. Agricultural lands	-List of expropriated agricultural parcels (inc. information on area and characteristics of the land plot) -Site allocation documents for expropriated lands; bilateral agreements, commitment and consent letters for non-expropriated lands	Project office	Document review	Quarterly	-FOIAS -Independent experts
			-Grievances received in the subjects of crossing of the expropriation borders, start of activities on non-expropriated lands, etc.	Project office	Review of grievance logs	Quarterly	-FOIAS -Independent experts
			-Number of cut olive trees	Locations of viaduct supports	-Review of design documents -Site audit -Review of grievance logs	Quarterly	-FOIAS -Independent experts
		C2.3. Pasturelands	-Area and number of pasturelands for which land use permits taken	Project office	Document review	Quarterly	-FOIAS -Independent experts
		C2.4. State-owned lands	-Area and number of state-owned lands for which land use permits taken	Project office	Document review	Quarterly	-FOIAS -Independent experts
		C.2.5. Privately-owned lands	-List and number of expropriated private parcels (inc. information on area and characteristics of the land plot) -Site allocation documents for expropriated lands; bilateral agreements, commitment and consent letters for non-expropriated lands	Project office	Document review	Quarterly	-FOIAS -Independent experts
			-Number of grievances received in the subjects of crossing of the expropriation borders, start of activities on non-expropriated lands, etc.	Project office	Review of grievance logs	Quarterly	-FOIAS -Independent experts
C3	Topography and Soils	C3.1. Top soil management	-Grievances received in the subjects of crossing of the expropriation borders, start of activities on non-expropriated lands, etc.	Top soil storage sites Rehabilitated areas	Site audit	Quarterly	-FOIAS -Independent experts
		C3.2.Earthworks	-Excavation and fill volumes (m^3) -Volume of reused materials (m^3) -Conditions at the storage sites	Excavated material storage sites	Site audit	Quarterly	-FOIAS -Independent experts
		C3.3. Erosion	-Erosion control measures taken (drainage channels, barriers, settling structures, etc.) -Area of exposed lands at each camp sites (m^2)	Locations of exposed lands within the expropriation corridor	Site audit	Quarterly	-FOIAS -Independent experts
		C3.4. Quarry	-Operation licenses -Mining method applied -Blasting activities -Production amount (m^3/day) -Slope stability -Borders of the camp sites -Management of waste rock	Location of quarries	Site audit	Quarterly	-FOIAS -Independent experts
		C3.5. Soil quality	-Number of spill/leakage incidents and corrective measures taken	Contaminated lands/sites	Site audit	Quarterly	-FOIAS -Independent experts

No	Subject	Sub-topic	Monitoring Parameter	Monitoring Station/Location	Monitoring Method	Monitoring Frequency	Responsibility
C4	Wastes	C4.1. Waste management	-List of hazardous materials/chemicals supplied, stored and used (inc. information on type and amount/volume) -Type (i.e. municipal, packaging, waste oil, etc.) and amount of wastes produced/disposed of -Waste management/disposal agreements done with licensed companies -Waste Management Plans -Temporary Waste Storage Areas	-Camp Sites -Road construction sites -Quarries	-Site audit -Document review	Quarterly	-FOIAS -Independent experts
			-Site practices on waste management (e.g. general housekeeping rules, source separation practice, containers, containment structures, etc.)		Visual inspection	Daily	-FOIAS -Subcontractor's personnel
C5	Water Resources	C5.1. Water quality	Annex-2, Table 2 of the Regulation on the Surface Water Quality Regulation	-Receiving water bodies for treated wastewater discharges (if any) -Groundwater resources used for water supply	-Water quality sampling, in-situ measurement, laboratory analyses	Quarterly	-FOIAS -Independent experts (environmental) -Accredited laboratories
		C5.2. Water supply	-Sources and amount of water supply -Water supply permits	-Project office -Camp Sites	-Document review	Quarterly	-FOIAS -Independent experts (environmental)
		C5.3. Wastewater management	-Environmental permits for domestic package wastewater treatment plant discharges -Wastewater disposal agreements/channel connection permits to be done with municipalities -Capacity of domestic package wastewater treatment plant -Discharge/disposal volumes	-Domestic Package Waste Water Treatment Plants	-Document review	Quarterly	-FOIAS -Independent experts (environmental)
			Quality of treated wastewater from the discharge of domestic package wastewater treatment plants (Water Pollution Control Regulation (Table 21.1))	Camp Sites	-Treated wastewater quality sampling, in-situ measurement, laboratory analyses	Quarterly	-FOIAS -Independent experts (environmental) -Accredited laboratories
			Wastewater management practices at concrete plants	-Camp Sites -Concrete Plant locations	-Site audit -Document review	Quarterly	-FOIAS -Independent experts (environmental)
C6	Ecology	C6.1.Terrestrial Flora	*Ziziphora taurica subsp. cleonioides*	Flora 9: 35S 591567 E 4201899 N	-Site survey	Twice a year (timing to be determined by experts)	-Flora experts
			Sensitive species and habitats	Project AoI			
		C.6.2. Terrestrial Fauna	Sensitive species and habitats	Project AoI	-Site survey	Twice a year (timing to be determined by experts)	-Fauna experts
			Alternative habitats	Project AoI			
			Animal passes	Ecological bridge			
			Streptopelia turtur and *Falco vespertinus nests*	Project AoI	-Site survey	April and May in 2024	
			Temporary protective fencing	Road construction sites	-Site audit	Quarterly	-FOIAS -Fauna experts
		C.6.3 Aquatic Flora/Fauna	All fish species and river/creek crossings	Project AoI	Site survey	Twice a year	-Hydrobiology experts
C7	Air Quality	C7.1. Dust	-PM_{10} -$PM_{2.5}$ -Settled dust -NO_x, SO_x, VOC	Sensetive receptors	-Site measurements	Quarterly or Upon Grievance	-FOIAS -Independent experts (environmental) -Accredited laboratories
			-Number of water trucks -Frequency of road watering	-Camp Sites -Affiliated Plants -Quarries	-Document review	Quarterly	-FOIAS -Independent experts (environmental)
			-Grievances received on impacts related with dust, air emissions	-Project office	-Review of grievance logs	Quarterly	-FOIAS -Independent experts
			-Environmental permits for concrete plants, asphalt plants	-Project office	-Document review	Quarterly	-FOIAS -Independent experts
C8	Environmental Noise and Vibration	C8.1. Environmental Noise	Environmental Noise (dBA)	Sensetive receptors	-Site measurements (24 hour)	Quarterly or Upon Grievance	-FOIAS -Independent experts (environmental) -Accredited laboratories
			Statistics on the grievances received on impacts related with noise generation	Project office	-Review of grievance logs	Quarterly	-FOIAS -Independent experts

No	Subject	Sub-topic	Monitoring Parameter	Monitoring Station/Location	Monitoring Method	Monitoring Frequency	Responsibility
		C8.2. Vibration	Ground vibration value	Sensetive receptors	-Measurement with vibrometer	Quarterly	-Independent experts -Accredited laboratories
			Statistics on the grievances received on impacts related with blasting operations	Project office	-Review of grievance logs	Quarterly	-FOIAS -Independent experts
C9	Cultural Heritage	C9.1. Chance finds	-Employment data on cultural heritage expert/archaeologist -Number of chance finds procedure operated	Road construction sites	-Document review -Site audit	Quarterly	-FOIAS -Independent experts (environmental/ cultural heritage)
		C9.2. Protected sites	Actions taken in accordance with the decisions of Conservations Boards (e.g. planning of bridges, embankments, etc.; number of georadar studies conducted, test or salvage excavations conducted, etc.)	Road construction sites	-Document review -Site audit	Quarterly	-FOIAS -Independent experts (environmental/ cultural heritage)
C10	Socio-economy	C10.1. Employment	Employment statistics (direct and contracted workers, local/non-local/foreign)	Project office	-Document review	Quarterly	-FOIAS -Independent experts (environmental/social)
		C10.2. Expropriation	-Agreement level for expropriation works -Number of court cases	Project office	-Document review	Quarterly	-FOIAS -Independent experts (environmental/social)
		C10.3. Social responsibility/volunteer activities	Number and scope of social responsibility/volunteer projects/activities conducted	Project office	-Document review	Quarterly	-FOIAS -Independent experts (environmental/social)
		C10.4. Local Infrastructure	Local infrastructure (e.g. roads) relocated/maintained/improved	Project office	-Document review	Quarterly	-FOIAS -Independent experts (environmental/social)
		C10.5. Land use restrictions	Locations and dimensions for culverts and underpasses that provide access to agricultural and/or pasturelands	Project office	-Document review -Site audit	Quarterly	-FOIAS -Independent experts (environmental/social)
C11	Health and Safety/ Labor and Working Conditions	C11.1. Occupational Health and Safety/Labor and Working Conditions	-Employment agreements -Number of work incidents/accidents/near misses -Number of personnel who are infected with an infectious disease -Source and quality of drinking water	-Project office -Camp Sites	-Document review	Quarterly	-FOIAS -Independent expert (environmental /health and safety)
			-Use of PPEs -Health and safety signs -Fire safety equipment/systems -Accommodation conditions	-Camp Sites -Road construction sites -Quarries	-Site audit -Visual observation	Quarterly	-FOIAS -Independent expert (environmental /health and safety)
			Number of health and safety trainings provided	-Project office -Camp Sites	-Document review	Quarterly	-FOIAS -Independent experts (environmental /health and safety)
			-Emergency Preparedness and Action Plan -Number of drills conducted	Project office	-Document review	Quarterly	-FOIAS -Independent experts (environmental /health and safety)
			-Grievance mechanisms for Project personnel -Grievances received from Project personnel	Project office	-Document review	Quarterly	-FOIAS -Independent experts
		C11.2. Community Health and Safety	-Employment data on the security personnel -Trainings provided to security personnel -Grievances received and replied to regarding the acts of security personnel	-Project office -Camp Sites	-Document review	Quarterly	-FOIAS -Independent experts
C12	Visual Aesthetics	C12.1. Visual Disturbance	-Visual barriers	Sensetive receptors	-Site audit -Review of grievance logs	Quarterly	-FOIAS -Independent experts
C13	Public Consultation	C13.1. Stakeholder Engagement	-Implementation of Stakeholder Engagement Plan -Number of stakeholder engagement activities/events conducted -Presence and functionality of ADMP web-site	Project office	-Document review	Quarterly	-FOIAS -Independent experts
		C13.2. Grievance Mechanism	-Statistics on the grievances received and solved	Project office	-Document review -Media screen	Quarterly	-FOIAS -Independent experts
		C13.3. Information Disclosure	-Disclosure of Supplementary ESIA documents	Project office	-Document review	Quarterly	-FOIAS

Operation							
O1	Environmental and Social Management System (ESMS)	O1.1. Policy and ESMP	-Project-specific Environment and Social Policy -Organizational Structure (number and CVs of the personnel employed under the Environmental and Social Interaction Department) -Periodical ESMP Performance Review and Monitoring Reports -Number of non-compliant situations -Project-specific Emergency Preparedness and Response Plan -Existence and validity of the legal environmental and health and safety permits -Budget allocated/spent for ESMP implementation -Number and scope of trainings, number of participants, training hours per employee, training materials, and trainings provided to sub-contractors, etc. -Measures taken to ensure compliance of sub-contracts with ESMP measures	Project office	Document review	Annual	-FOIAS -Independent experts
				Project office	Document review	Annual	-FOIAS -Independent experts
O2	Land Use and Property	O2.1. Afforestation	Implementation of afforestation (area afforested, number of trees planted, success of planting, etc.)	Project office	-Document review -Site audit	Annual	-FOIAS -Independent experts
O3	Topography, Soils and Geology	O3.1. Erosion	Erosion control measures taken (drainage channels, barriers, etc.)	-Embankment locations -Immediate area of Motorway	Site audit	Annual	-FOIAS -Independent experts
		O3.2. Quarry	Rehabilitated area	Location of quarries	Site audit	Annual	-FOIAS -Independent experts
		O.3.3. Geotechnics	Maintenance requirement of engineering structures	Foundations and viaducts supports, bridges, other structural elements	Site audit	Annual	-FOIAS/Project (technical) experts -Independent experts
O4	Wastes	O4.1. Waste management	-List of hazardous materials/chemicals supplied, stored and used (inc. information on type and amount/volume) -Type (i.e. municipal, packaging, waste oil, etc.) and amount of wastes produced/disposed of -Waste management/disposal agreements done with licensed companies -Waste Management Plans -Temporary Waste Storage Areas -Site practices on waste management (e.g. general housekeeping rules, source separation practice, containers, containment structures, etc.)	-Operation facilities/buildings -Service areas	-Site audit -Document review	Annual	-FOIAS -Independent experts
O5	Water Resources	O5.1. Drainage	Presence and functionality of drainage system	-Motorway route	-Site audit	Annual	-FOIAS -Independent experts
		O5.2. Water supply	-Sources and amount of water supply -Water supply permits	-Operation facilities/buildings -Service areas	-Site audit -Document review	Annual	-FOIAS -Independent experts
		O5.3. Wastewater management	-Environmental permits for domestic package wastewater treatment plant discharges -Wastewater disposal agreements/channel connection permits to be done with municipalities -Capacity of domestic package wastewater treatment plants -Discharge/disposal volumes	-Domestic Package Wastewater Treatment Plants	-Document review	Annual	-FOIAS -Independent experts (environmental)
O6	Ecology	O6.1.Terrestrial Flora	*Ziziphora taurica subsp. cleonioides*	Flora 9: 35S 591567 E 4201899 N	-Site survey	Twice a year (timing to be determined by experts)	-Flora experts
			Sensitive species and habitats				
			Revegetation	Project AoI			
		O.6.2. Terrestrial Fauna	Alternative habitats	Project AoI	-Site survey	Twice a year	-Fauna experts
			Animal passes	Ecological bridge			
		O.6.3 Aquatic Flora/Fauna	All fish species and river/creek crossings	Project AoI	Site survey	Twice a year	-Hydrobiology experts
O7	Air Quality	O7.1. Gaseous Pollutants	NO_x, SO_X, VOC	Sensetive receptors	-Site measurements	Annual	-Independent experts (environmental) -Accredited laboratories
			Grievances received on impacts related with gaseous emissions	Project office	-Review of grievance logs	Annual	-FOIAS -Independent experts
O8	Environmental Noise and Vibration	O8.1. Environmental Noise	Environmental Noise (dBA)	Sensetive receptors	-Site measurements	Annual or Upon Grievance	-FOIAS -Independent experts (environmental) -Accredited laboratories
			Grievances received on impacts related with traffic noise	Project office	-Review of grievance logs	Annual	-FOIAS Independent experts

O9	Cultural Heritage	O9.1. Newly registered sites	Number of sites, which have been registered as a result of cultural heritage studies	Project office Databases of Cultural Heritage authorities	-Document review	One-off at the beginning of operation	-FOIAS -Independent experts (environmental/ cultural heritage)
O10	Socio-economy	O10.1. Employment	Employment statistics (direct and contracted workers, local/non-local/foreign)	Project office	-Document review	Annual	-FOIAS -Independent experts (environmental/social)
		O10.2. Social responsibility/volunteer activities	Number and scope of social responsibility/volunteer projects/activities conducted	Project office	-Document review	Annual	-FOIAS -Independent experts (environmental/social)
O11	Health and Safety/Labor and Working Conditions	O11.1. Occupational Health and Safety/Labor and Working Conditions	-Employment agreements -Number of work incidents/accidents/near misses during operation and maintenance works	-Project office -Operation facilities/buildings -Service areas	-Document review	Annual	-FOIAS -Independent experts (environmental /health and safety)
			-Emergency Preparedness and Action Plan -Number of drills conducted	Project office	-Document review	Annual	-FOIAS -Independent experts (environmental /health and safety)
			-Grievance mechanisms for project personnel -Grievances received from project personnel	Project office	-Document review	Annual	-FOIAS -Independent experts
		O11.2. Community Health and Safety	-Traffic safety measures taken (safety systems established, traffic signs, etc.) -Traffic accident records on the Motorway	-Motorway -Project office	-Site audit -Document review	Annual	-FOIAS -Independent experts (environmental /health and safety)
O12	Public Consultation	O12.1. Stakeholder Engagement	-Implementation of Stakeholder Engagement Plan -Number of stakeholder engagement activities/events conducted -Presence and functionality of ADMP web-site	Project office	-Document review	Annual	-FOIAS -Independent experts
		O12.2. Grievance Mechanism	Statistics on the grievances received and replied to	Project office	-Document review -Media screen	Annual	-FOIAS -Independent experts
		O12.3. Information Disclosure	-Disclosure of Supplementary ESIA documents	Project office	-Document review	Annual	-FOIAS

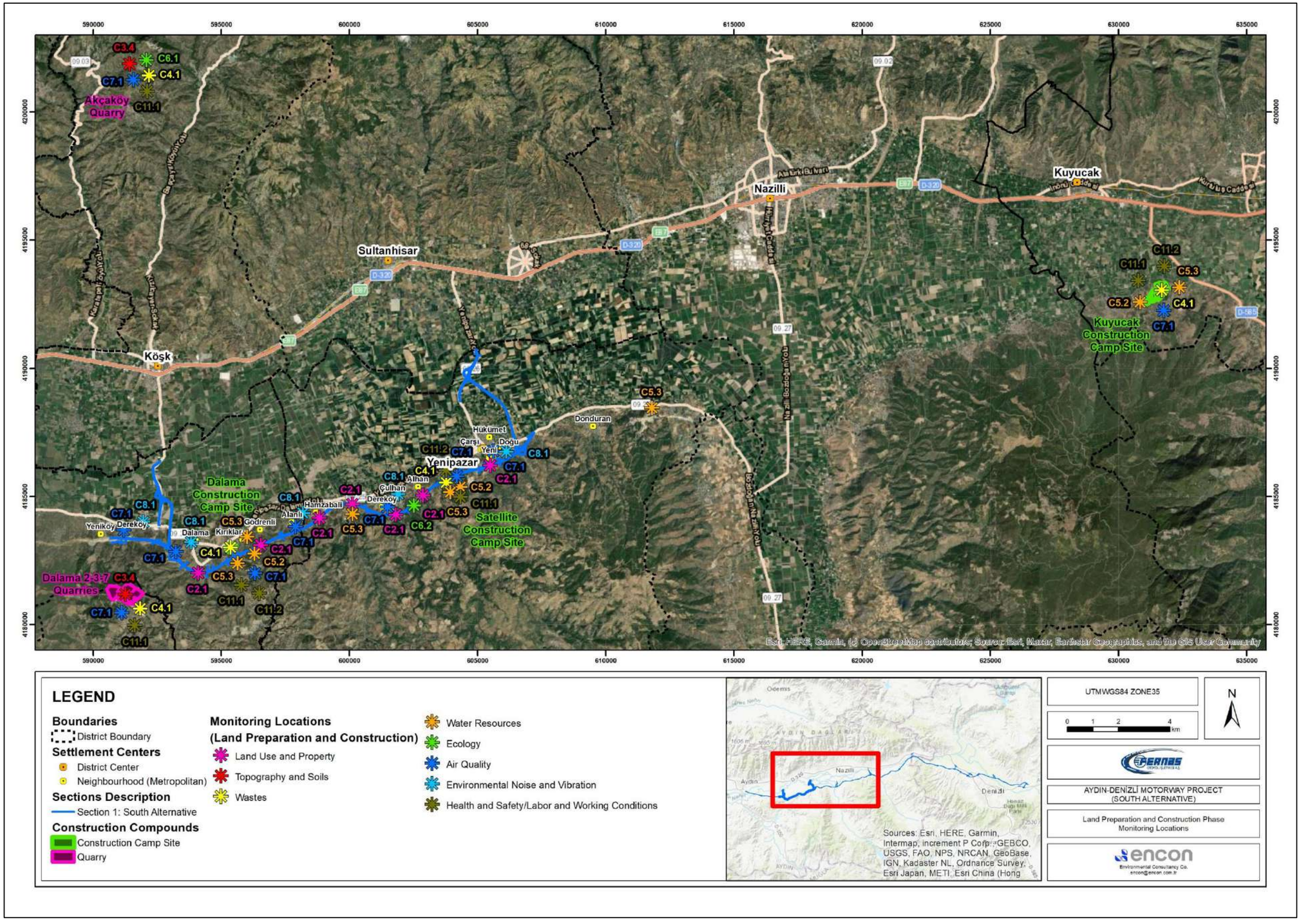


Figure 20.2 Land Preparation and Construction Phase Monitoring Locations

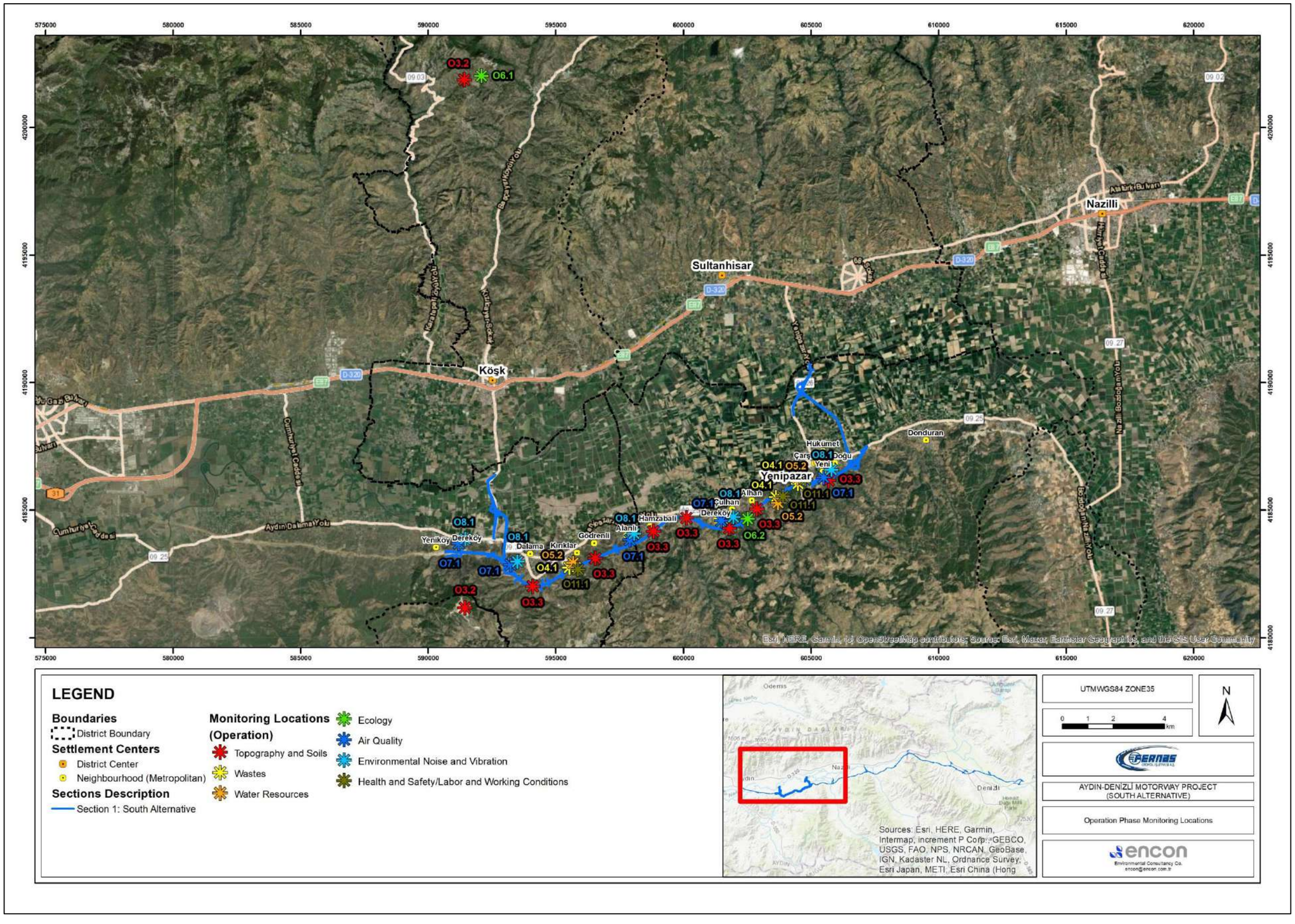


Figure 20.3 Operation Phase Monitoring Locations

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- https://www.epa.gov/so2-pollution
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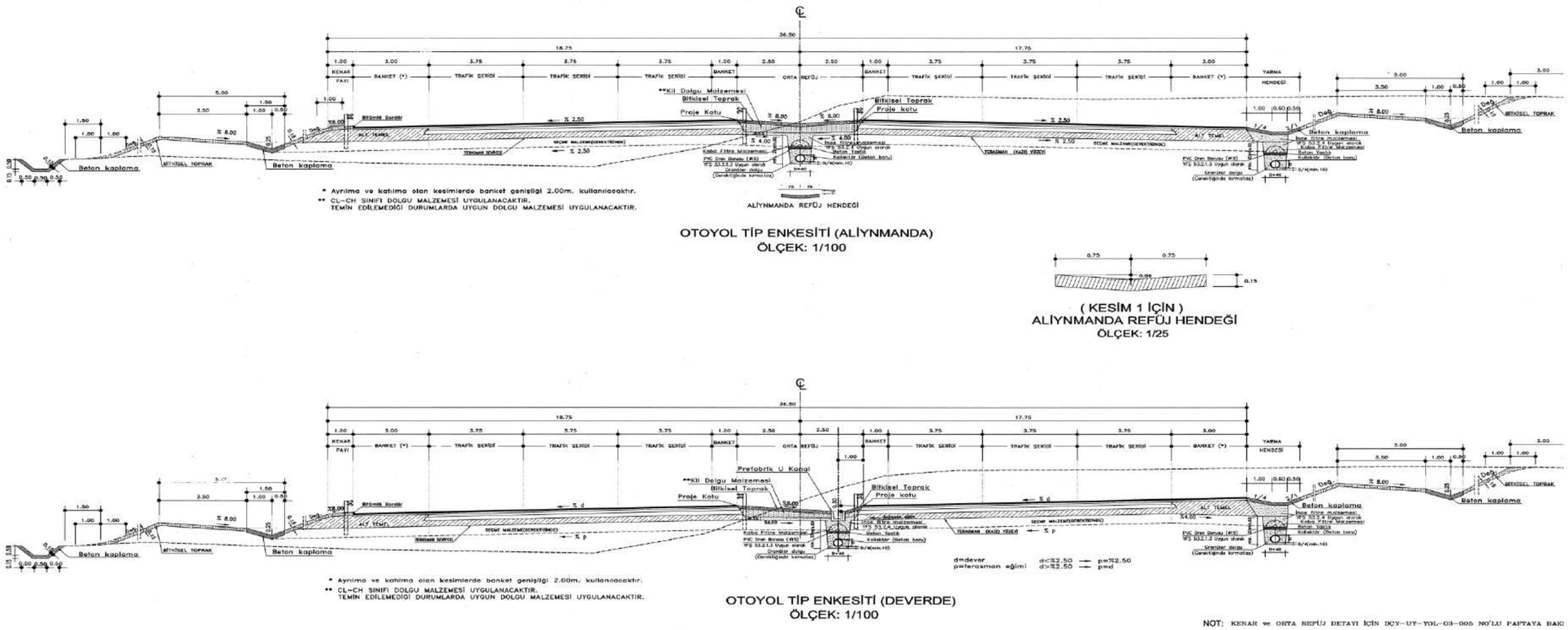
ANNEXES

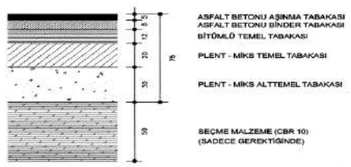
ANNEX–1

DRAWINGS

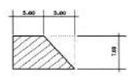
Annex-1 DRAWINGS

Annex-1.1 Typical Cross-Section for the Motorway's Main Carriageway (in Turkish)

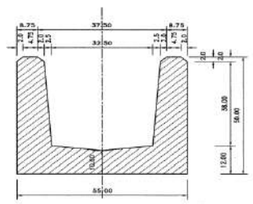




YOL ÜSTYAPI DETAYI
ÖLÇEK: 1/20

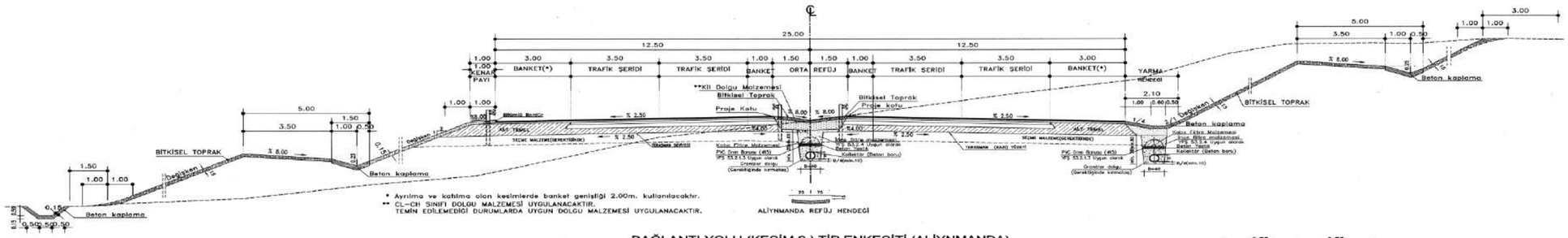


BİTÜMLÜ BORDÜR DETAYI
ÖLÇEK: 1/5

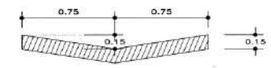


U KANAL DETAYI
ÖLÇEK: 1/10

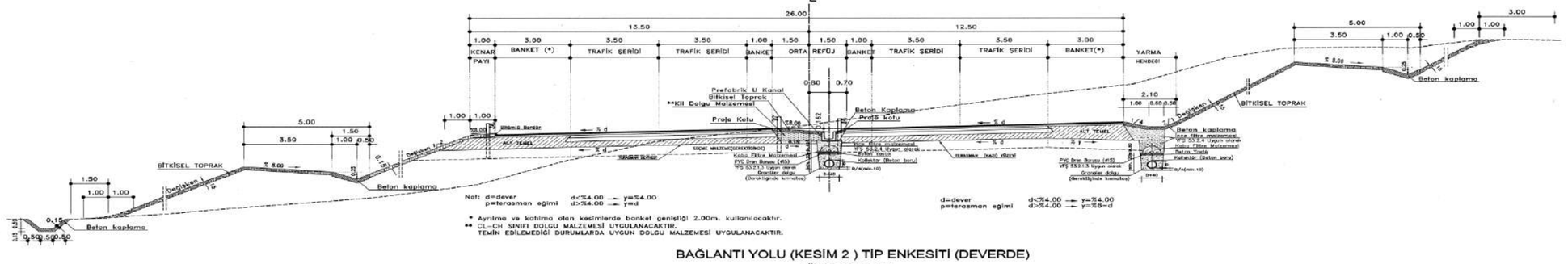
Annex-1.2 Typical Cross-Section for the Motorway's Access Roads (in Turkish)



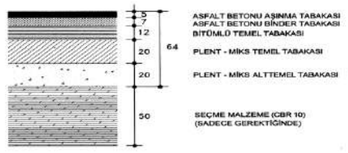
BAĞLANTI YOLU (KESİM 2) TİP ENKESİTİ (ALİYNMANDA)
ÖLÇEK: 1/100



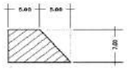
(KESİM2 İÇİN)
ALİYNMANDA REFÜJ HENDEĞİ
ÖLÇEK: 1/25



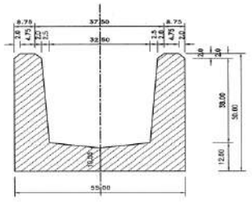
BAĞLANTI YOLU (KESİM 2) TİP ENKESİTİ (DEVERDE)
ÖLÇEK: 1/100



YOL ÜSTYAPI DETAYI
ÖLÇEK: 1/20

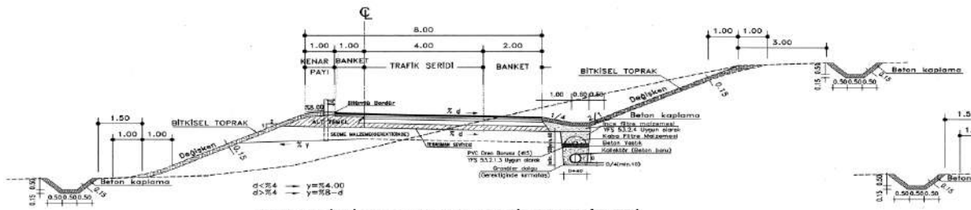


BİTÜMLÜ BORDÜR DETAYI
ÖLÇEK: 1/5

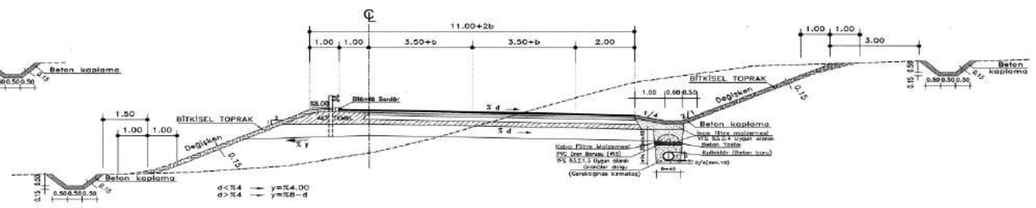


U KANAL DETAYI
ÖLÇEK: 1/10

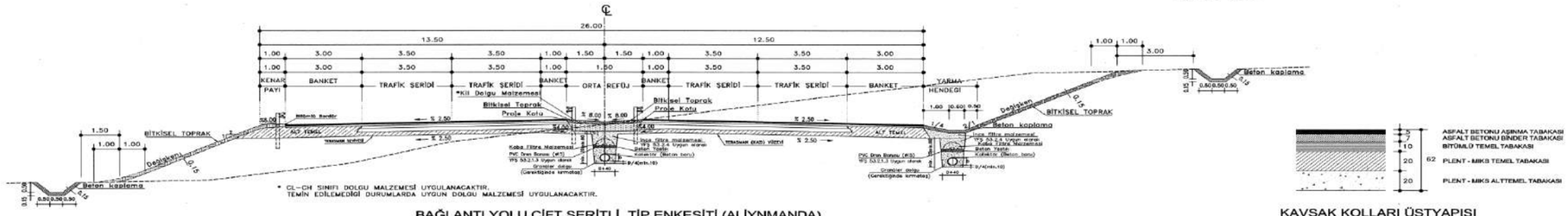
Annex-1.3 Typical Cross-Section for the Interchange Arms and Access Roads (in Turkish)



TEK ŞERİTLİ KAVŞAK KOLLARI TİP ENKESİTLERİ
ÖLÇEK: 1/100

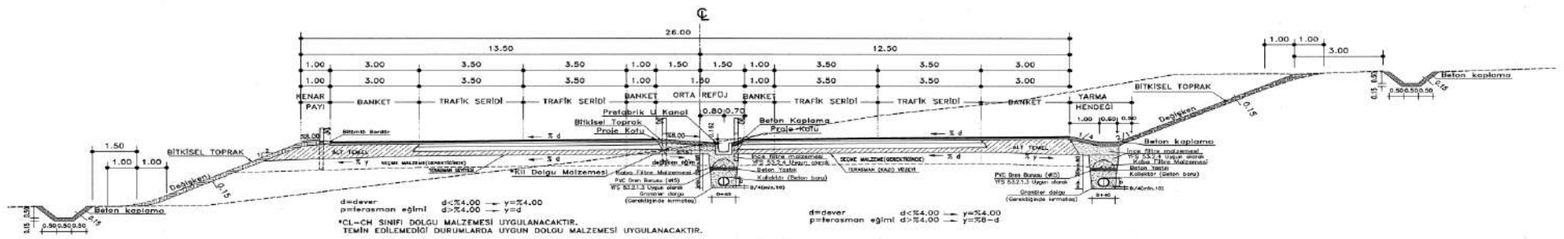


ÇİFT ŞERİTLİ KAVŞAK KOLU TİP ENKESİTİ
ÖLÇEK: 1/100

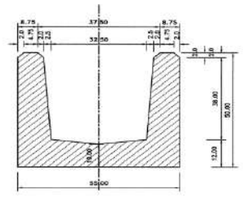


BAĞLANTI YOLU ÇİFT ŞERİTLİ TİP ENKESİTİ (ALİYNMANDA)
ÖLÇEK: 1/100

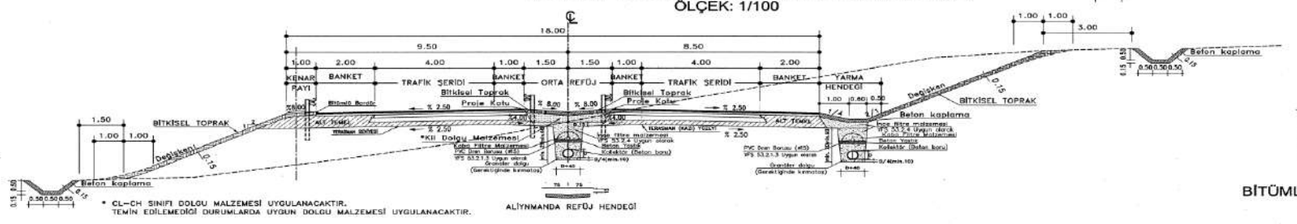
KAVŞAK KOLLARI ÜSTYAPISI
ÖLÇEK: 1/20



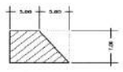
BAĞLANTI YOLU ÇİFT ŞERİTLİ TİP ENKESİTİ (DEVERDE)
ÖLÇEK: 1/100



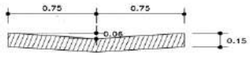
U KANAL DETAYI
ÖLÇEK: 1/10



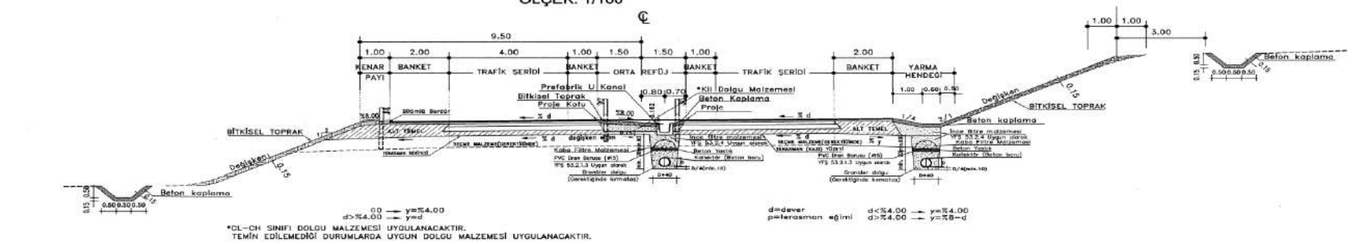
BAĞLANTI YOLU TEK ŞERİTLİ TİP ENKESİTİ (ALİYNMANDA)
ÖLÇEK: 1/100

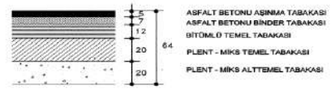


BİTÜMLÜ BORDÜR DETAYI
ÖLÇEK: 1/5



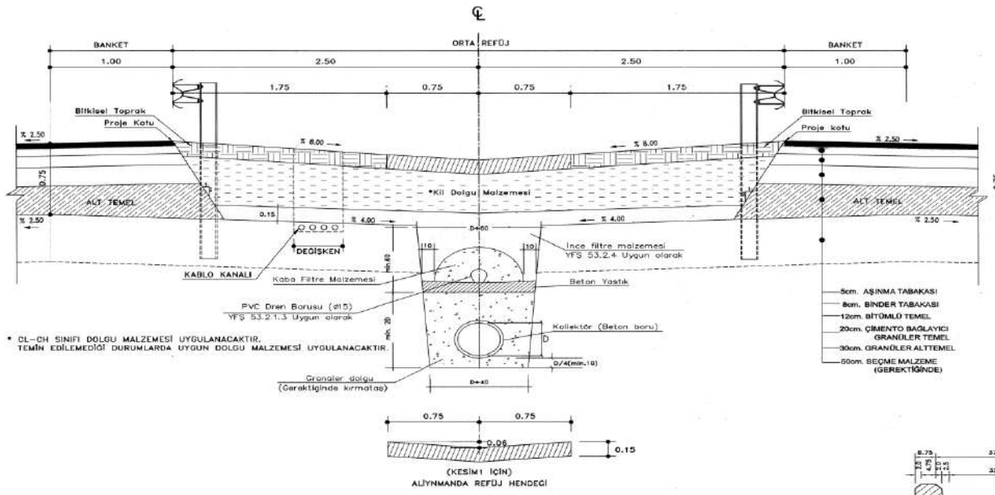
(KESİM 1 İÇİN)
ALİYNMANDA REFÜJ HENDEĞİ
ÖLÇEK: 1/25



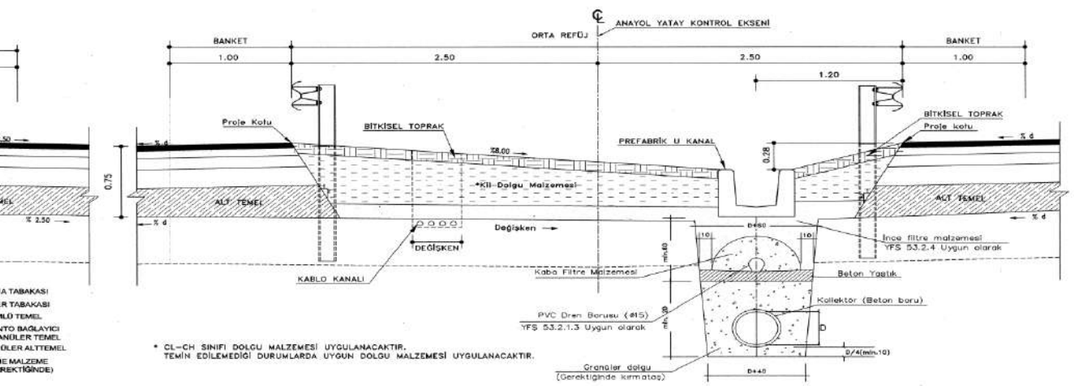


BAĞLANTI YOLU ÜSTYAPISI
ÖLÇEK: 1/20

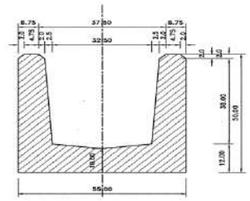
Annex-1.4 Typical Cross-Section for the Central Reserve of the Motorway (in Turkish)



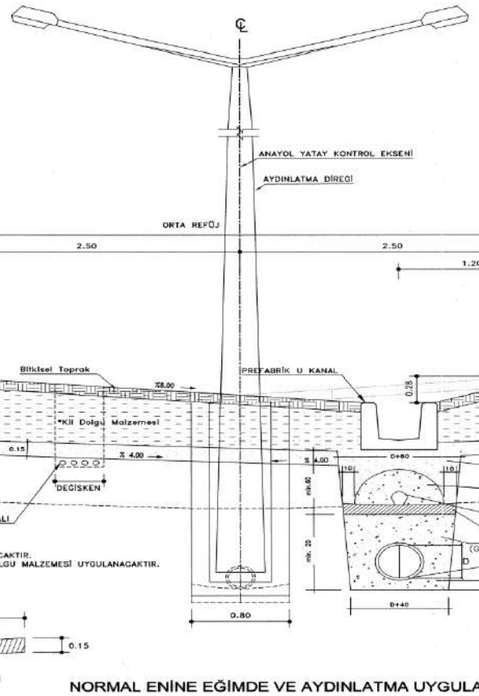
NORMAL ENİNE EĞİMDE ORTA REFÜJ DETAYI
ÖLÇEK: 1/25



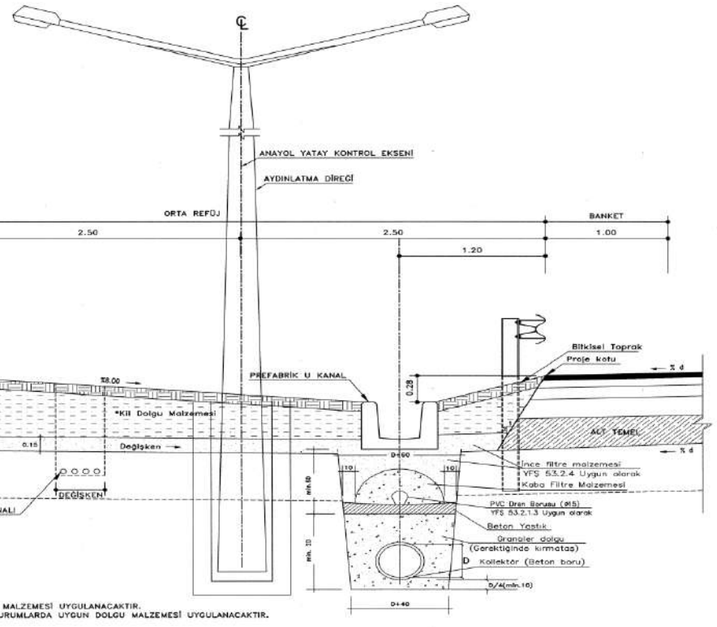
DEVERLİ KESİTTE ORTA REFÜJ DETAYI
ÖLÇEK: 1/25



F TİPİ HENDEK (U KANAL)
ÖLÇEK: 1/10

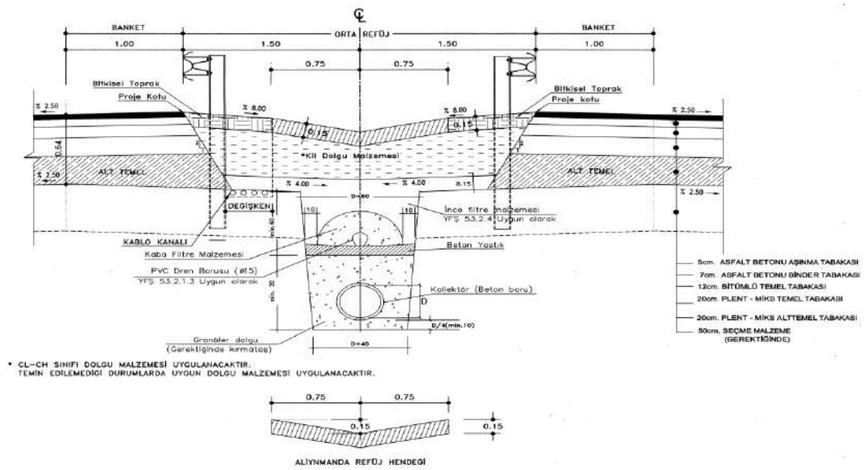


NORMAL ENİNE EĞİMDE VE AYDINLATMA UYGULANAN KESİMLERDE
ORTA REFÜJ DETAYI

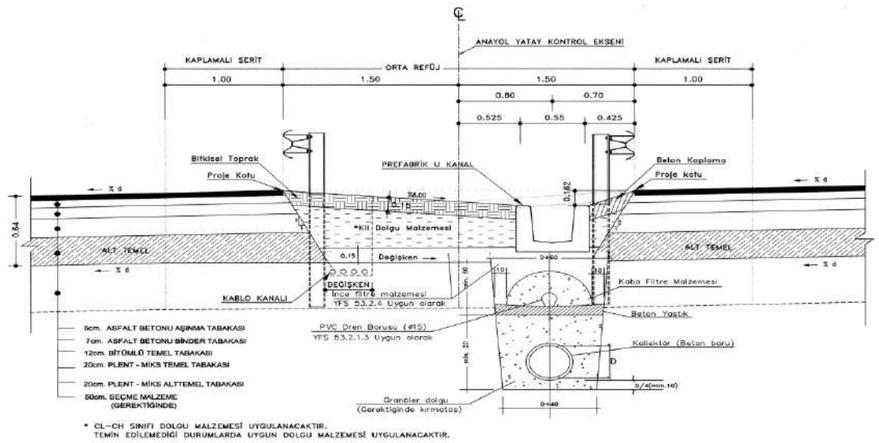


DEVERLİ KESİTTE VE AYDINLATMA UYGULANAN KESİMLERDE
ORTA REFÜJ DETAYI
ÖLÇEK: 1/25

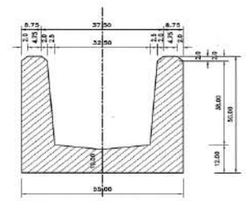
Annex-1.5 Typical Cross-Section for the Central Reserve of the Access Roads (in Turkish)



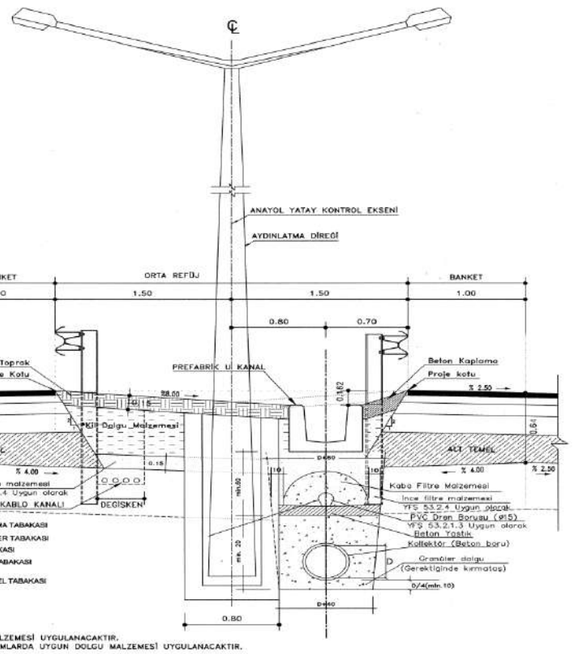
NORMAL ENİNE EĞİMDE ORTA REFÜJ DETAYI
ÖLÇEK: 1/25



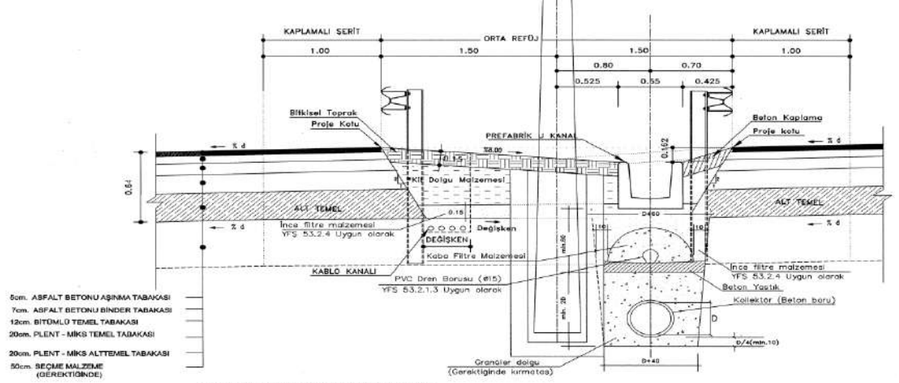
DEVERLİ KESİTTE ORTA REFÜJ DETAYI
ÖLÇEK: 1/25



F TİPİ HENDEK (U KANAL)
ÖLÇEK: 1/10

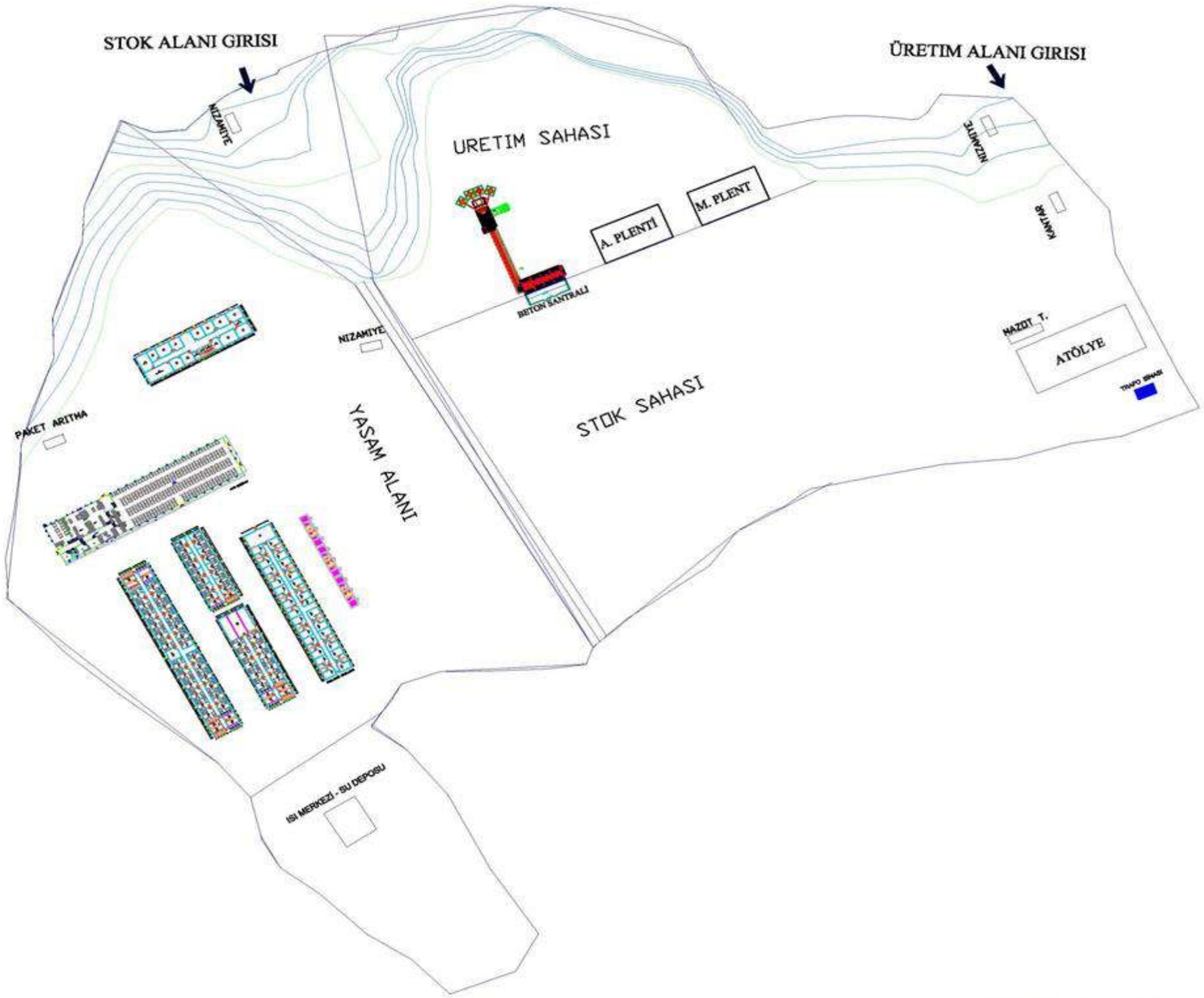


NORMAL ENİNE EĞİMDE VE AYDINLATMA UYGULANAN KESİMLERDE
ORTA REFÜJ DETAYI

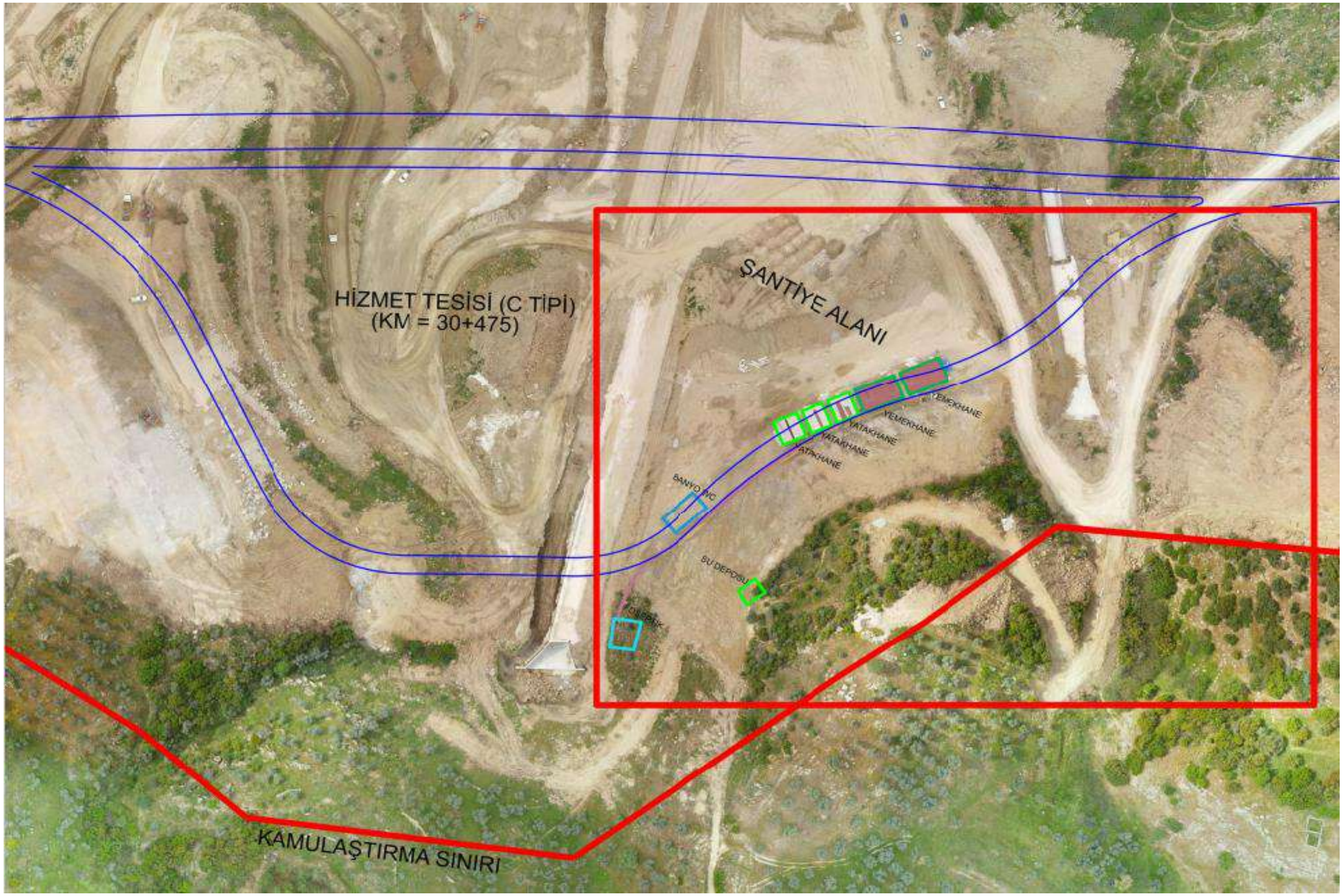


DEVERLİ KESİTTE VE AYDINLATMA UYGULANAN KESİMLERDE
ORTA REFÜJ DETAYI

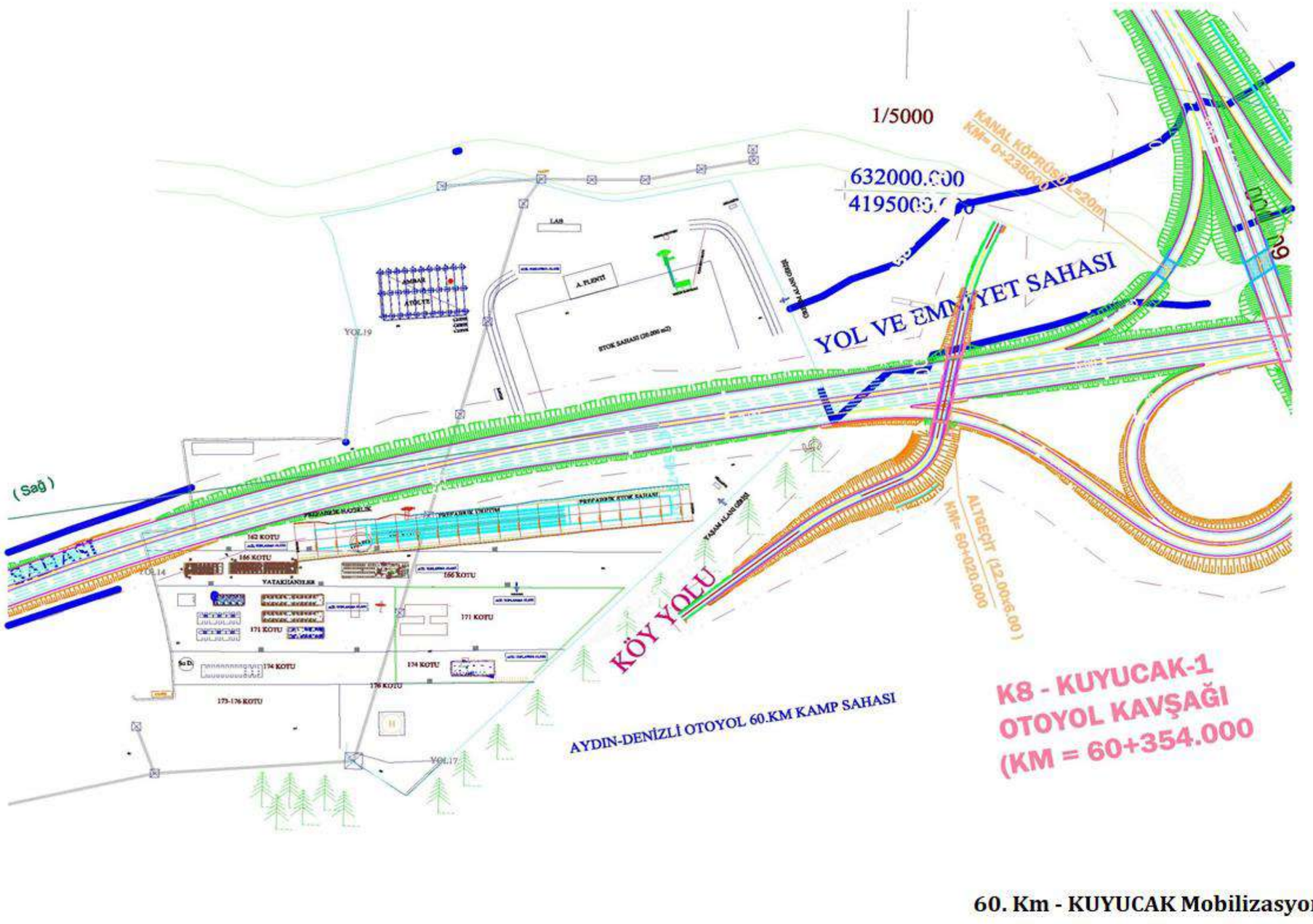
Annex-1.6 Layout plan of Dalama Construction Camp Site (in Turkish)



Annex-1.7 Layout plan of Satellite Construction Camp Site (in Turkish)



Annex-1.8 Layout plan of Kuyucak Construction Camp Site (in Turkish)



ANNEX–2

OFFICIAL DOCUMENTS AND LETTERS

ANNEX–2.1

EIA POSITIVE DECISION

ADMP

T.C.
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI

T.C.
ÇEVRE ve ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Konu: "Aydın- Denizli Otoyolu" Projesi ÇED Olumlu Kararı

DAĞITIMLI

Aydın, Denizli İlleri, Merkez, Buharkent(Çubukdagı), Kuyucak, Nazıllı, Yenipazar, Merkez, Honaz, Sarayköy İlçeleri, Aydın Denizli Mevkii'nde, T.C. Ulaştırmaş Denizcilik ve Haberleşme Bakanlığış Karayolları Genel Müdürlüğü tarafından yapılması planlanan Aydın- Denizli Otoyolu projesi ile ilgili olarak Bakanlığımıza Çevrimiçi ÇED süreci Yönetim Sisteminden sunulan ÇED Raporu, İnceleme Değerlendirme Komisyonu tarafından incelenmiş ve değerlendirilmiştir.

Aydın- Denizli Otoyolu hakkında ÇED Yönetmeliğinin Geçici 1. Maddesi kapsamında 14. maddesi gereğince Bakanlığımızca "Çevresel Etki Değerlendirmesi Olumlu" Kararı verilmiş olup, Aydın Valiliği (Çevre ve Şehircilik İl Müdürlüğü), Denizli Valiliği (Çevre ve Şehircilik İl Müdürlüğü) tarafından kararın halka duyurulması gerekmektedir.

Söz konusu projeye ait Nihai ÇED Raporu ve eklerinde belirtilen hususlar ile 2872 sayılı Çevre Kanununa istinaden yürürlüğe giren yönetmeliklerin ilgili hükümlerine uyulması, mer'i mevzuat uyarınca ilgili kurum/kuruluşlardan gerekli izinlerin alınması, yatırımın başlangıç ve inşaat dönemine ilişkin bilgilendirme raporlarının Bakanlığımıza, projede yapılacak Yönetmeliğe tabi değişikliklerin de Bakanlığımıza veya Aydın Valiliği (Çevre ve Şehircilik İl Müdürlüğü), Denizli Valiliği (Çevre ve Şehircilik İl Müdürlüğü) 'ne iletilmesi gerekmektedir.

Bilgilerinizi ve gereğini arz ve rica ederim.

M. Mustafa SATILMIŞ
Bakan a.
Genel Müdür

BELGENİN ASLI
ELEKTRONİK İMZALIDIR.
09/02/2017
Erol BARIŞ

Ek: ÇED Olumlu Belgesi

T.C.
KARAYOLLARI GENEL MÜDÜRLÜĞÜ
Genel Evrak ve Arşiv Şefliği

Belgenin	Kayıt Sayısı	51325
	Kayıt Tarihi	10 Şubat 2017
	Kayıt Saati	11:33
HAVALE EDİLECEK YER		

Adres: Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9.km No:278 Çankaya/ANKARA
Telefon : 0 312 410 10 00 Faks : 0 312 417 02 57
Elektronik Ağ:www.csb.gov.tr e-posta :aysegul.boran@csb.gov.tr

T.C.
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI

T.C.
ÇEVRE ve ŞEHİRCİLİK BAKANLIĞI

DAĞITIM: Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Ankara Çevre Yönetimi Genel Müdürlüğü (Atık Yönetimi Dairesi Başkanlığı)
Ankara Çevre Yönetimi Genel Müdürlüğü (Hava Yönetimi Dairesi Başkanlığı)
Ankara Enerji ve Tabii Kaynaklar Bakanlığı (Maden İşleri Genel Müdürlüğü)
Ankara Enerji ve Tabii Kaynaklar Bakanlığı (TEİAŞ Genel Müdürlüğü)
Ankara Karayolları Genel Müdürlüğü
Ankara Kültür ve Turizm Bakanlığı (Kültür Varlıkları ve Müzeler Genel Müdürlüğü)
Ankara Kültür ve Turizm Bakanlığı (Yatırım ve İşletmeler Genel Müdürlüğü)
Ankara Mekansal Planlama Genel Müdürlüğü
Ankara MTA Genel Müdürlüğü
Ankara Orman ve Su İşleri Bakanlığı (Doğa Koruma ve Milli Parklar Genel Müdürlüğü)
Ankara Orman ve Su İşleri Bakanlığı (DSİ Genel Müdürlüğü)
Ankara Orman ve Su İşleri Bakanlığı (Orman Genel Müdürlüğü)
Ankara Tabiat Varlıklarını Koruma Genel Müdürlüğü
Aydın Buharken Belediye Başkanlığı
Aydın Büyükşehir Belediye Başkanlığı
Aydın Valiliği (Çevre ve Şehircilik İl Müdürlüğü)
Aydın Valiliği (İl Afet ve Acil Durum Müdürlüğü)
Aydın Valiliği (İl Gıda, Tarım ve Hayvancılık Müdürlüğü)
Aydın Valiliği (İl Halk Sağlığı Müdürlüğü)
Denizli Büyükşehir Belediye Başkanlığı
Denizli Valiliği (Çevre ve Şehircilik İl Müdürlüğü)
Denizli Valiliği (İl Afet ve Acil Durum Müdürlüğü)
Denizli Valiliği (İl Gıda, Tarım ve Hayvancılık Müdürlüğü)
Denizli Valiliği (İl Halk Sağlığı Müdürlüğü)
Petrol ve Madencilik Şube Müdürlüğü
T.C. Ulaştırmaş Denizcilik ve Haberleşme Bakanlığış Karayolları Genel Müdürlüğü (Ek)
Proje Sahibi Adres: Ankara il Çankaya ilce İNÖNÜ BULVARI NO:14 06100 YÜCETEPE
Çınar Müh. Müş. A.Ş.
Firma Adres: Ankara ili Öveçler Huzur Mah. 1139.sok. 6/3 06460 Çankaya/Ankara

Ulastırma, Denizcilik ve Haberlesme Bakanlıgı
(Altyapı Yatırımları Genel Müdürlügü)

Yenipazar Belediye Baskanlıgı/AYDIN

Nazilli Belediye Baskanlıgı/AYDIN

Kuyucak Belediye Baskanlıgı AYDIN

Sarayköy Belediye Baskanlıgı/DENIZLI

Pamukkale Belediye Baskanlıgı/DENIZLI

Honaz Belediye Baskanlıgı/DENIZLI

Adres: Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9.km No:278 Çankaya/ANKARA
Telefon : 0 312 410 10 00
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Elektronik Ağ:www.csb.gov.tr
e-posta :aysegul.boran@csb.gov.tr

T.C.
ÇEVRE ve ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

ÇED OLUMLU BELGESİ

25.11.2014 tarih ve 29186 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin Geçici 1. Maddesi kapsamında 14. maddesi gereğince; **"Aydın-Denizli Otoyolu"** projesi hakkında **"Çevresel Etki Değerlendirmesi Olumlu"** kararı verilmiştir.

M.Mustafa SATILMIŞ
Bakan a.
Genel Müdür

Karar Tarihi : 08.02.2017
Karar No : 4518
Proje Sahibi : T.C. ULAŞTIRMAŞ DENİZCİLİK VE HABERLEŞME BAKANLIĞIŞ KARAYOLLARI GENEL MÜDÜRLÜĞÜ
Proje Yeri : Aydın, Denizli İli, Merkez, Buharkent(Çubukdagı), Kuyucak, Nazıllı, Yenıpazar, Merkez, Honaz, Sarayköy İlçesi, Aydın Denizli

T.C.
ÇEVRE ve ŞEHİRCİLİK BAKANLIĞI

DAĞITIM: Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Ankara Çevre Yönetimi Genel Müdürlüğü (Atık Yönetimi Dairesi Başkanlığı)
Ankara Çevre Yönetimi Genel Müdürlüğü (Hava Yönetimi Dairesi Başkanlığı)
Ankara Enerji ve Tabii Kaynaklar Bakanlığı (Maden İşleri Genel Müdürlüğü)
Ankara Enerji ve Tabii Kaynaklar Bakanlığı (TEİAŞ Genel Müdürlüğü)
Ankara Karayolları Genel Müdürlüğü
Ankara Kültür ve Turizm Bakanlığı (Kültür Varlıkları ve Müzeler Genel Müdürlüğü)
Ankara Kültür ve Turizm Bakanlığı (Yatırım ve İşletmeler Genel Müdürlüğü)
Ankara Mekansal Planlama Genel Müdürlüğü
Ankara MTA Genel Müdürlüğü
Ankara Orman ve Su İşleri Bakanlığı (Doğa Koruma ve Milli Parklar Genel Müdürlüğü)
Ankara Orman ve Su İşleri Bakanlığı (DSİ Genel Müdürlüğü)
Ankara Orman ve Su İşleri Bakanlığı (Orman Genel Müdürlüğü)
Ankara Tabiat Varlıklarını Koruma Genel Müdürlüğü
Aydın Buharken Belediye Başkanlığı
Aydın Büyükşehir Belediye Başkanlığı
Aydın Valiliği (Çevre ve Şehircilik İl Müdürlüğü)
Aydın Valiliği (İl Afet ve Acil Durum Müdürlüğü)
Aydın Valiliği (İl Gıda, Tarım ve Hayvancılık Müdürlüğü)
Aydın Valiliği (İl Halk Sağlığı Müdürlüğü)
Denizli Büyükşehir Belediye Başkanlığı
Denizli Valiliği (Çevre ve Şehircilik İl Müdürlüğü)
Denizli Valiliği (İl Afet ve Acil Durum Müdürlüğü)
Denizli Valiliği (İl Gıda, Tarım ve Hayvancılık Müdürlüğü)
Denizli Valiliği (İl Halk Sağlığı Müdürlüğü)
Petrol ve Madencilik Şube Müdürlüğü
T.C. Ulaştırmaş Denizcilik ve Haberleşme Bakanlığış Karayolları Genel Müdürlüğü (Ek)
Proje Sahibi Adres: Ankara il Çankaya ilce İNÖNÜ BULVARI NO:14 06100 YÜCETEPE
Çınar Müh. Müş. A.Ş.
Firma Adres: Ankara ili Öveçler Huzur Mah. 1139.sok. 6/3 06460 Çankaya/Ankara

Ulastırma, Denizcilik ve Haberlesme Bakanlıgı
(Altyapı Yatırımları Genel Müdürlügü)

Yenipazar Belediye Baskanlıgı/AYDIN

Nazilli Belediye Baskanlıgı/AYDIN

Kuyucak Belediye Baskanlıgı AYDIN

Sarayköy Belediye Baskanlıgı/DENIZLI

Pamukkale Belediye Baskanlıgı/DENIZLI

Honaz Belediye Baskanlıgı/DENIZLI

Adres: Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9.km No:278 Çankaya/ANKARA
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T.C.
ÇEVRE ve ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Konu: "Aydın- Denizli Otoyolu" Projesi ÇED Olumlu Kararı

DAĞITIMLI

Aydın, Denizli İlleri, Merkez, Buharkent(Çubukdagı), Kuyucak, Nazıllı, Yenıpazar, Merkez, Honaz, Sarayköy İlçeleri, Aydın Denizli Mevkii'nde, T.C. Ulaştırmaş Denizcilik ve Haberleşme Bakanlığış Karayolları Genel Müdürlüğü tarafından yapılması planlanan Aydın- Denizli Otoyolu projesi ile ilgili olarak Bakanlığımıza Çevrimiçi ÇED süreci Yönetim Sisteminden sunulan ÇED Raporu, İnceleme Değerlendirme Komisyonu tarafından incelenmiş ve değerlendirilmiştir.

Aydın- Denizli Otoyolu hakkında ÇED Yönetmeliğinin Geçici 1. Maddesi kapsamında 14. maddesi gereğince Bakanlığımızca "Çevresel Etki Değerlendirmesi Olumlu" Kararı verilmiş olup, Aydın Valiliği (Çevre ve Şehircilik İl Müdürlüğü), Denizli Valiliği (Çevre ve Şehircilik İl Müdürlüğü) tarafından kararın halka duyurulması gerekmektedir.

Söz konusu projeye ait Nihai ÇED Raporu ve eklerinde belirtilen hususlar ile 2872 sayılı Çevre Kanununa istinaden yürürlüğe giren yönetmeliklerin ilgili hükümlerine uyulması, mer'i mevzuat uyarınca ilgili kurum/kuruluşlardan gerekli izinlerin alınması, yatırımın başlangıç ve inşaat dönemine ilişkin bilgilendirme raporlarının Bakanlığımıza, projede yapılacak Yönetmeliğe tabi değişikliklerin de Bakanlığımıza veya Aydın Valiliği (Çevre ve Şehircilik İl Müdürlüğü), Denizli Valiliği (Çevre ve Şehircilik İl Müdürlüğü) 'ne iletilmesi gerekmektedir.

Bilgilerinizi ve gereğini arz ve rica ederim.

M. Mustafa SATILMIŞ
Bakan a.
Genel Müdür

Ek: ÇED Olumlu Belgesi

Adres: Mustafa Kemal Mahallesi Eskişehir Devlet Yolu (Dumlupınar Bulvarı) 9.km No:278 Çankaya/ANKARA
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ANNEX–2.2

URGENT EXPROPRIATION DECISION

CUMHURBAŞKANI KARARI

Karar Sayısı: 2973

Aydın-Denizli Otoyolu ve Bağlantı Yolları Projesi kapsamında bazı taşınmazların Karayolları Genel Müdürlüğü tarafından acele kamulaştırılmasına ilişkin ekli Kararın yürürlüğe konulmasına, 2942 sayılı Kamulaştırma Kanununun 27 nci maddesi gereğince karar verilmiştir.

23 Eylül 2020

Recep Tayyip ERDOĞAN
CUMHURBAŞKANI

23/9/2020 TARİHLİ VE 2973 SAYILI CUMHURBAŞKANI KARARININ EKİ
KARAR

MADDE 1- (1) Aydın-Denizli Otoyolu ve Bağlantı Yolları Projesi (km: 0+000.00-138+400.00) kapsamında, ekli krokide gösterilen güzergâh üzerinde bulunan;

a) Aydın İli;

1) Efeler İlçesi, Çeştepe, Tepecik, Gölhisar, Şahnalı, Mesutlu, Armutlu, Kozalaklı, Karahayıt, Yeniköy, Dereköy, Dalama, Kırıklar, Gödrenli ve Alanlı mahalleleri,

2) Köşk İlçesi, Köşk ve Çiftlikköy mahalleleri,

3) Yenipazar İlçesi, Hamzabalı, Dereköy, Çulhan, Alhan, Çarşı, Yeni, Karaçakal, Doğu, Donduran ve Direcik mahalleleri,

4) Bozdoğan İlçesi, Alamut Mahallesi,

5) Sultanhisar İlçesi, Atça Mahallesi,

6) Nazilli İlçesi, Hamidiye, Toygar, Kırçaklı, Yazırlı, Mescitli, Dualar, Pirlibey, Pirlibey/Atatürk ve Pirlibey/Cumhuriyet mahalleleri,

7) Kuyucak İlçesi, Uzgur (Çamdibi), Karapınar, Kuyucak, Pamucak, Ören, Çiftlik (Başaran), Azizabat, Yamalak ve Bucakköy mahalleleri,

8) Karacasu İlçesi, Yenice Mahallesi,

9) Buharkent İlçesi, Buharkent/Merkez Mahallesi,

b) Denizli İli;

1) Sarayköy İlçesi, Kabaağaç, Tekke, Tırkaz, Kumluca, Acısu, Gerali, Duacılı, Yakayurt, Sazak, Sığma, Bala, Sakarya, Beylerbeyi ve Altıntepe mahalleleri,

2) Babadağ İlçesi, Kelleci Mahallesi,

3) Merkezefendi İlçesi, Yeşilyayla, Kumkısık, Hacıeyüplü, Üzerlik, Salihağa ve Çeltikçi mahalleleri,

4) Pamukkale İlçesi, Karakova, Korucuk, Küçükdere, Irlıganlı, Eldenizli ve Kocadere mahalleleri,

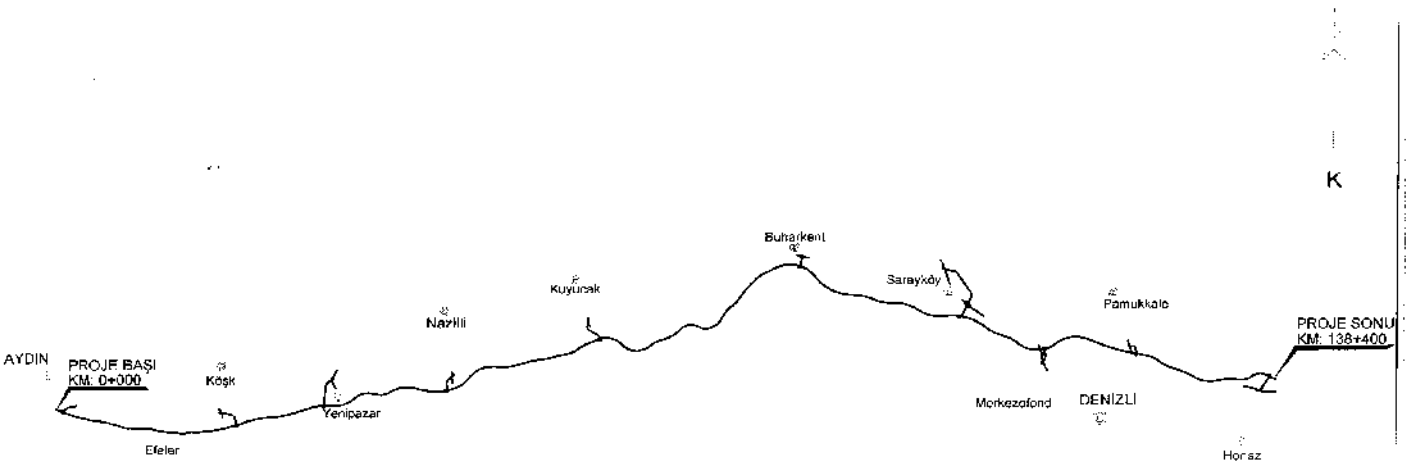
5) Honaz İlçesi, Gürlek, Kocabaş, Dereçiftlik ve Honaz mahalleleri,

sınırları içerisinde yol yapım çalışmalarının yürütülmesi ve anılan il ve ilçelerimizde Proje için gerekli olan malzeme ocakları (taş ocağı, ariyet ocağı vb.), kazı fazlası depo yerleri ve bağlantı yollarının yapımı amacıyla ihtiyaç duyulan taşınmazlar ile üzerlerindeki müştemilatın Karayolları Genel Müdürlüğü tarafından acele kamulaştırılması kararlaştırılmıştır.

MADDE 2- (1) Bu Karar yayımı tarihinde yürürlüğe girer.

MADDE 3- (1) Bu Karar hükümlerini Ulaştırma ve Altyapı Bakanı yürütür.

AYDIN - DENİZLİ OTOYOLU
(KM. 0+000 - 138+400)



ANNEX–2.3

EIA – OUT OF SCOPE

SOUTH ALTERNATIVE

T.C.
KARAYOLLARI GENEL MÜDÜRLÜĞÜ
2. Bölge Müdürlüğü

Sayı : E.72157479- 755 / 805919 27.04.2022
Konu : Güzergah Değişikliği Hk.

FERNAS OTOYOL İŞLETMESİ A.Ş.YE
Karapınar Mah. Karapınar Cad. No:364 Kuyucak/AYDIN

İlgi: Çevre Şehircilik ve İklim Değişikliği İl Müdürlüğü nün 20/04/2022 tarihli ve 98914016 - 3475588 sayılı yazısı.

Yapım çalışmaları devam eden Aydın-Denizli Otoyolu Projesi Yap-İşlet-Devret Modeli ile Yapılması, İşletilmesi ve Devri İşi'nde;

Aydın Valiliği, Çevre, Şehircilik ve İklim Değişikliği İl Müdürlüğü'nün güzergah değişikliği ile ilgili yazısı yazımız ekinde gönderilmektedir.

Gereğini rica ederim.

Tarkan ALTUNTAŞ
Otoyol Yapım Şefi

EK:
İlgi Yazı Fotokopisi (1 Syf.)

DAĞITIM:
Gereği:
Fernas Otoyol İşletmesi A.Ş.

Bilgi:
Emay Uluslararası Mühendislik ve Müşavirlik A.Ş.

Kazım Dirik Mahallesi Sanayi Cad. No : 41 Bornova/İZMİR
Bilgi İçin: Murat TÜRKOĞLU
Büro ve Kayıt Memuru
Telefon No : 232 4935000 Faks: 232 4627277 Tel - Faks: 232 4935000-
İnternet Adresi : www.kgm.gov.tr **KEP: kgm2bolge@hs01.kep.tr** e-posta : mturkoglu@kgm.gov.tr
İlgili Birim : Aydın - Denizli Otoyolu Kontrol Başmühendisliği -

T.C.
AYDIN VALİLİĞİ
Çevre, Şehircilik ve İklim Değişikliği İl Müdürlüğü

Sayı : E-98914016-220.03-3475588

Konu : Aydın- Denizli Otoyolu Güzergah Değişikliği

KARAYOLLARI 2. BÖLGE MÜDÜRLÜĞÜNE

İlgi : a) 11/04/2022 tarihli ve 159438 Referans No'lu Başvuru.
b) Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğünün 08.04.2022 tarihli ve E-81195450-220.03-3377547 sayılı yazısı.

Aydın İli, Yenıpazar-Efeler İlçelerinde Dalama- Gödrenli- Hamzabali Mahalleleri mevkiinde Karayolları 2. Bölge Müdürlüğü tarafından yapılması planlanan Aydın - Denizli Otoyolu Projesi'nin Km: 15+856 – 34+630 kesiminde Güzergah Değişikliği (18,8 km) projesi, Bakanlığımızın İlgi (b) kayıtlı yazısı kapsamında değerlendirilmiş olup, 25/11/2014 tarih ve 29186 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren ÇED Yönetmeliği Listelerindeki eşik değerden az olduğu için kapsam dışı olarak değerlendirilmiştir.

Ancak, planlanan yatırım ile ilgili olarak, 5491 sayılı kanunla değişik 2872 sayılı Çevre Kanunu ile bu Kanuna istinaden çıkarılan Yönetmeliklerin ilgili hükümlerine uyulması ve diğer mer'i mevzuat çerçevesinde öngörülen gerekli izinlerin alınması, ekolojik dengenin bozulmamasına, çevrenin korunmasına ve geliştirilmesine yönelik tedbirlere riayet edilmesi gerekmektedir.

Bilgilerinizi ve gereğini rica ederim.

Mustafa Hulusi ARAT
Vali a.
Vali Yardımcısı

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Bilgi için:Himmet BAĞ
Mühendis

ANNEX–3

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

Annex-3 EMERGENCY PREPAREDNESS and RESPONSE PLAN

1. INTRODUCTION

The Aydın-Denizli Motorway is a project planned by the Ministry of Transportation and Infrastructure (MoTI), General Directorate of Highways ("KGM" or "the Administration") in accordance with the Law on Implementation of Some of the Investments and Services in the Framework of Build, Operate and Transfer Model (Law No: 3996). KGM, as the Project's owner and administrative authority, has commissioned a special purpose entity (SPV) for the implementation of the project under the related Build, Operate and Transfer (BOT) contract. In this regard, Fernas Group of Companies (Fernas Otoyol Işletmesi A.Ş.- FOIAS) has been awarded with a BOT Contract for the implementation of the Project.

FOIAS sought for potential financing for the Project, and granted the required finance from Ziraat Bankası, İş Bankası, Yapı Kredi Bankası and Akbank (four together, Lenders). To meet the environmental and social requirements of the lenders, who have required international environmental and social standards and guidelines to be adopted in the implementation of the Projects that would be financed by them, a full-scale ESIA process has been completed for the Project in April, 2022.

However, after completion of the ESIA study, it was stated by the Project Sponsor that there was an order from Administration for a change in the route design which might bring changes in the existing project components of the route and so that environmental and social impacts. Thus, this Supplementary ESIA study has been conducted for the South Alternative, the redesigned part of the Aydın-Denizli Motorway Project (ADMP), in the scope of Supplementary Lenders Information Package (SLIP).

Emergency preparedness and response can be defined as the organization, coordination and implementation of a range of measures to prevent, mitigate, respond to, overcome and recover from the consequences of emergency events affecting the community, its assets and the environment. Emergency preparedness is an integrated part of the planning and implementation process for the project. It starts from proper planning and design and extends to safe construction and operation including further considerations regarding emergency response.

Emergency planning requires identification and assessment of the hazards likely to cause an emergency. In this regard risk assessment and management will be carried out in line with related Turkish legislation and international standards. Emergency Preparedness and Response Policy (EPRP) focuses on reducing the risks that would end up as emergencies and at the same time being prepared for the unavoidable emergency events. The first part is more related to proper environmental, health and safety management, while the second part is concentrating on the means of response to emergencies (including sufficient care, trained staff, tools and equipment, etc.). Thus, this EPRP establishes the targets and framework regarding the means for dealing with possible emergency situations during construction and operation.

2. PROJECT SPONSOR EMERGENCY PREPAREDNESS AND RESPONSE POLICY (EPRP)

2.1 Objectives

Project Sponsor and its nominated subcontractors will respond to and manage emergency events in accordance with statutory requirements, best practice procedures and the requirements of this EPRP. Project Sponsor will implement this policy with a continuous improvement approach by monitoring and further developing/refining the relevant emergency response measures.

The main objective of the EPRP of Project Sponsor is to establish strategies and procedures for managing all aspects of emergency situations associated with project components. In this regard the EPRP consists of targets and procedures regarding the following aspects of emergency management:

- Prevention and preparation measures (actions to be taken before emergency)
- Response measures (actions to be taken during emergency)
- Damage assessment and recovery measures (actions to be taken after emergency)

2.2 Principles

The basic principles that Project Sponsor has adopted, which provide a basis for the policies and practices provided in the upcoming sections are as follows:

- Providing a safe working environment for the workers in line with Occupational Health and Safety Management policies.
- Providing safe transportation infrastructure for all users in line with Community Health and Safety Management policies.
- Maintaining the integrity of the motorway system through proper operation, maintenance and repair as necessary.
- Managing the project in an environmentally responsible and sustainable manner in line with Environmental Management policies.
- Providing road corridors and user facilities with appropriate amenity.
- Developing, implementing and maintaining emergency preparedness and response plans and practices for emergency events specific to the project components.
- Ensuring that there will be sufficient number of trained and capable staff and relevant tools and equipment, at all times, to manage emergency events.
- Monitoring and reviewing the EPRP regularly and making improvements as necessary.
- Involving subcontractors and suppliers in the adoption of the same commitments taken on in the matter of EPRP.

2.3 Institutional/Organizational Arrangements

2.3.1 Framework for Emergency Preparedness and Response

The framework for EPR is outlined by the relevant Turkish laws and regulations and international industry/sector good practices for motorways. The minimum requirements are established by the provisions in relevant legislation, including provisions for the occupational and public health and safety integrated with the environmental protection in the case of accidental cases or disastrous events. This legal and regulatory framework comprises the following:

- Environmental Law No: 2872
- Occupational Health and Safety Law No: 6331
- Labor Law No: 4857
- Social Insurance and General Health Insurance Law No: 5510
- Public Health Law No: 1593
- Law of Precautions and Aids in Case of Disasters Affecting Public No: 7269
- Law on Forests No: 6831
- Law on Special Provincial Administration No: 5302
- Regulation on Occupational Health and Safety Signs
- Regulation on Emergency Situations in Workplaces
- Regulation on Risk Assessment of Health and Safety
- Regulation on Health and Safety Measures to be taken in Workplace Buildings
- Regulation on Health and Safety Provisions in Use of Work Equipment
- Regulation on Health and Safety Measures in Working with Chemical Substances
- Regulation on Protection of Workers from the Hazards of Explosive Environments
- Regulation on Safety Data Sheets on Hazardous Substances and Mixtures
- Regulation on the Classification, Labeling and Packaging of Materials and Mixtures
- Regulation on First Aid

- Regulation on Procedures and Principles of Occupational Health and Safety Trainings of Employees
- Regulation on the Occupational Health and Safety Requirements for Temporary or Fixed-Term Employment
- Regulation on the Occupational Health and Safety in Construction Works
- Regulation on Duties, Authorities, and Responsibilities of Occupational Physicians
- Regulation on Use of Personal Protective Equipment in Workplaces
- Regulation on Protection of Buildings from Fire
- Turkey Building Earthquake Regulation
- Regulation on Buildings to be Constructed in Disaster Regions
- Regulation on Environmental Impact Assessment
- Regulation on Protection of Workers from Vibration-Related Risks
- Regulation on Protection of Workers from Noise-Related Risks
- Regulation on Prevention and Mitigation of Impacts of Large-Scale Industrial Accidents
- Regulation on Transportation of Hazardous Substances via Motorway
- Waste Oil Control Regulation
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 4
- Environmental, Health, and Safety Guidelines for Toll Roads (IFC, 2007)
- Environmental Health and Safety General Guidelines (IFC, 2007)

Some emergency categories are defined regarding to the significance scale of the emergency occasions. Within this regard, four categories are defined from least significant (Category 1) to most significant (Category 4). Some of the incidences defined under these categories can be summarized below in Figure 1.

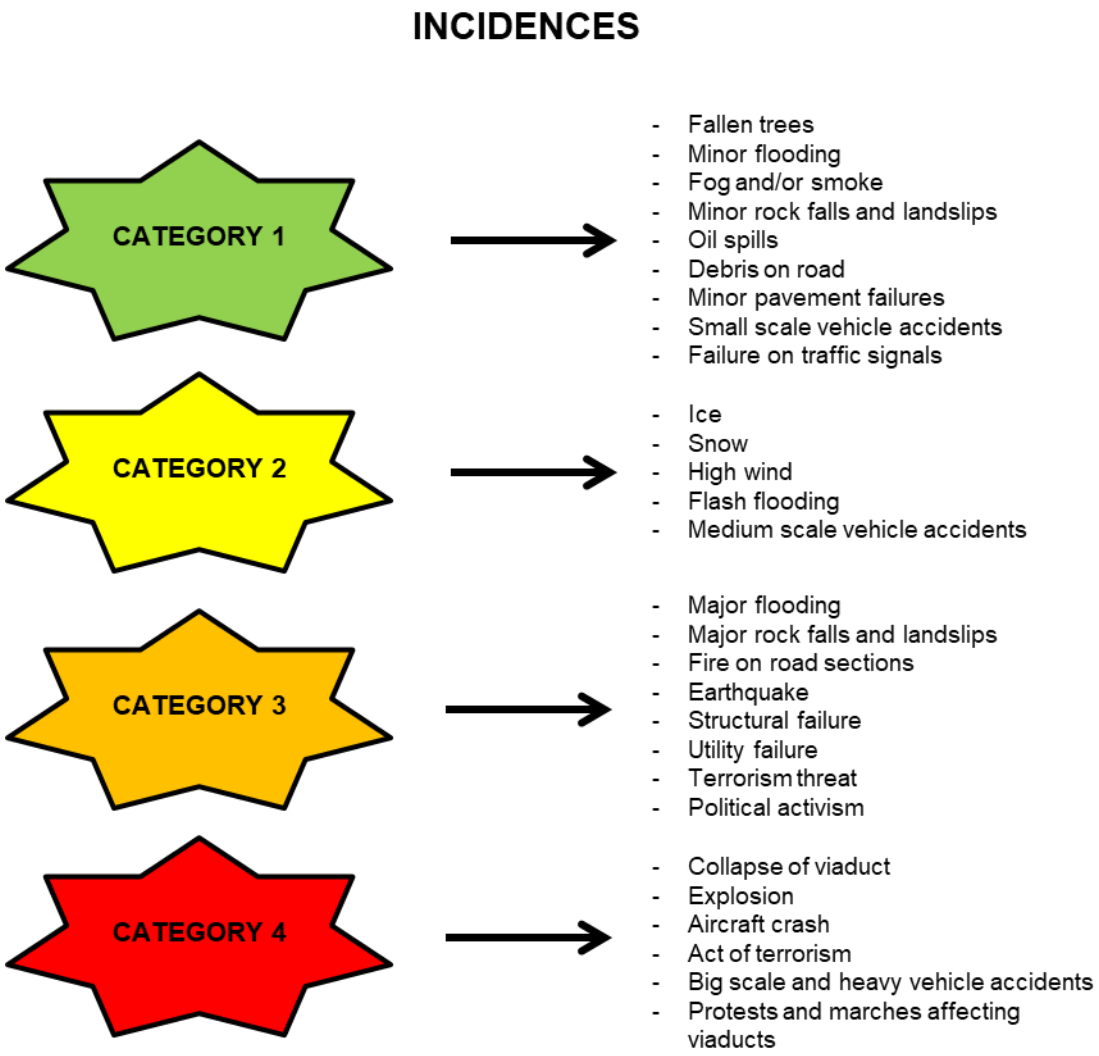

Figure 1 Categories of Incidences

2.3.2 Institutional Arrangements for Emergency Categories 1 and 2

For these emergency categories Project Sponsor, and its subcontractors, are the main responsible bodies. For traffic control and relevant road closures Turkish Police/Gendarme Force will be responsible. Province/District Fire Departments/Services have the responsibility for management of fire incidents during operation phase. Where Police/Gendarme Force or Fire Departments are involved, they act as the Lead Agency and staff of Project Sponsor or (e.g. maintenance subcontractor, etc.) will provide the relevant support.

In this respect, Project Sponsor will assign an Emergency Preparedness and Response Coordinator and establish Emergency Response Teams to act in line with the EPRP. In addition, Emergency Response Centers will be established for control and coordination of emergency response actions. Relevant institutional bodies and information about them are submitted in Table 1 below.

Table 1 Institutional Arrangements and Responsibilities for Emergency Categories 1 and 2

Title	Remark	Responsibilities
Project Sponsor	All activities that are performed during construction and operation phases of the project are under the responsibility of the Project Sponsor.	• Selection and assignment of the Emergency Preparedness and Response Coordinator and approval of Emergency Response Teams to be established by the EPR Coordinator. • Providing necessary resources to Emergency Response Centers (e.g. staff, vehicles, equipment etc.). • Annual management review related to EPRP and approval of the recent version of the EPRP and related procedures. • Approval of the major activities, which are not included in this EPRP, to be developed further and taken during an emergency situation. • Evaluation of the incidence reports prepared after any emergency situation.
Emergency Preparedness and Response Coordinator (EPRC)	In general, implementation of the activities developed and specified in the EPRP and improvement of this policy and related procedures are the main responsibilities of the EPRC.	• Establishment of the Emergency Response Teams (ERT). • Training the ERT and the project staff for emergency situations in line with the EPRP. • Making the division of responsibilities between ERT members. • Reviewing and improving, if necessary, the EPRP and related procedures together with the ERT annually. • Controlling functionality and practicality of the EPRP and related procedures by performing exercises in specified intervals. • According to type of emergency situation, determination of the people that will be contacted during emergency response, and keeping contact information of these people in written form in a place that everybody in the ERT can reach. • Keeping the contact information of the ERT and people that will be contacted in emergency situations updated. • Coordinating the ERT in order to successfully implement the EPRP and related procedures in emergency situations. • After the end of emergency, reviewing the situation with the ERT and preparation of the incidence report. • Communication and coordination with the district and provincial emergency management centers and responsible organizations. • Disclosure or relevant information to public and activities for arising awareness.
Emergency Response Teams (ERT)	Emergency Response Teams will be established from the project staff according to their capabilities.	• Attending the training sections and exercises for implementing the EPRP and related procedures. • Reviewing and improving, if necessary, the EPRP and related procedures annually together with the EPRC. • Informing EPRC when an emergency situation occurs. • According to type of emergency situation, implementing the necessary measures in accordance with the EPRP and related procedures. • Notifying the relevant designated contact people and authorities/agencies. • Reviewing the situation with the EPRC after the end of emergency situation, and preparation of the incidence report.
Emergency Response Centers (ERC)	Emergency Response Centers will be established in the construction sites by EPRC during the construction phase. During the operation phase, the centers will be established in operation center(s) as relevant.	• An ambulance will be available on-site for 24 hours for emergency situations. • Vehicles that will directly be involved in any emergency situation will be identified. • The necessary equipment to be utilized in any emergency situation will be identified and placed in the ERC. • Communication infrastructure to act as centers of coordination. • Sufficient staff to manage emergency response activities.

2.3.3 Institutional Arrangements for Emergency Categories 3 and 4

For these emergency categories relevant governmental agencies have the leading role. Project Sponsor, and its subcontractors, has the responsibility to communicate the situation to relevant authorities and for providing all necessary support during and after emergency incidence. In this regard the General Directorate of Highways (KGM) and its Regional Directorates carry the main responsibilities for severe emergency situations related to the Project, especially during the operation phase, together with relevant local and central governmental agencies. Such severe emergency situations would include occasions such as earthquakes, terrorist attacks, and collapse of viaducts.

The central government and provincial and district authorities have legal responsibility for emergency management nationwide and in their area of authority as they have direct responsibility for the protection of life and property of the public against the effects of natural and human caused disasters. In Türkiye, institutions responsible for emergency preparedness and response mainly include the following governmental bodies:

- General Directorate of Disaster Affairs
- Provincial and district governorships (including all relevant local governmental agencies such as fire departments)
- Municipalities
- Red Crescent of Turkey

In addition, various nongovernmental organizations (NGOs), such as Search and Rescue Association (AKUT), take part in emergency situations, as necessary in coordination with the governmental leading agencies. The hierarchy of responsibility for emergency response at national scale is presented in Figure 2.

At provincial level, local directorate of various agencies carry the responsibility of dealing with emergency situations in coordination with the governor's office, these agencies include, but not limited to, Provincial Directorates of the Ministries for Health, Fire Fighting, Environment, Urbanization and Climate Change, Agriculture and Forestry, and Special Provincial Administration. These emergency situations include natural disasters (e.g. earthquakes, major floods, extended fires, explosions, significant accidents, etc.)

In a major emergency event if the capacity of a local authority (agency/center) responsible for managing emergencies is not sufficient to handle the situation, it shall require support from the closest authorities. In addition, all governmental authorities have obligations to provide relevant support and help in the capacity to overcome major emergency situations (e.g. storms, severe weather conditions, major floods, and earthquakes, accidents on motorway, public health epidemic, civil disturbance/riot, and terrorism).

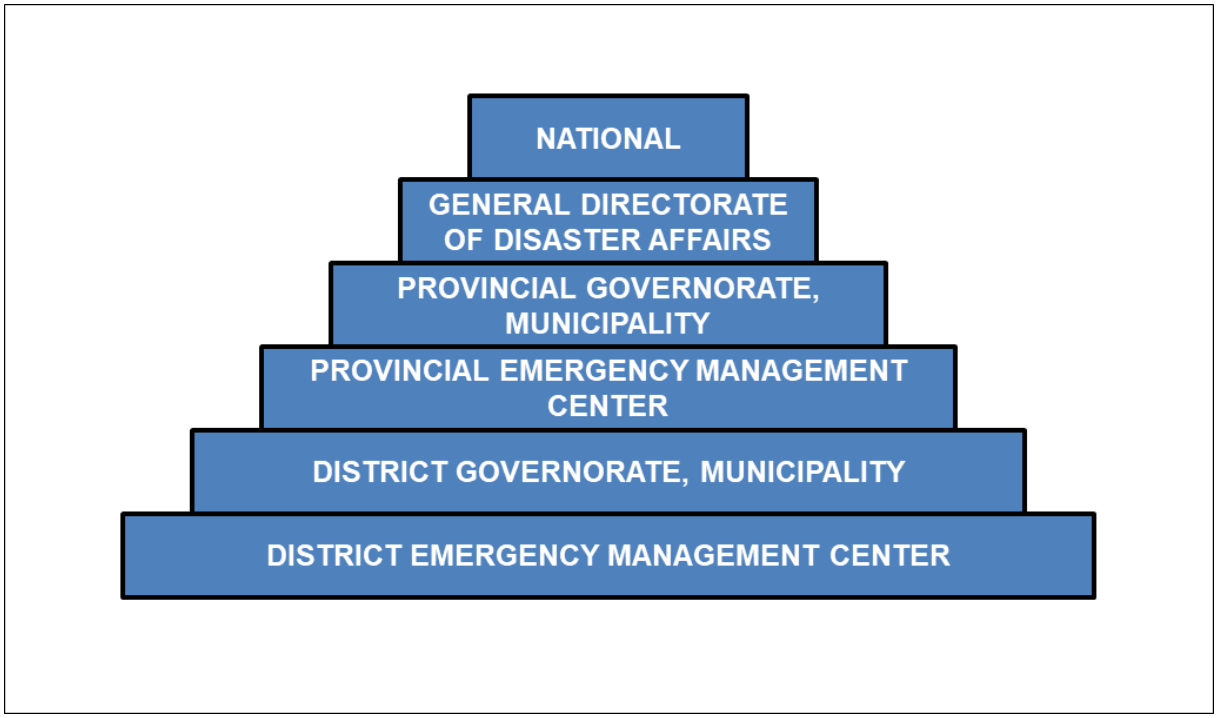

Figure 2 National Scale Emergency Response and Coordination Hierarchy

2.4 Organization Chart

2.4.1 Construction Phase

At the construction phase of South Alternative, there will be an organizational structure responsible for the construction activities. With respect to emergency preparedness and response the organizational structures to be employed would be the same.

It is planned that the Occupational Health and Safety Manager would also act as the Emergency Preparedness and Response Coordinator (EPRC). Thus, emergency preparedness and response would be under the responsibility of the Occupational Health and Safety Department. The emergency response teams and centers would be acting under the coordination of the EPRC. Here it should be noted emergency response teams would be composed of staff from all relevant directorates/department.

The responsibilities and functions of the EPRC and ERT and the functions of the ERC are presented in the previous section. The general EPRP organization chart for the construction phase is presented in Figure 3.

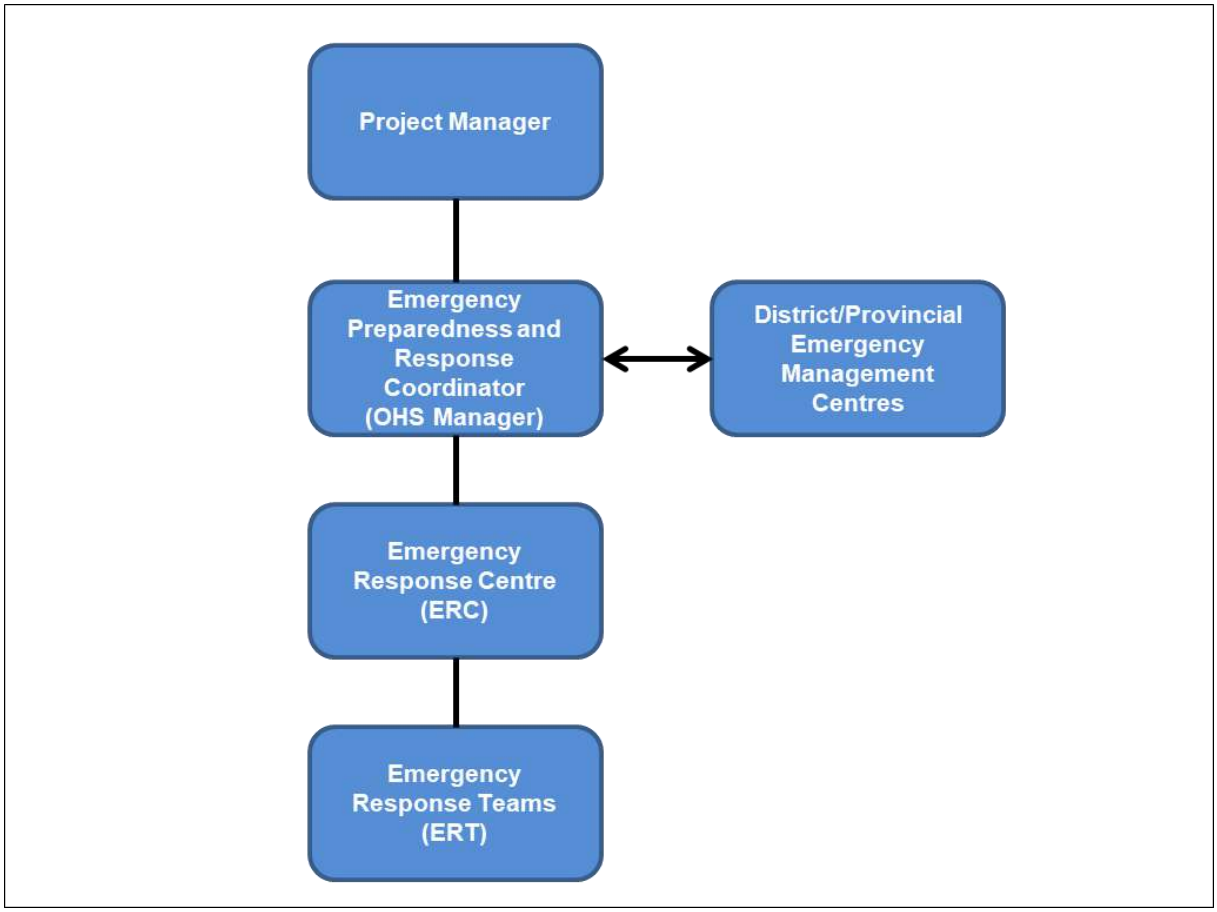

Figure 3 Emergency Preparedness and Response Organization Chart for the Construction Phase

2.4.2 Operation Phase

With the start of the operation period, the organization will be operation-oriented. Roles and responsibilities for Project Coordination, Traffic Management, Safety and Maintenance functions including Traffic and Safety Control and control and maintenance of booth equipment will be assigned.

Similar to the construction phase, the Occupational Health and Safety Manager is envisaged to act as the Emergency Preparedness and Response Coordinator (EPRC) during the operation phase as well. Thus, emergency preparedness and response would be under the responsibility of the Occupational Health and Safety Department. The emergency response teams (composed of staff from various relevant directorates/departments) and centers would be acting under the coordination of the EPRC.

The responsibilities and functions of the EPRC and ERT and the functions of the ERC are presented in the previous section. Therefore, here only the general organizational structure with regard to EPRP is provided. The general EPRP organization chart for the organization phase is presented in Figure 4.

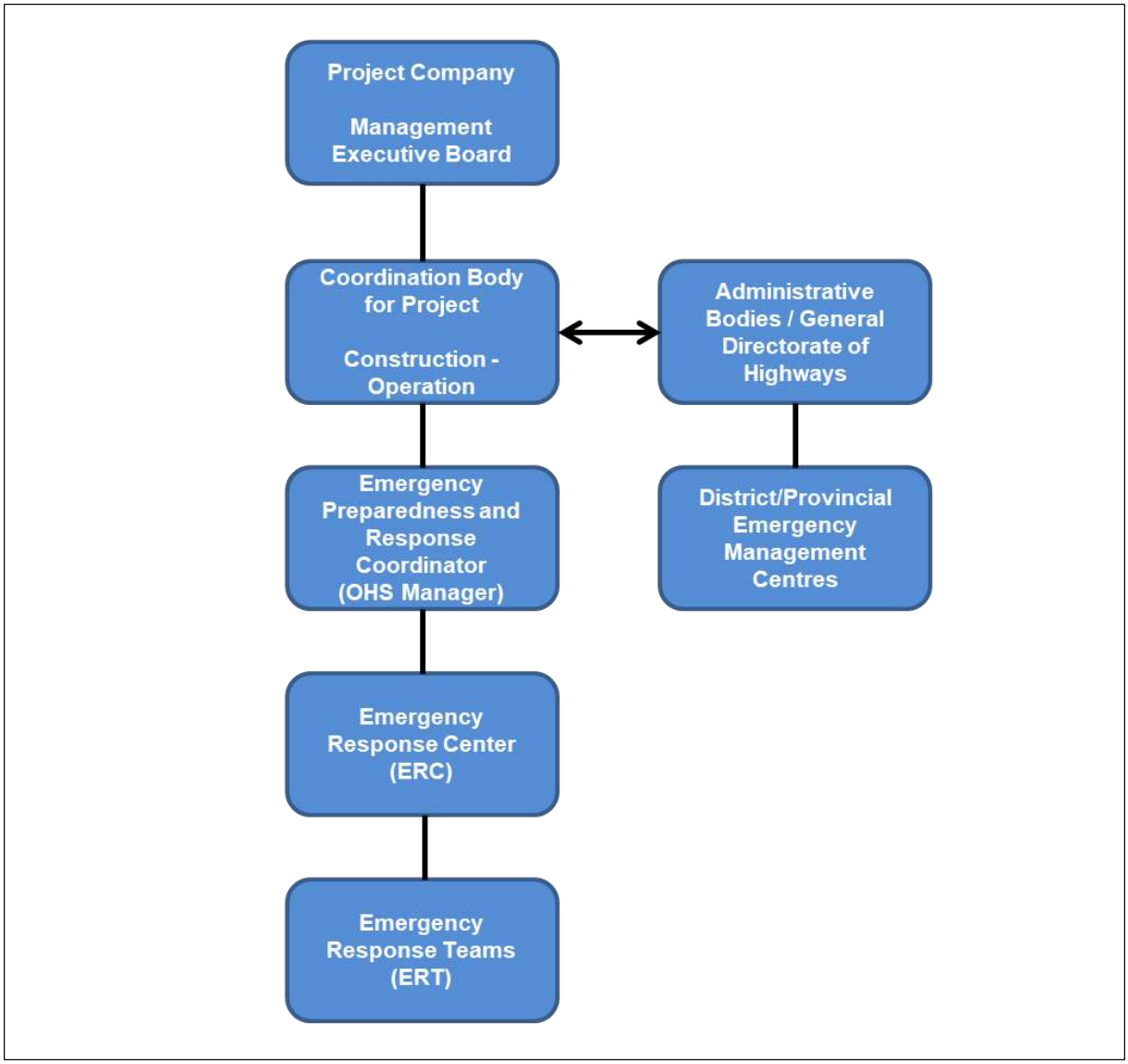

Figure 4 Emergency Preparedness and Response Organization Chart for the Operation Phase

3. PROJECT SAFETY REQUIREMENTS AND EMERGENCY PREPAREDNESS

This section covers the actions to be taken before an emergency situation takes place. These actions are mainly associated with proper planning and design of the project units, construction in accordance with specifications and operation and maintenance in line with project safety requirements. It also includes the actions to be taken for preparing to an emergency such as installation of monitoring and warning systems, communication systems, and carrying out impact studies, training of staff for vigilance, procedures for warning, communication, mobilization of emergency forces and equipment, responsibilities, and evacuation practices.

3.1 Objective and Scope

Project safety requirements aim to develop the project in a safe manner preventing or minimizing the possible impacts to be caused by the project on human and environmental health and safety during its construction and operation. Planning for emergency preparedness aim to eliminate or reduce the impacts of a potential hazard and increase the resilience of potentially affected communities to recover from the consequences. Thus, emergency preparedness planning is a part of project safety requirements and an integral part of the project planning activities.

Project Sponsor is responsible for developing the project in compliance with national and international safety standards including necessary means for the prevention of emergencies related to the project, and where this is not possible minimization of the adverse consequences on humans and the environment. The major emergency preparedness planning actions would include briefly the following:

- Setting, implementing and reviewing the EPRP and related procedures.
- Managing and monitoring the conditions of the Project components.
- Establishing communication mechanisms for close cooperation and coordination with the General and Regional Directorates of Highways, Provincial Governorships and Municipalities across the route of the project.
- Preparing and updating risk assessment studies, taking into account of any new or emerging risk related to the project components and adequacy of present control measures.
- Assigning resources (e.g. man power, equipment, funding, etc.) to establish mitigation measures for the identified hazards that have a risk of causing significant adverse impacts.

3.2 Hazard Identification and Analysis and Control of Risks

3.2.1 General Hazards

In this EPRP a number of major hazards have been identified, which might have the potential to affect the integrity of the project and placing the construction workers, the community residing in the vicinity of the project route and road users at risk. These hazards, any other that might be identified, and their possible consequences would be studied in further detail during environmental and social impact assessment (ESIA) studies.

The hazards are classified into four main categories that reflect the potential level of significance with respect to mainly the consequences. Category 1 and 2 type incidences might be more frequently seen when compared with Category 3 and 4 type incidences. However, generally the consequences of Category 3 and 4 type incidences would be more significant requiring the involvement of more than Project Sponsor including various governmental agencies and sometimes relevant NGOs.

3.2.2 Analysis of Risks

In line with this EPRP and the further planning studies including design and ESIA, Environmental and Social Interaction Department, or consultants to be designated, will conduct risk analyses, as necessary, for all major project components. The results of the risk analysis shall be included in the safety documentation to be submitted to the relevant governmental authorities in line with their reporting requirements.

The risk analysis would take the following factors into consideration:

- All design specifications
- Geographical characteristics (i.e. topography, geology, weather, etc.)

- Forecast for traffic loads (including heavy vehicle traffic)
- Traffic characteristics and type
- Length and geometry of viaducts

As a result of these studies a risk/hazard register would be established and would be reviewed and updated, if necessary, on a regular basis (i.e. annually). While forming and updating the register the following issues would be taken into account:

- Project components and any new installations
- Nearby land use and changes with time
- Demography and settlements, as well as community behavior (e.g. increasing traffic loads on particular sections), and changes with time
- Priorities for risk control
- Opportunities and mechanisms to treat and mitigate risks
- Risk control measures
- Availability of necessary resources and their supply

3.2.3 Risk Control Measures

Based on the results of the risk analysis Project Sponsor aims to reduce the likelihood and adverse consequences of emergency events through risk control measures, which would broadly cover two main areas as follows:

- Physical treatment and measures
- Process and procedural measures

Physical Treatment and Measures

Physical measures include physical safeguards taken, or installed, for prevention and minimization of the occurrences of emergency events. In general, these include the following main items:

- Establishment of proper infrastructure and improvements as necessary such as proper maintenance and upgrading of road surfaces and drainage systems.
- Establishment of standard structural measures such as safety barriers and traffic control devices including signals, warning signs, etc.
- Establishment of maintenance and management units with sufficient resources.

Process and Procedural Measures

These measures mainly cover establishment of systems and procedures that enable effective and efficient emergency response arrangements. In general, these measures would cover the following main areas:

- Management of Project components and work programs.
- Training and awareness increasing programs for project staff.
- Establishing adequate risk management and reporting systems.
- Establishing procedures for the safety of physical and human assets.
- Participating in the municipal and governorship level emergency management planning and response committees.
- Keeping the emergency management among on one of the important management functions through provision of sufficient resources.

3.3 Project Safety Requirements

In Türkiye the safety requirements for motorways are following the European Union (EU) standards based on the fact that Türkiye is in the accession period to EU. In fact, in many fields Türkiye has been adopting the EU acquis. In the following sub-sections the safety requirements are provided for the motorway in general and for viaducts.

3.3.1 General Safety Requirements for the Motorway

In order to secure the proper and safe traffic flow along the motorway some major structures and physical measures will be provided. These measures aim to minimize the potential for accidents and other risky incidences. In addition, they would contribute to make emergency response and management easier and more effective. These can be summarized as follows:

- Service roads and under/over passes
- Big culverts
- Retaining walls
- Maintenance facilities, service and resting/parking areas
- Guard rails
- Traffic signalization plates and lighting
- Horizontal marking

Based on the results of further studies including the risk analysis, further details regarding the physical safety measures for the motorways would be identified and applied as appropriate.

Service Roads

The construction subcontractors will construct service roads in order not the affect (such as increasing the heavy traffic load) the natural flow on the existing roads and for avoiding the passage of heavy vehicles through residential areas to the extent possible. In addition, service roads will be constructed where the traffic will be temporarily diverted. Furthermore, service roads will be used for transportation of the construction machinery, equipment and materials used for the project.

A series of local roads will intersect with the motorway so necessary structures such as under and over passes for these intersections will be built.

Big Culverts and Retaining Walls

The culverts are standard structures of motorways designed generally for the passage of water and some wildlife species. In addition to those, big culverts would be constructed, where necessary, for stream passages and for farm roads.

The retaining walls might be needed at certain sections for achieving soil and slope stability and prevention of rock or stone falling to the road. At such sections retaining walls will be used.

Maintenance Facilities, Service and Resting/parking Areas

Maintaining the motorway surface and structures at best conditions ensured during design and construction is one of the key activities to prevent emergency events. In this regard, sufficient maintenance facilities would be established and regular checks of the motorway would be conducted.

Service and resting areas carry importance for the users of the motorway both providing them assistance with their vehicles and providing areas for refreshing, which would in turn contribute to safe driving. Thus, at proper intervals along the motorway route these areas would be established.

Guard Rails

Guard rails planned in line with the work program covers separator and protector guard rails to be placed on all or particular sections of the road upon fabrication in accordance with the project specifications in order to ensure safe flow of traffic on the motorway.

Traffic Signalization Plates

Fabrication and installation of traffic signs, utilization principles and horizontal marking will be carried out in accordance with the principles specified under Traffic Signs Handbook I and II "Traffic Signalization Standard in Access Controlled Highways" published by General Directorate of Highways. These signs would be installed on the relevant sections of the motorway. In addition to that, during construction of the motorway, principles specified under "Traffic Sign Standards of Road Construction, Maintenance and Repair" will be used.

Proper lighting is an important issue that can prevent accidents especially for the nighttime. Necessary lighting would be installed at all junctions, fee collection areas, service areas, and parking/rest areas.

Horizontal Marking

Horizontal marking will facilitate controlled and safe flow of traffic on the motorway. Thus, horizontal marking would include; drawing of lane and side lines, designation of pedestrian crossings by lines, drawing of arrows that show appropriate choice of lane on junction approaches, painting of bordures of junctions, refuges and islands to improve night visibility, marking of deceleration and accelaration lanes, drawing of parking lots, marking of refuge approaches, marking of turn islands approaches and such transverse markings.

3.3.2 Safety Requirements for the Viaducts

Viaducts are among the special and critical structural parts of a motorway. Some of the incidents that can be considered as minor on various motorway sections might have significant results when took place on viaducts. Thus, design, construction and operation of the viaduct structures will take into consideration relevant risk factors and proper emergency response. The risk factors can be summarized as types of vehicles and their loads, characteristics of the infrastructure (length and geometry), and user behavior.

In order to secure the proper and safe traffic through the viaducts some physical measures will be provided. These measures aim to minimize the potential for accidents and other risky incidences. In addition, they would contribute to make emergency response and management easier and more effective. These can be summarized as follows:

- Traffic signs, communication means and monitoring devices
- Electrical and mechanical installations
- Drainage

Traffic Signalization, Communication and Monitoring

Apart from the legislative requirements for the traffic signs (overhead and horizontal), communication and monitoring means, further necessities might be identified for enhancing the proper working of the facilities. The communication means would be mainly telephones and monitoring means will be CCTV cameras.

For the installation of the bedplates of equipment, power units and controller wiring with channels will be provided. The locations to be selected for these bedplates will be suitable to structural lay out, arrangements regarding access and operation of the viaducts.

Standard motorway direction signs will be available on the structure. In addition, installation of bedplates and lighting system for these signs will be provided. Where the overhead signs are to be used, they will extend beyond the width of the motorway.

Electrical and Mechanical Installations

All of the electrical and mechanical equipment and their installations will be in compliance with the following regulations and specifications:

- Motorway Technical Specifications
- Regulation on Occupational Health and Safety
- English Standards and Rules or equivalent European Rules related to Electrical / Mechanical Equipment and Installations.

For safe and effective operation and maintenance of the viaducts suitable mechanical and electrical equipment and supplementary systems will be used. The capacity of the electric circuits will be capable of providing all needs of the lighting systems, maintenance needs and in addition the power demands of all overhead signs.

All equipment, conduits, cables, pipes, and the similar will be supported and fixed steadying. The viaducts will be equipped with lightning guard system. This will be provided by steel structures in reinforcements system included equipotential steel structure link and concrete structures. Independent power sources for all the electrical equipment and emergency spare systems for the electrical equipment will be provided.

Drainage

A drainage system will be constructed without damaging the viaduct structures to discharge the precipitation falling on the road platform from several points. Drainage canals and other rainwater discharge structures will be constructed such that no flooding would take place in the roadside section.

The rain falling on the viaducts will be collected by the drainage system of the motorway sections. Drainage systems will be constructed on all moveable joints and drainage holes will be made in all box beams and protection slabs.

The materials to be used in the drainage system will have a lifetime comparable to that of the viaduct structures. Drainage installation components will be replaceable. Material that may be easily damaged in the slab, which may burn by fuel oil, diesel oil or chemical materials or those can be reshaped will not be used.

3.4 Preparedness to Emergency Situations

3.4.1 Planning and Coordination

Preparedness ensures that arrangements and resources are maintained in a state of readiness to be mobilized and deployed for response and recovery to an emergency event. In this regard planning plays a key role together with coordination. In the previous sections, some of the studies and measures for identifying the hazards and risks and designing mitigation measures are described. These are part of the planning activities for any case of emergency. In addition, preparing the staff, relevant resources and activity programs are important for effective emergency response.

Coordination is not only important during an emergency, but it is also vital throughout the Project implementation and management. In this regard, effective coordination before an emergency event would ensure a more efficient response. Furthermore, good coordination is also a measure of building thrust between parties and developing confidence against emergency situations.

The following is a summary of activities for emergency preparedness to be conducted and coordinated by the EPRC in the scope of planning and coordination:

- Regular review and updating, when necessary, of the Emergency Preparedness and Response Policy, and plans and procedures.
- Ensure all personnel are aware of, and hold sufficient competency to perform, their emergency response/management roles and responsibilities, as detailed in the Emergency Response Procedures.
- Arrange training and education programs for staff, subcontractors and the community. This includes increasing the awareness of staff and managers regarding their roles and responsibilities across the EPRP or targeted community awareness programs (for example regarding road construction and maintenance activities).
- Planning and conducting exercises to test specific aspects of the EPRP, and its procedures.
- Establishing processes for lessons learned including conducting debriefs and reviews of other emergency events or exercises that are relevant to Project Sponsor.
- Maintaining working relationships for emergency management and refreshing any specific response and recovery support arrangements with municipalities and other agencies.
- Having supporting systems in place for response and recovery (e.g. cost capture, documents and records management).
- Ensure the nominated Emergency Response Centers are adequate, accessible and properly resourced to meet needs during an emergency.
- Continual review, evaluation and auditing of emergency management arrangements, identifying and promoting opportunities for improvement.

These activities will be performed continuously and/or at regular intervals. Some of the above activities would be conducted by the EPRC and ERT, while for some of them staff and management from various directorates/departments would need to participate.

3.4.2 Training

The EPRC will review staff and subcontractor competency regarding to emergency preparedness and identify training needs for management, staff and/or subcontractors. The training activities would cover the following:

- Project Sponsor’s internal inductions and specific training (EPRP and further plans and procedures)

- Preparation of online or self-training materials and making them available to relevant parties.
- Courses and workshops for the EPRP and emergency event case studies, as well as enquiries and programs of relevant governmental agencies.
- Debriefs or shared learning's with or from other emergency response organizations.
- On the job training through exercises.

The exercises related to the EPRP will be a part of the training activities. The EPRP, and related plans and procedures will be tested or exercised to determine the effectiveness and efficiency of emergency management arrangements, and identify opportunities for improvement. These exercises can cover the following:

- Field exercises; where a scenario is created (e.g. a staged traffic accident) and emergency responders (ERT) approach the scenario as though it were a real situation.
- Desktop exercises; where the scenario is described and participants discuss their roles and can examine various aspects and alternatives. This can include testing a procedure or process.

In determining what aspect of the emergency management process will be exercised, consideration will be given to the issues below:

- Any new or emerging hazard.
- The sections of the EPRP that has not recently been tested.
- If there have been any specific changes for the emergency management roles or the people who can perform them (such as changes in the ERT).
- If a field exercise is being planned independently of other agencies related to emergency response, it is important to inform the local emergency services regarding the exercise details, so the exercise does not disrupt their response to genuine emergency calls.

For big scale field exercises and/or for the ones participation of other agencies is requested, the EPRC will consult the schedule and scope of the exercise with the related parties including the General Directorate of Highways, municipalities, governorships, etc. The EPRC would coordinate the implementation of the exercise and participation of the relevant persons. The results of the exercises would also be evaluated together with the participants to determine their usefulness. In this regard ERT will conduct debrief following the exercise to identify what worked well and what are the opportunities for improvement.

In the event of epidemic conditions during construction and operation of the project, the EPRP and activities will be aligned and implemented in accordance with the guidelines of relevant and responsible national and international organizations such as WHO, Ministry of Health (MoH) and Ministry of Environment, Urbanization and Climate Change (MoEUCC).

Face-to-face trainings and drills within the scope of EPRP under epidemic conditions will be carried out in accordance with the mask and social distancing rules of the Ministry of Health and WHO. In addition, it will be ensured that trainings and drills will be organized in open areas, if feasible, in accordance with the social distancing and other regulations of the MoH and WHO.

3.4.3 Resources

The resources required for overall emergency management process would include; in-kind (e.g. equipment, vehicles, etc.), cash and human resources. In this regard, Budget and Planning Department would cooperate with the EPRC to ensure provision of necessary resources. Accordingly, this directorate/department would be able to follow and record the related expenditures for emergency

preparedness and response. This would especially be important for the after emergency actions in terms of determination of damage or losses, and recovery actions.

In order to mobilize the necessary resources administrative arrangements will be made by the EPRC in cooperation with the Project Management and all the active directorates/department during the construction and planning phases. Thus, EPRC would be regularly informing the management units and consulting with them regarding the emergency preparedness and response issues.

4. EMERGENCY RESPONSE

4.1 General

Emergency response is defined as actions taken to minimize the effects of an emergency event, and to limit the threat to life, property and the environment. Some emergency categories are defined with regard to the significance scale of the emergency events. With this regard four categories are defined from least significant (Category 1) to most significant (Category 4). In line with this categorization the emergency events in the first two categories are comparatively small scale where the main responsibility generally has to be taken by Project Sponsor. In more severe emergency events (Categories 3 and 4) relevant governmental agencies, starting with the local ones, shall act as the lead agency for emergency response. In Turkey, the district and provincial governorships are the main bodies under which the local directorates of the central agencies work. Therefore, generally governorships act as the lead coordinating agency together with municipalities.

Emergency response mainly covers the following:

- Initial assessment and reporting of the event, location and identified communication methods.
- On-site management of the situation.
- Coordination of resources (off-site coordination) to support the on-site management.
- Providing advice and reports of the situation to stakeholders.
- Ending response actions when the situation is resolved.

The following emergency response procedures (ERP) define the arrangements for the management of emergencies related to roads, viaducts, other engineering structures, traffic signals and flow. The ERP specifies some of the actions needed for the identified hazards and structures.

Emergency response procedures will be reviewed and elaborated, including addition of further procedures/activities, as found necessary, based on the further studies being undertaken in the scope of project development and on regular review of the risks and hazards. In addition, further measures can be defined or changes on the procedures can be considered based on testing of these through exercises.

4.2 Emergency Response Procedures (ERP) for Motorway and Viaducts

The general emergency response procedures cover the whole motorway including viaducts. These procedures cover the emergency response activities mainly for the following major hazards:

- Accidents
- Fires
- Earthquakes
- Spills and leakages

4.2.1 Accidents

Potential accidents during construction and operation may cause injuries and even death. In accident events that caused human injury, first aid will be provided by the ERT. Then, for further action assistance will be sought from the closest village clinic and/or the closest hospital. In this regard safe transport of the injured persons to the closest health facility will be the first priority.

In any injury encountered at the construction sites first aid will be the responsibility of the ERT members including the medical doctor available at the main camp facilities. In the meantime, to prevent any further damage other ERT members will ensure environmental safety, investigate any fire possibility, and clean any spilled materials.

As a result of some accidents, fuel, oil, or other hazardous liquids may reach the surface waters. When fuel or other hazardous materials are seen floating in the surface waters, first ERT will intervene, and, if necessary, the closest fire department will be contacted to get assistance. Fuel, oil, and other floating materials will be separated from water via skimming. These skimmed materials will be collected in sealed tanks and disposed in accordance with Waste Oil Control Regulation.

Mission and responsibilities of the ERT in accidents are as follows:

- All of the team members should know the type of injury risk in the work areas and project sections.
- In emergency situations, team members will check for the persons that might be injured in their area of responsibility.
- The ERT member who identifies a person with injury will provide first aid as proper. If he/she decides that the injury is beyond his/her ability for first aid than a more capable, or authorized, person (such as a doctor) will be waited.
- Any attempt that may worsen the situation of the injured person should be prevented.
- Depending on the type and extent of injury an ambulance may be required. In such a case, a member of the ERT will wait in the road junction (or such) to direct the ambulance to the incident location.
- After the arrival of the ambulance the responsibility passes to the medical personnel that arrived with the ambulance, but ERT member(s) will help first aid activities if needed.
- During the first aid activities, ERT prevents the entrance of irrelevant people to the incident area.
- After the completion of the necessary actions and/or injured person is sent to the hospital, the incident record is prepared.
- If there is no injured person in an accident, ERT secures the incident area and reports to the EPRC.

4.2.2 Fires

Fire possibilities will be minimized in the construction sites and camp facilities by taking necessary preventive measures. In addition, in working areas fire extinguishing equipments will be kept at proper places for emergency action. Furthermore, no fires are allowed in the forest areas and all precautions will be taken in the construction sites to prevent fire.

Fire events that might be of concern during the operation of the Project would be mainly associated with accidents. Thus, emergency response actions for such fires would follow the procedures both given below and specified for accidents.

Mission and responsibilities of the ERT in case of fire are as follows:

- All of the team members should know the fire risk in each work area. They have to know how to extinguish different types of fires as well.

- In emergency situations, team members will check for any fire in their area of responsibility.
- If any fire is determined or emergency situation is a fire, ERT takes the necessary actions for extinguishing without panic under the control of a team leader.
- Depending on the type and extent of fire a fire engine may be required. In such a case, a member of the ERT will wait in the road junction (or such) to direct the fire engine to the incident location.
- After fire engine arrives, team members help extinguishing activities if needed.
- During the fire fighting, ERT prevents the entrance of irrelevant people to the area.
- If any fire is not determined after emergency situation, team members are counted, and present under the head of team leader collectively.
- Ambulance will be called in case there are injuries or smoke poisoning.

4.2.3 Earthquakes

Trainings will be provided to all workers related to actions to be taken during an earthquake for their safety. If an earthquake with a scale of more than 4.5 on Richter scale is determined in the area, and workers on duty feel earth tremor or are exposed to specified earthquake consequences (feeling of the earthquake by everybody, moving/falling of objects in the shelves, moving/falling down of furniture, fracturing of some plasters and walls, quaking of trees and shrubs), the steps given below will be followed and implemented:

- General visual check of the project components (motorway sections, viaducts and associated structures) after the earthquake.
- After completion of the relevant controls and audits, findings will be communicated to the relevant authorities.
- If the structures are collapsing or had such a damage that may cause the collapse of the structure, the users will be informed through signalization and radios. In addition, at a relevant distance from the structural damage the area the road section would be closed to users by barriers. Furthermore, the closest settlement(s) located in the area will be informed immediately.
- If the structures have a damage, which is not as serious to cause a collapse, necessary observations and collapse risk assessment will be made immediately. Then, the assessment will be communicated with relevant local and national authorities and the instructions of the technical specifications and that would come from these authorities will be followed.

4.2.4 Spills and Leakages

Oil, fuel, dye etc. may spill on the construction sites and/or roads that are used for transportation. The activities that shall be performed immediately following these spills are important in terms of prevention of contamination. The actions to be taken in case of leakage and/or spill after an accident are as follows:

- Leakage source will be determined and if possible, leakage will be stopped.
- Trucks, construction equipment etc. that had an accident on the roads will be brought into their normal position as fast as possible, and by this way more leakage and/or spill will be prevented.
- In order to prevent spreading of leakage sandbags will be placed around the leakage source.
- In case of big leakages, depending on the slope of the land, a small canal will be opened in the downstream part of the leakage, and this canal will be filled with absorbent material to collect leakage in this canal and prevent mixing with groundwater.
- Pollutant, polluted absorbent material, and soil will be put into bags that have proper size and durability, and these bags will be labeled properly.

- In case of a big leakage and/or spill, the incident will be reported to the construction site director/manager (during construction phase) and the operation director/manager (during the operation phase) immediately. Relevant local authorities will also be informed about the incident as necessary.

In case of leakage of oil, fuel or other chemicals to water resources, absorbent barges will be used to prevent the dispersion of the spill and to keep the surface area of the spill as small as possible. Inner part of the absorbent barges will be filled with absorbent fibrous material. When required, based on the extent of leakage and flow of water, more than one barge can be used. Following these actions, the water quality will be monitored at relevant locations in the downstream and upstream of the leakage point.

A kit will be kept ready at each site and operation center where there is fuel and chemical leak risks and the emergency response team will be ready to act as soon as possible. The minimum extent of equipments such a kit will contain is summarized below:

- Fuel/chemical absorbents (covers, sand etc.)
- Manuel pump
- Electrical pump
- Drainage tanks
- Chemical resistant gloves, clothes, tall boots, face covers and other personal protective equipment
- Equipment to disperse chemical gases
- Sand (sand is a good material that absorbs pollutants on roads and soil)
- Sawdust: Sawdust is one of the materials used to prevent dispersion of liquid material spilled to the roads and soil.
- In the leakages originating from damaged tins, barrel or such, the material in these packages will be transferred safe packages immediately.
- Absorbent barges.
- Absorbent bolster.
- Barrels resistant to chemical material.
- Firm plastic bags
- Warning signs

4.3 Incident Command

During an emergency incident, the effective management and control of the emergency response actions might keep the adverse consequences of the incident at rather low levels. Therefore, for efficient coordination and cooperation during an emergency management roles and communication channels carry importance. Accordingly, two command systems for simple and complex incidents can be foreseen.

For the simple incidents, which would have small and local adverse consequences, EPRC will be in command and ERT will manage the emergency situation. In the mean time cooperation with the directors/directorates of construction site administrative and financial affairs will be achieved during construction phase. During he operation phase, operation teams and the coordination body for operation will cooperate with the EPRC as necessary. Following the end of emergency incident, post emergency report will be prepared and relevant information will be provided to top management and relevant departments.

In a complex emergecy incident, which would have significant and extended consequences, while EPRC will have the firsthand incident command for Project Sponsor, during construction phase directors/managers would assume command if necessary. Similarly, during the operation phase, the operation coordination body might be the decision-maker for Project Sponsor, as necessary. In

addition, in such incidents generally the leading agency that carries the authority would be relevant governmental agency, such as the provincial governorship.

4.4 Activation Triggers

In the scope of further detailed planning for emergency management Occupational Health and Safety Department (i.e., EPRC) would prepare an Emergency Response Time Schedule (ERTS) in consultation with the other units of management for both construction and operation phase. This schedule will take the dedicated resources (staff, tools and equipment) for emergency response and the location and number of emergency response centers as key variables. The response times for emergency incidents would be based on the severity of the incident, thus the emergency categories as defined previously.

4.5 Environment, Health & Safety (Occupational and Community)

The policies and procedures related to EHS and Labor/Workforce will be the leading documents for personnel who will be involved in the emergency situations directly or indirectly. These policies and procedures are in fact the key documents for prevention of emergency events if they are implemented sufficiently.

4.6 Communication and Information Disclosure

Communication about the emergency preparedness and response activities would be governed by the following principles:

- Only nominated spokesperson(s) of Project Sponsor shall make public comment about the response or recovery efforts.
- Comments of Project Sponsor would be made following consultation with the General and Regional Directorates of Highways, and the other lead agency, if any, for the emergency incident.
- Spokesperson(s) of Project Sponsor would take care to restrict their comments to factual information that is relevant to activities and especially to avoid commenting on other agencies actions.
- Spokesperson(s) of Project Sponsor would make themselves available for media enquiries, as appropriate, and give relevant messages to promote community safety and limit possible disruptions caused by emergency events.

4.7 Emergency Contacts

Emergency Contacts including the key internal and external persons, contact means and information (i.e., cellular and stationary phones, radio, pager, etc.) will be managed by the ERT and the EPRC. This information would be kept updated in its most recent form. In addition, it will be posted to relevant places and at least be available to all relevant staff taking a role in emergency preparedness and response.

4.8 Reports from Subcontractors and Incident Debriefs

The assigned ERT member(s) would ensure that the reporting of responses to incidents attended by subcontractors follows appropriate procedures and those opportunities for improvement are acted upon.

The EPRC will ensure that all staff and subcontractors of Project Sponsor are debriefed and/or attend debriefs organized by the lead agency following a major incident. It will be ensured that the

lessons learned are considered in the management of future emergency arrangements. This would include any revisions or updated in the EPRP and associated procedures, equipments, staffing, etc.

Personnel of Project Sponsor may be involved in traumatic incidents as part of the emergency response activities they had been involved. The Occupational Health and Safety Department will be responsible for managing the critical incident stress debriefing process.

5. END OF EMERGENCY SITUATION, FURTHER ACTIONS AND RECOVERY

5.1 After Emergency Actions

When the emergency conditions end, EPRC approves the safety of the project/incidence area, and relevant units and authorities are informed related to the incidence. ERT makes a general assessment together with the EPRC and prepares the report regarding the emergency incidence (event), the damage caused (consequences), and the status of the incidence area and project structures. This report would be shared by the General and Regional Directorates of the Highways as well and would serve for the improvement of the future studies and providing information for further planning.

The activities taken during the emergency will be assessed and any necessary adjustments and/or improvements shall be made in the emergency preparedness and response procedures and measures. If the emergency incidence is an unforeseen case, the precaution measures to prevent this type of emergency incidences and the action plan for such emergencies will be developed and integrated into the EPRP.

In case of a significant emergency incidence, General Directorate of Highways (KGM) or the relevant governorship will establish a committee for identification of the damages and losses due to the event. This committee might be formed from the representatives of various local governmental agencies, where the presence of KGM representatives is obligatory. This committee prepares a report to be submitted to the Ministry of Interior and KGM.

5.2 Recovery Management

Recovery is defined as measures which support emergency affected individuals and communities in the reconstruction of physical infrastructure and restoration of emotional, economic, and physical well being.

Project Sponsor would be managing all the relevant recovery operations and needs in the construction sites during the construction phase. This would also cover the recovery issues for staff of Project Sponsor in line with the national legislation and Labour/Employement Policy of Project Sponsor.

During operation Project Sponsor would typically manage the following road and infrastructure operations:

- Damage assessment and categorization.
- Management of the demolition process.
- Provision of temporary services.
- Reinstatement of traffic signals.
- Structural repairs.
- Maintenance of environmental and workplace standards.

Recovery efforts associated with significant emergency events (i.e., categories 3 and 4) may be coordinated by General and Regional Directorates of Highways, local authorities (i.e. governorship or municipality) and other relevant agencies and institutions.

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ANNEX–4

AFFORESTATION PLAN

Annex-4 AFFORESTATION PLAN

1. INTRODUCTION

The Afforestation Plan provides insight into international requirements for mitigating the loss of forests and identifies the strategy for action. Overall, it is prepared to determine the type and characteristics of the forest areas in the Project Area, the potential loss of forests, and the options (including estimates for the number of trees to be replanted and the size of land needed for afforestation) for mitigation of the adverse impacts. The mitigation and compensation options will follow relevant Turkish legislation and international practices.

This Afforestation Plan has been prepared about the national requirements to compensate for the loss of forests due to the South Alternative Project.

ADMP has a total length of 163 km including main carriageway and the access roads, and has two sections given below:

Section 1: Aydın-Kuyucak (Km 0+000 - 60+865), and
Section 2: Kuyucak-Denizli (Km 60+865 - 140+650)

At the construction phase of the ADMP, KGM, as the owner of the project, has submitted an order for a design change of the main carriageway between Km 15+856 and 34+630 in Section 1 ("South Alternative"). Thus, project description and the assessments had been done in this report had been conducted in the scope of said section of the ADMP.

Table 1 provides the summary of the key information of actual design of the section that formed the basis of assessments.

Table 1 Summary of the Key Information of South Alternative

Section	Name	Location		Length (Km)		
		Start	End	Main Road	Access Road	TOTAL
Section 1	South Alternative	Km 15+856	Km 34+630	18.774	7.242	26.016

The scope of this afforestation plan report is mainly based on the following information and studies:

- Forest management plans (official data of General Directorate of Forestry), management plan data and maps provided by Project Sponsor.
- Forest data serving as a basis for the forestry permit.
- Information and data obtained from the visits to the General Directorate of Forestry and Regional Directorates of Forestry.
- Data collected during the ESIA field surveys on biodiversity/ecology, especially vegetation cover, flora and habitats.

2. BASELINE CONDITIONS

2.1 General

South Alternative Project falls within the jurisdiction of two different Forestry Management Directorates (Aydın, Nazilli) under Muğla Regional Directorate of Forestry as summarized in Table 2. The boundaries of these directorates are presented in Figure 1.

Table 2 Relevant Forestry Directorates for the Project

Section	Regional Directorate	Forestry Management Directorate	Management Sub-directorate
Section 1	Muğla Regional Directorate of Forestry	Aydın Forestry Management Directorate	Köşk Forestry Management Sub-directorate
		Nazilli Forestry Management Directorate	Yenipazar Forestry Management Sub-directorate

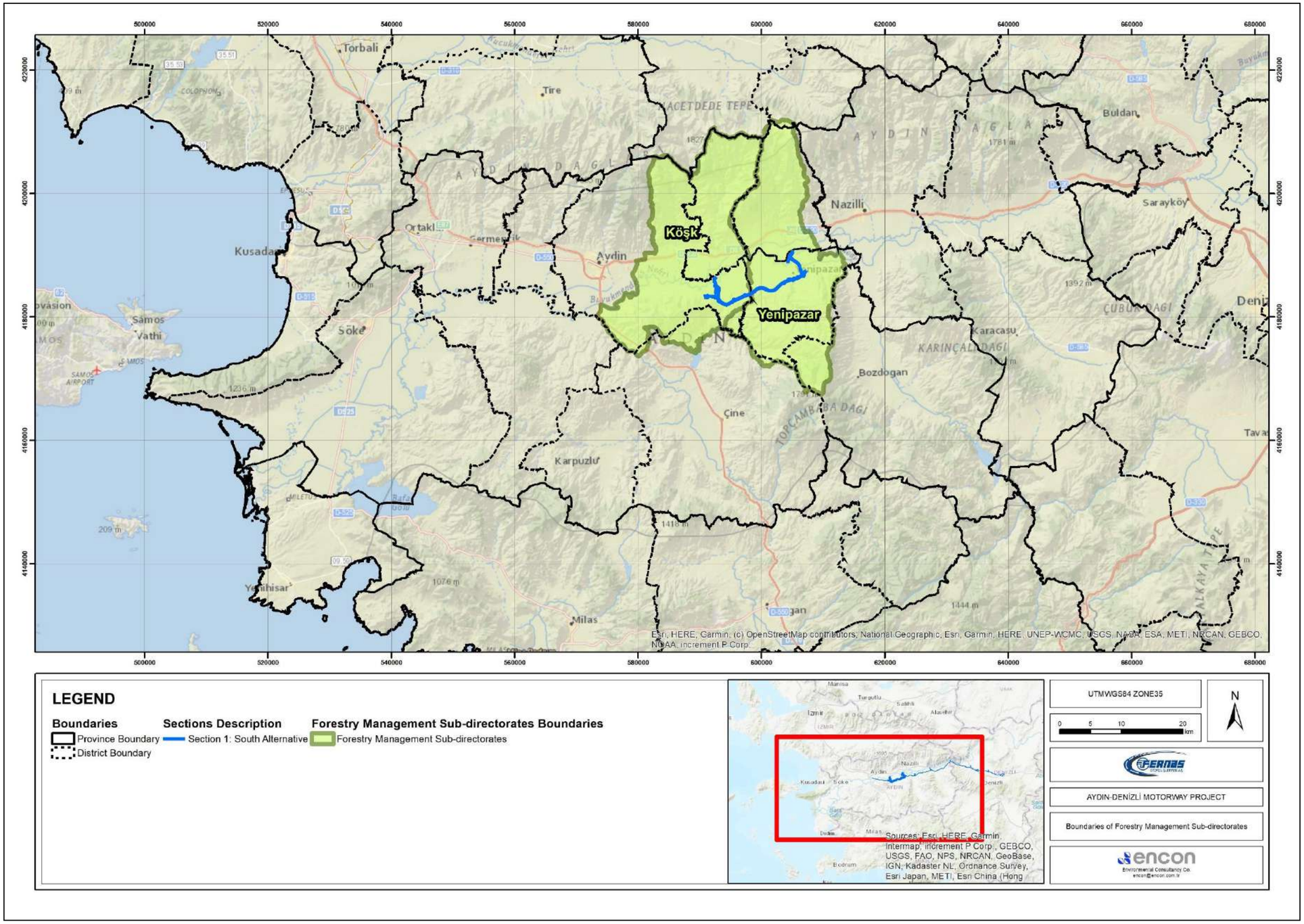

Figure 1 Boundary of Forestry Management Sub-directorates

2.2 Land Use Characteristics within the Study Corridor

Existing land use characteristics along the South Alternative route changes. The South Alternative passes predominantly through olive trees, forest areas and agricultural lands. The land use characteristics for the South Alternative have been analyzed by using the "Coordination of Information on the Environment (CORINE) Land Cover" (2018) database with the aid of GIS tools. The study area for the land use analyses has been determined based on the width of the expropriation corridor, which will have a width of a minimum of 100 meters in accordance with motorway standards and may expand up to 350 meters depending on topographical conditions and associated cut and fill plans. Accordingly, the GIS analyses have been conducted for a corridor having a width of 400 meters (around 200 meters in each side), which would cover the maximum expropriation corridor. The results of the land use analyses are presented in Table 3.

As can be seen from the information provided in Table 3, a major part of the South Alternative route (for a corridor of 400 m, which would cover the maximum width of the expropriation corridor that is given as 350 m) is formed of lands classified as forests and semi-natural areas according to CORINE Land Cover database. Lands classified as forest and semi-natural regions are more than 63% of the studied corridor, of which only 4% consists of forests classified as Coniferous forest types. Lands classified as agricultural areas cover 33% of the studied corridor. Artificial surfaces of discontinuous urban fabric cover almost 3% of the studied corridor. The corridor's remaining negligible part (0.75%) corresponds to water bodies. The entire corridor (400 m wide) covers an area of around 1,385 ha.

Table 3 Land Use Characteristics along the South Alternative

Level 1	Level 2	Level 3	Code 2018	South Alternative			Level 1 Total Area (ha)		Level 2 Total Area (ha)		Level 3 Total Area (ha)	
				Area (m^2)	Area (ha)	Percent (%)	Area (ha)	Percent (%)	Area (ha)	Percent (%)	Area (ha)	Percent (%)
1. Artificial surfaces	1.1. Urban Fabric	1.1.2. Discontinuous urban fabric	112	360,449.05	36.04	2.60	36.04	2.60	36.04	2.60	36.04	2.60
2. Agricultural areas	2.1. Arable Land	2.1.2. Permanently irrigated land	212	3,186,256.17	318.63	23.01	458.98	33.15	318.63	23.01	318.63	23.01
	2.4. Heterogeneous agricultural areas	2.4.2. Complex cultivation	242	1,403,538.89	140.35	10.14			140.35	10.14	140.35	10.14
3. Forests and seminatural areas	3.1. Forests	3.1.2. Coniferous forest	312	562,598.94	56.26	4.06	879.33	63.50	56.26	4.06	56.26	4.06
	3.2. Shrub and/or herbaceous vegetation associations	3.2.1. Natural grassland	321	93.85	0.01	0.00			823.07	59.44	0.01	0.00
		3.2.3. Sclerophyllous vegetation	323	8,230,593.43	823.06	59.44					823.06	59.44
5. Water bodies	5.1. Inland waters	5.1.1. Water courses	511	58,633.96	5.86	0.42	10.34	0.75	10.34	0.75	5.86	0.42
		5.1.2. Water bodies	512	44,797.96	4.48	0.32					4.48	0.32
Total				**13,846,962.24**	**1,384.70**	**100.00**	**1,384.70**	**100.00**	**1,384.70**	**100.00**	**1,384.70**	**100.00**

Forest Management Plans covers both the actual forests where forest cover (e.g., trees) are present at different density levels and open areas where forest cover is absent (unwooded forest soils) or where uses other than forestry such as settlement, agricultural, quarry, etc. are present. Forest Management Plans categorize the actual forests as high forests and coppice forests. Each category is further classified as productive forests where canopy cover rates range between 11-100% and degraded forests, where canopy cover rate is lower than 10%. Classification of canopy levels as 1, 2 and 3 according to the density of cover is done as summarized in Table 4.

Table 4 Canopy Cover Classification According to Forest Management Plans

Canopy Cover Classification	**Canopy Cover Levels**	
	Symbol	**Rate (%)**
Absent to sparse	-	0-10
Sparse	1	11-40
Moderately closed	2	41-70
Closed to fully closed	3	71-100

Areas of actual forests (covered by forest vegetation) and open areas corresponding to the study area according to their functions and canopy levels have been analyzed by using the Forest Management Plans and the relevant database. The results of the analyses are presented in Table 5.

As known, the study area for the assessment of Project impacts on the land use is 1,385 ha for the 400 meters study corridor. Within the study corridor, there is no forest specified as “coppice forest”, and thus all of the actual forests are categorized as high forests having different canopy covers. The key findings of the analyses done based on the relevant Forest Management Plans of the study area are summarized below:

- According to the Forest Management Plans, 8.41% (116.49 ha) of the entire study corridor is covered by actual forests. Almost 68% (79.21 ha) of the actual forests are productive, where the canopy cover level changes between 10-100%, while the remainder 32% (37.27 ha) correspond to degraded forests where the canopy cover level is less than 10%.
- Regarding the actual forest functions, 90% (105.17 ha) of the all-actual forests serve for economic functions, while the remaining 10% (11.32 ha) serves for ecological functions.

Table 5 Canopy Cover Classification According to Forest Management Plans

Forest Functions			Area of Actual Forests (ha)								Open Areas (ha)	
			High Forests				Coppice Forests					
			Canopy Cover Classification				Canopy Cover Classification					
			Productive			Degraded	Productive			Degraded		
			Level 3 (71-100%)	Level 2 (41-70%)	Level 1 (11-40%)	(0-10%)	Level 3 (71-100%)	Level 2 (41-70%)	Level 1 (11-40%)	(0-10%)		
SOUTH ALTERNATIVE											**Settlements**	**Agricultural Land**
Economic	Forest products production	Industrial plantation	1.94									
		Industrial wood production in maximum capacity	20.33	3.87		26.67						
		Production of non-wood forestry products	3.54	11.31	37.51							
Ecological	Nature protection	Very unfavorable growth grounds	0.71			10.61						
Sub-total (Canopy Levels)			26.52	15.18	37.51	37.27	0.00	0.00	0.00	0.00		
Total (Actual Forest/Open Area Type)			116.49				0.00				52.90	1,215.30
Total (Actual Forests/Open Areas)			116.49									1,268.21
Grand Total (South Alternative)												1,384.70

2.3 Forest Types and Tree Species

In addition to information presented above, forests corresponding to the study area according to their stand types have been analyzed by using the Forest Management Plans and the relevant database. The results of the analysis are presented in Table 6.

As it can be observed from the table, 3.78% (52.36 ha) of forest areas in the South Alternative constitute of stone pine types. The second dominant stand type is calabrian pine. It should be noted that open areas (especially agricultural lands) are dominant in the South Alternative.

Table 6 Land Use Properties and Forestlands according to Stand Types within the Study Area

Forest Stand Types	**South Alternative**		
	Area (m^2)	**Area (ha)**	**Percent (%)**
Stone Pine	523,620.12	52.36	3.78
Calabrian Pine	261,421.52	26.14	1.89
Scrub	7,093.20	0.71	0.05
Degraded Scrub	106,065.16	10.61	0.77
Degraded Forest Area	149,199.10	14.92	1.08
Open Area for Afforestation	117,484.02	11.75	0.85
Settlements	529,040.05	52.90	3.82
Agricultural Land	12,153,039.08	1,215.30	87.77

3. POTENTIAL IMPACTS ASSOCIATED WITH THE PROJECT

The potential impacts on forestry associated with the South Alternative are expected to be primarily related to the land take requirements of the Project. They will occur during the earthworks and construction phases (including mobilization and preparatory works). Therefore, the potential impacts on forestry are considered under the following main issues in this section:

- Loss of forest land and assets,
- Loss of carbon captures capacity.

3.1 Loss of Trees

Trees corresponding to the permitted road construction areas (road footprint and embankment and fill zones) will be removed and appraised by the relevant Regional Directorate of Forestry in coordination with the KGM and Project Sponsor. In this scope, the Regional Directorate determines the exact number of trees removed after examining current management plans and field studies. Accordingly, the number of trees to be removed in the scope of the Project has been estimated for each section of the Project and is summarized in Table 7.

The figures given in this table has been calculated to cover the trees to be removed from the footprint of the Motorway construction areas, construction camp sites and quarries including the embankment and fill zone. As can be seen from Table 7, Total number of trees that are lost is 24,555 for the South Alternative including construction camp sites and quarries.

Table 7 Estimated Number of Trees to be Removed in the South Alternative Including Construction Camp Sites and Quarries

Section	Regional Directorate	Forestry Management Directorate	Management Sub-directorate	Number of Trees	Corresponding Forest Area (ha)	
					Total Area	Area of Degraded Forest Lands
South Alternative	Muğla Regional Directorate of Forestry	Aydın	Köşk	0	5.27	5.27
		Nazilli	Yenipazar	8,844	54.35	4.80
Dalama Quarries	Muğla Regional Directorate of Forestry	Aydın	Köşk	15,619	61.87	5.88
Akçaköy Quarry	Muğla Regional Directorate of Forestry	Aydın	Köşk	92	2.49	0.00
Total				**24,555**	**123.98**	**15.95**
Percent (%)					**100.00**	**12.86**

When the forest stand, the types are considered Calabrian Pine stands out as the most common types of species affected by the Project. Percentage of trees to be removed according to their stand types is given in Table 8.

Table 8 Trees to be Removed according their Stand Types

Forest Stand Type		Percentage of Stand Type Among All Trees to be Removed		
		Authority Area of Related Forestry Management Directorate (%)		Total
Turkish Name (Stand Map Code)	English Name	Aydın	Nazilli	
Kızılçam (Çz)	Calabrian Pine	96.97	85.15	92.71
Fıstık Çamı (Çf)	Stone Pine	3.03	13.89	6.94
Meşe (M)	Oak	0.00	0.96	0.35

3.2 Loss of Carbon Capture Capacity

Carbon is retained in biomass, decomposing organic matter and soil in terrestrial ecological systems. Carbon stock in terrestrial ecological systems plays an important role in the global carbon cycle. Carbon is exchanged between ecological systems and the atmosphere through natural processes such as photosynthesis, respiration, decomposition and combustion. Human activities change the carbon stocks in ecological systems and alter the exchanges between the carbon pools and the atmosphere through land use and land use change. (IPCC, 2000)

South Alternative is considered to have a potential impact on regional carbon stocks through removal of forests for motorway construction. In this section, the loss in carbon captures oxygen generation capacities due to deforestation activities are estimated. Loss of carbon capture capacity is based on a comparative analysis of this capacity with regard to the official data held by the District and Sub-District Directorates of Forestry regarding the capacity that has been calculated to exist in the region of responsibility of each directorate. The region of responsibility is the geographical area/region where the directorate is responsible for managing all the forest areas and assets in this region (including provision of permits in the forest areas, reforestation/afforestation activities, tree planting and removing). As a result of this evaluation, the significance assessment has been made based on the calculated availability of carbon capture capacity and the forest area to be lost.

Carbon capture and oxygen generation capacities of the forest areas around the South Alternative Route are detailed in Chapter 10 (“Air Quality and Climate Change”). According to the assessment, approximately 0,34% of the total carbon captures and oxygen generation capacities will be lost in the forests of District and Sub-District Directorates of Forestry.

4. LEGAL STATUS AND COMPENSATORY REQUIREMENTS

4.1 Relevant Turkish Legislation and Procedures for Projects on Forest Land

The legislation related to forest areas, their protection, and utilization for public interest is composed of laws and regulations based on Turkey's constitution. The central administrative authority is the Ministry of Agriculture and Forestry (MAF). The relevant agency within MAF is the General Directorate of Forestry, which itself has Regional Directorates in the country and Operational Directorates and Sections in those regions. These Directorates are responsible for protecting forestry and forestry resources against negative impacts and developing and managing forestry and forestry resources in a sustainable way.

Laws and regulations for the realization of various types of projects on state-owned forest land and regulation of afforestation and other related measures on these areas can be summarized as follows:

- Forest Law (Law No. 6831, Official Gazette date 8.9.1956, No. 9402)
- Implementing Regulation of 16th Article of the Forest Law (Official Gazette dated 18.04.2014, No. 28976)
- Implementing Regulation of 17th/3 and 18th Articles of the Forest Law (Official Gazette dated 18.04.2014, No. 28976)
- Regulation on Afforestation (Official Gazette dated 23.10.2019, No. 30927)

Ministry of Transport and Infrastructure (MoTI), General Directorate of Highways ("KGM" or "the Administration"), as the owner of the Aydın-Denizli Motorway Project, has commissioned a special purpose entity (SPV) for the implementation of the Project under the related Build, Operate and Transfer (BOT) contract. The Project Area contains forest areas under the authority of the Ministry of Agriculture and Forestry, General Directorate of Forestry. Article 4 of "Implementing Regulation of 17th/3 and 18th Articles of the Forest Law" states that a permit application must be made for motorways (amongst other construction types listed in this article) that are to be built in forest land. Therefore, it will be necessary for project protocols to be established between the two relevant ministries. An application by the Ministry of Transport and Infrastructure must be made to the Ministry of Agriculture and Forestry to proceed with the project construction.

Following documents are required for this application (note that these documents are required for infrastructure projects, and this list excludes additional documents needed for mine projects):

a. Operation license
b. Map or sketch with 1/25,000 scale
c. Stand map
d. Layout plan 1/1,000 or appropriate scale
e. Coordinate lists
f. Forest cadastral map
g. Tree relievo plan with 1/1,000 or appropriate scale
h. Local zoning plan with 1/1,000 scale
i. EIA permit license
j. Bill of quantities of the facilities built in the requested area and summary of estimates prepared according to proforma invoices or current year unit prices which will be determined by the Ministry of Environment, Urbanisation and Climate Change and the relevant state authorities or public institutions and organizations.

The Ministry of Transportation and Infrastructure should commission an authorized company to prepare the documents above. The application paperwork is complete and accurate; a delegation from the Regional Directorate explores the land and prepares a preliminary or final permit report. This report includes consideration of whether the Project is in the public interest. If the final permit report is given, permission for up to 49 years (extendable up to 100 years) is provided. Within one month following the permit issuance, the General Directorate of Forestry takes relevant fees and assurance from the Ministry of Transportation and Infrastructure.

The General Directorate of Forestry and its Regional Directorate perform all the works (including tree marking, felling, logging, chipping, and removal) on the area during permit issuance and delivery of the land to the Ministry of Transportation and Infrastructure.

The above documentation is required for final permitting, and by preparing the documents mentioned in the items, an application for pre-approval may be made to the regional directorate. A pre-approval application generally serves as a permit to prepare the documents and information needed to apply for the final permit. Thus, preparatory studies could be done for permitting in this period (generally 24 months), but construction is not allowed.

The Fees required for the application are afforestation fee, land permit fee, forest-village relations fee (Orkoy fee), erosion fee, and storage fee. However, it should be noted that state institutions and organizations are not required to pay these fees for pre-approval applications. Therefore, The Ministry of Transportation and Infrastructure was relieved from the payment of any such fee in connection with the Aydın-Denizli Motorway Project.

A raw material production permit is required for activities concerning the construction of raw materials by state institutions and organizations in forest areas. Based on this permit, allowance of all operations and constructions for this purpose is regulated by Implementing Regulation of 16th Article of the Forest Law and Implementing Regulation of 17/3 and 18th Articles of the Forest Law.

The Ministry of Transportation and Infrastructure is preparing the documents for permitting through a consultant authorized (by the Ministry of Agriculture and Forestry) to prepare those documents. Therefore, the data used in this plan are also mainly based on the data of the authorized forestry consultant. For the forestry lands, treasury lands, and other state-owned lands, necessary permits, land use permits, and/or easement rights will be obtained by KGM from the related authorities in the scope of the applicable legislation.

4.2 Further Compensatory Actions with regard to International Requirements

Starting with the United Nations (UN) Conference on Environment and Development (UNCED), international conferences like the UN Convention on Biological Diversity, the UN Convention to Combat Desertification (UNCCD) and the UN Framework Convention on Climate Change (UNFCCC) are some of the many conventions which have given forests an increasingly important role in the context of sustainable development and environmental conservation. UN Forum on Forests (UNFF) and its supporting institution, Collaborative Partnership on Forests (CPF), are responsible for international forest arrangements. Although these conventions and institutions did not manage a consensus for a single legally binding document, they each contributed to the terms and conditions regarding subjects like sustainable forestry, reforestation and afforestation (Eurostat, 2001; European Communities (EC), 2003; UNCCD, 2012; UNCED, 1992).

Since international finance is widely used for large-scale projects, worldwide financing institutions have developed standards and guidelines regarding environmental and social issues associated with the projects supported by such finance. The World Bank Group has a specifically important role among these institutions, having established multiple documents covering almost every environmental and social aspect related to various project types. International Finance Corporation (IFC), which serves the private sector projects in the World Bank Group, has established well-developed performance standards and guidance regarding environmental and social issues, including forestry and biodiversity.

IFC lists key initiatives and practices for the forestry sector in its web-based "Guide to Biodiversity for the Private Sector" (IFC, 2006). Among these key initiatives, the following two, which have comparatively more importance, are defined as follows:

- The World Bank/WWF Forest Alliance: The Alliance works with governments, the private sector and civil society to create new protected forest areas, improve the management of existing protected areas and promote independent certification of the world's production forests.
- The Forest Stewardship Council (FSC): The FSC is a global multi-stakeholder standard setter for sustainable forest management certification, promoting "environmentally appropriate, socially beneficial, and economically viable management of the world's forests."

As stated in Section 4.1, the General Directorate of Forestry and its Regional Directorate are responsible for establishing and maintaining new forest areas, as compensation for the losses caused by the relevant project. The project sponsor is only responsible for paying an amount required for compensation. No international requirements regarding compensation in form of afforestation are given in this section, since only the Directorate is responsible for such forest works.

Furthermore, IFC Performance Standard 6 (PS6) - Biodiversity Conservation and Sustainable Management of Living Natural Resources, categorizes habitats as modified, natural and critical. Critical habitats are a subset of modified or natural habitats, which also includes forest areas. The main requirements contained in PS6 are summarized as follows:

- The risk and impact identification process, as set out in Performance Standard 1 (PS1), should consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts. This process will consider relevant threats to biodiversity and ecosystem services, especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution;
- As a matter of priority, the client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented; and
- Where paragraphs 13–15 (the paragraphs which concern natural habitats) are applicable, the client will retain competent professionals to assist in conducting the risks and impacts identification process. Where paragraphs 16–19 (the paragraphs which concern critical habitats) are applicable, the client should retain external experts with appropriate regional experience to assist in the development of a mitigation hierarchy that complies with PS6 and to verify the implementation of those measures (*IFC, 2006; Forest Stewardship Council, 2013; IFC, 2012*).

In the project's scope, these international requirements and guidance have been and will be taken into account during planning (including ESIA and design), construction, and operation activities. In addition, relevant measures are developed during the planning phase in the context of the ESIA, especially in the scope of the assessment made on ecology and master plan/design studies for mitigating and, where necessary, compensating the adverse impacts on forests and forest habitats. These mitigation and compensation measures are explained in detail in the following sections.

5. AFFORESTATION PLANNING AS MITIGATION AND SITES TO BE PROTECTED

The impacts on forests will occur during the pre-construction/construction period, and relevant mitigation measures are presented in this section. It should be noted that some of the mitigation actions, mainly afforestation, will be implemented through both the construction and operational phases of the Project. This topic is also addressed in the following section.

The main measures that will be implemented for the mitigation of impacts on forestry in the Project Area are as follows:

- Protecting the existing forests in the Project Area to the extent possible;
- Replacing the forests at alternative off-site locations (afforestation/reforestation) and on-site;
- Establishment of similar habitats at alternative sites; and
- Compensation through payment of fees to the General Directorate of Forestry.

5.1 General Provisions

According to relevant regulations, the General Directorate of Forestry is the authority that manages the forests in Turkey. In this regard, this Directorate is responsible for plantation works and maintenance of trees, cutting and/or translocating trees, and identifying species and locations for afforestation. Therefore, the project owner is only required to pay the fees that this Directorate determines.

To compensate for the loss of forest assets in the Project Area, it is advised that the planting would be five times the number of trees to be removed from the Project Area. The afforestation will be done by the General Directorate of Forestry, Muğla Regional Directorate of Forestry, in accordance with Turkish legislation. However, volunteer companies/organizations can perform afforestation works in cooperation with Forestry administrations. Planning of the afforestation works will be outlined in the protocol between the Project Sponsor and Forestry administration. Since the afforestation area to compensate for the losses would be rather large, as estimated below, the time needed for afforestation is expected to take many years, and details are provided below.

5.2 Replacing the Forests/Afforestation at Alternative Sites and On Site, and Translocation Potential

For permit applications regarding projects on forest areas, no fee is required for state property forests (i.e., forests that third parties do not establish through private plantation work) if the applicant is a government body. However, if private forests or plantation areas are present, the project owner pays the necessary fees for this type of forest regardless of whether it is a governmental organization. Therefore, the Ministry of Transport and Infrastructure acquired the necessary preliminary permit by only paying the fees needed for plantation areas.

According to Turkish Legislation, afforestation for compensation is not required by the law when the project owner is a government body. For privately owned projects, the total area of afforestation is determined by the General Directorate of Forestry. This area always equals the total forest area loss caused by the related private sector project. For the South Alternative, the government is responsible for taking clearance for the whole Project Area. Later, the appointed project sponsor will hand over the land to build and operate the Project. Therefore, there is no legal requirement for compensation afforestation for the Project. However, the Project Sponsor voluntarily committed to compensating for the loss of all forest assets by afforestation.

Ministry of Agriculture and Forestry Department of Permission and Easements states that for individual afforestation applications, as with Project Sponsor, afforestation can be done in any region of Turkey. However, the Project Sponsor plans to compensate for the forest habitat losses specific to Mediterranean vegetation so that the new plantation areas would be in this region. For each region,

specific tree species for plantations are determined by the related regional forestry directorate, depending on that region's forest habitats and economic requirements. These requirements are determined yearly and are specified on that year's afforestation plans of the Regional Directorate. Since they are local species, *Pinus brutia Ten*. and *Pinus pinea L.* are suitable species for Mediterranean vegetation. Other suitable species are: for riparian vegetation *Platanus orientalis L.,* for roadsides and dry areas; *Fraxinus angustifolia L.,* and *Quercus cerris L*. However*, Pinus pinea L*. is the region's most recommended afforestation plant species by expert botanists. In this context, the area to be afforested for compensating the loss due to the Project would be determined by coordinating and cooperating with the Project Sponsor with related Directorate/Directorates. In the worst-case scenario, where all of the trees in the entire permit area of the Project are removed, a total of 24,555 trees would be lost. For compensation afforestation planning, the Muğla Regional Directorate of Forestry will determine the area for planned plantations depending on the forest assets lost and the total annual increase this asset creates.

Considering the number of trees lost is 24,555 the number of trees for compensation would be slightly more than 122,000. Plantations will be made elsewhere in the region and based on the availability of land outside the Project Area. The Project Sponsor will sign a protocol with relevant Regional Forestry Directorates. The number of saplings for the plantation will be determined based on the area and tree species/types.

The numbers of saplings planted per hectare by the Muğla Regional Forestry Directorate for different tree types are as follows: Calabrian pine saplings 1,660; stone pine 555 and 3,300 oak saplings. Therefore, the maximum afforestation area will be approximately 221.22 hectares if only stone pine saplings are used for afforestation. The minimum afforestation area will be 37.20 hectares if only oak saplings are used for afforestation. The minimum afforestation area will be 73.96 hectares if only Calabrian pine saplings are used for afforestation. When afforestation is implemented in non-forested areas and degraded forest areas, there is a need for this type of area to implement afforestation. The amount of these areas in each forestry management sub-directorate is presented in Table 9.

Table 9 Non-forested Area and Degraded Forest Areas in each Relevant Management Sub-Directorate for the Project

Management Sub-directorate	**Non-forested Area (ha)**	**Degraded Forest Area (ha)**
Köşk Forestry Management Sub-directorate	41,396.00	4,531.00
Yenipazar Forestry Management Sub-directorate	34,595.40	3,661.20
Total	**75,991.40**	**8,192.20**

According to stand data of relevant forest sub-district directorates, there are approximately 75,991.40 hectares of non-forested area and about 8,192.20 hectares of degraded (0-10% canopy cover) forest areas around the Project Area. Therefore, the needed area for afforestation exists around the Project Area. A Map of unwooded forest soils and degraded forest areas around the Project Area is presented in Figure 2.

Under Turkish law, there is no legal requirement for payment of any compensation fees, as discussed above, due to the nature of the Project (designed as a build, operate, transfer project). However, the Project Sponsor will implement afforestation activities to replace the lost forest assets at appropriate locations shown by the Forestry Directorates. In this regard, costs associated with the afforestation activities will be paid by Project Sponsor.

The time required for exact compensation for the loss of forest assets depends on various interacting factors regarding forest conditions of the Project Area and conditions of afforestation. Some of these factors are as follows:

- Factors regarding species that will be lost and that will be planted, such as growth rate
- Proportion of different age stands of different species that will be lost
- Proportion of different species that will be planted

- Proportion of trees that will be planted each year
- Site-specific conditions like average precipitation and soil productivity of the selected afforestation areas

Planting and growing the forests to maturation will take a relatively long time, an unavoidable consequence of the Project. Thus, compensating for the impacts on forests would be achieved in the medium to long term (including maturation of the woods to be planted).

Translocation Potential

The translocation success of the common pine species, the Stone Pine and Calabrian Pine are quite low. In the Project Area, cutting and selling stands of all ages, consisting of species with fast growth rates and low landscape and economic value, such as Calabrian pine (*Pinus Brutia*), is acceptable by the General Directorate of Forestry.

Translocation of oaks (*Quercus sp*.) is not feasible due to the low rate of translocation success. Because their landscape and economic value are down, these stands' translocation is considered infeasible. Likewise, tree species cannot translocate, C-age (20 35.9 cm in diameter) and D-age (36 51.9 cm in diameter); however, they have economic value. Therefore, it is appropriate that the Administration cut the C-age trees and provide them to market.

As a result, no species suitable for translocation have been identified among the tree species affected within the project's scope.

Afforestation on Site

General Directorate of Highways (KGM) has technical specifications for landscaping works and a motorway maintenance handbook. These specifications cover project design, implementation, and operation/maintenance phases. Therefore, all mitigation measures about landscaping have been provided in the technical attachments of the contract, and Project Sponsor is responsible for implementing and keeping these measures. According to these attachments, landscaping works around highways include herein below;

- Urban Crossings
    - Side Slopes
    - Central Reserves
    - Intersections
    - Engineering Structures (Underpass / Overpass, Viaducts, and Retaining Wall)
    - Motorway Service Facilities
    - Toll Plazas and Maintenance Services
    - Special Areas
        - Areas between expropriation borders and side slopes
        - Expropriation borders
        - Material Borrow Sites and Quarries
- Rural Crossings

According to the KGM handbook, side slopes that are wider than three meters should be afforested. In case the side slope is narrower than three meters, the side slope should be planted with groundcover species, shrubs, and tree clubmoss. Similarly, central reserves that are wider than three meters should be planted with shrubs and three species. Therefore, when afforestation at these two large components of the South Alternative is considered, compensation on tree assets will be much more, regardless of the voluntary afforestation of the Project Sponsor.

5.3 Sites to be protected

In the South Alternative, siting the route on flat terrain has been the priority to the extent feasible, however, where the environmental and/or social (i.e., topography, geology, geotechnics, ecological sensitivities, important water bodies, protected areas, cultural heritage sites, etc.) conditions did not allow, road structures such as viaducts, bridges, overpasses, underpasses, etc. have been added to the design to cross non-flat terrains. Detailed information on route changes and the integration of engineering structures such as viaducts to protect forest areas and other sensitive areas is provided in Chapter 18 (“Analysis of Alternatives”).

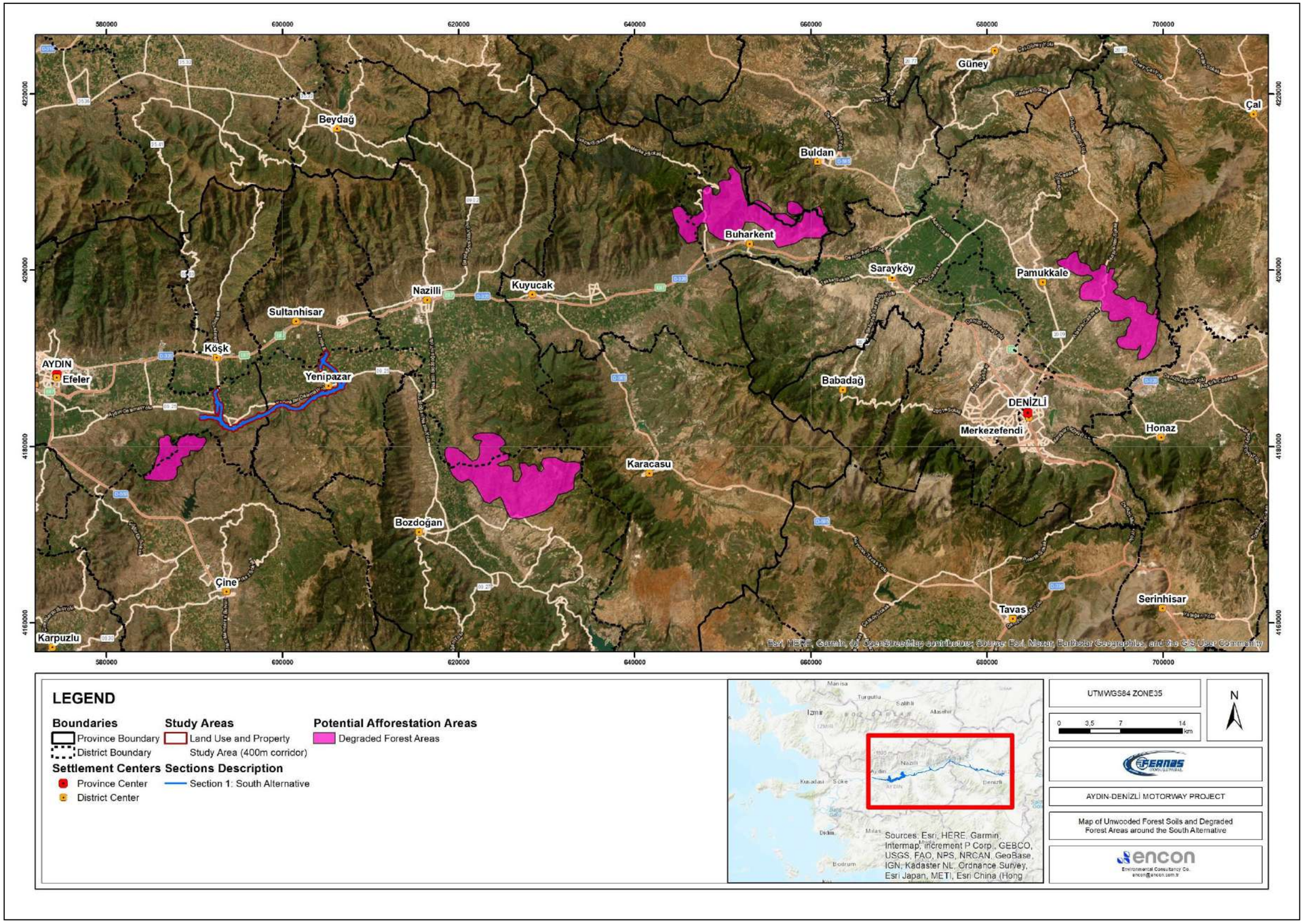

Figure 2 Map of Unwooded Forest Soils and Degraded Forest Areas around the Project Area

ANNEX–5

LABORATORY RESULT FORMS

SOIL QUALITY

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09-23

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Müşteri Adı / Adresi Client Name / Address	Encon Çevre Danışmanlık Ltd. Şti. Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA
Teklif Numarası *Proposal Number*	LT21_0103
Rapor Tarihi / Sayfa Sayısı Report Date / Number of Pages	29.09.2023 / 2
Numune Kayıt No Sample Record Number	NUM.23.2977
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	ENCON Laboratuvarı A.Ş.
Numune Alınan Yer Sampling Location	Denizli-Aydın Otoyol Projesi (Koordinat : 35S 592249/4185935)
Numune Türü / Numune İşareti Sample Type / Sample Sign	Toprak / T-11
Numunenin Alınış Şekli *ve Amacı* *Way and Aim the Sampling*	Anlık / İzleme
Numuneyi Alan Person Conducted Sampling	Hüseyin KALKAN
Numune Alma Standardı *Sampling Standard*	TS 9923
Numune Alma / Kabul Tarihi Sampling Date / Date of Samples Received	14.08.2023 / 15.08.2023
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Mühürsüz, Plastik Şişe, Cam Şişe
Numune Alımında Çevre Şartları Environmental Conditions During Sampling	Açık
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Parametre Parameter	**Birim** Unit	**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
Antimon	mg/kg	2,80	EPA 3051 A,EPA 6010 D
Alüminyum	mg/kg	49370,63	EPA 3051 A,EPA 6010 D
Arsenik	mg/kg	<1,0	EPA 3051 A,EPA 6010 D
Bakır	mg/kg	26,87	EPA 3051 A,EPA 6010 D
Baryum	mg/kg	8930,07	EPA 3051 A,EPA 6010 D
Berilyum	mg/kg	0,65	EPA 3051 A,EPA 6010 D
Bor	mg/kg	32,01	EPA 3051 A,EPA 6010 D
BTEX	mg/kg	<0,25	EPA 5021 A,EPA 8260 D
Civa	mg/kg	<0,1	EPA 3051 A,EPA 6010 D
Çinko	mg/kg	113,29	EPA 3051 A,EPA 6010 D
Demir	mg/kg	54305,69	EPA 3051 A,EPA 6010 D
Gümüş	mg/kg	<0,5	EPA 3051 A,EPA 6010 D
Kadmiyum	mg/kg	<0,5	EPA 3051 A,EPA 6010 D
Kalay	mg/kg	1,93	EPA 3051 A,EPA 6010 D
Kobalt	mg/kg	12,12	EPA 3051 A,EPA 6010 D
Krom	mg/kg	46,70	EPA 3051 A,EPA 6010 D
Kurşun	mg/kg	6,52	EPA 3051 A,EPA 6010 D
Lityum	mg/kg	21,61	EPA 3051 A,EPA 6010 D
Mangan	mg/kg	899,90	EPA 3051 A,EPA 6010 D
Molibden	mg/kg	1,20	EPA 3051 A,EPA 6010 D
Nikel	mg/kg	27,41	EPA 3051 A,EPA 6010 D
PAH*	mg/kg	<0,5	EPA 3550 C, EPA 8270 D
Selenyum	mg/kg	12,35	EPA 3051 A,EPA 6010 D
Talyum	mg/kg	<1,0	EPA 3051 A,EPA 6010 D
Titanyum	mg/kg	3352,65	EPA 3051 A,EPA 6010 D
TOX*	mg/kg	98,20	EPA 9020 B
TPH	mg/kg	<25,0	TS ISO 14507,TS EN 14039
Vanadyum	mg/kg	97,80	EPA 3051 A,EPA 6010 D
VOC	mg/kg	<0,25	EPA 5021 A,EPA 8260 D

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LR.23.2978
09-23

DENEY RAPORU / TEST REPORT

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Teklif Numarası *Proposal Number*	LT21_0103
Rapor Tarihi / Sayfa Sayısı Report Date / Number of Pages	29.09.2023 / 2
Numune Kayıt No Sample Record Number	NUM.23.2978
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	ENCON Laboratuvarı A.Ş.
Numune Alınan Yer Sampling Location	Denizli-Aydın Otoyol Projesi (Koordinat : 35S 592249/4185935)
Numune Türü / Numune İşareti Sample Type / Sample Sign	Toprak / T-12
Numunenin Alınış Şekli *ve Amacı* *Way and Aim the Sampling*	Anlık / İzleme
Numuneyi Alan Person Conducted Sampling	Hüseyin KALKAN
Numune Alma Standardı *Sampling Standard*	TS 9923
Numune Alma / Kabul Tarihi Sampling Date / Date of Samples Received	14.08.2023 / 15.08.2023
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Mühürsüz, Plastik Şişe, Cam Şişe
Numune Alımında Çevre Şartları Environmental Conditions During Sampling	Açık
Açıklamalar Remarks	Müşteri talebi üzerine özel istek numunesi olarak çalışılmıştır. Bu rapor çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz.
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DENEY RAPORU / TEST REPORT

Parametre Parameter	**Birim** Unit	**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
Antimon	mg/kg	<1,0	EPA 3051 A,EPA 6010 D
Alüminyum	mg/kg	21938,57	EPA 3051 A,EPA 6010 D
Arsenik	mg/kg	6,25	EPA 3051 A,EPA 6010 D
Bakır	mg/kg	29,90	EPA 3051 A,EPA 6010 D
Baryum	mg/kg	14359,79	EPA 3051 A,EPA 6010 D
Berilyum	mg/kg	0,79	EPA 3051 A,EPA 6010 D
Bor	mg/kg	34,98	EPA 3051 A,EPA 6010 D
BTEX	mg/kg	<0,25	EPA 5021 A,EPA 8260 D
Civa	mg/kg	0,18	EPA 3051 A,EPA 6010 D
Çinko	mg/kg	87,79	EPA 3051 A,EPA 6010 D
Demir	mg/kg	56561,63	EPA 3051 A,EPA 6010 D
Gümüş	mg/kg	<0,5	EPA 3051 A,EPA 6010 D
Kadmiyum	mg/kg	<0,5	EPA 3051 A,EPA 6010 D
Kalay	mg/kg	<1,0	EPA 3051 A,EPA 6010 D
Kobalt	mg/kg	17,37	EPA 3051 A,EPA 6010 D
Krom	mg/kg	52,15	EPA 3051 A,EPA 6010 D
Kurşun	mg/kg	8,01	EPA 3051 A,EPA 6010 D
Lityum	mg/kg	25,07	EPA 3051 A,EPA 6010 D
Mangan	mg/kg	918,63	EPA 3051 A,EPA 6010 D
Molibden	mg/kg	1,24	EPA 3051 A,EPA 6010 D
Nikel	mg/kg	20,54	EPA 3051 A,EPA 6010 D
PAH*	mg/kg	<0,5	EPA 3550 C, EPA 8270 D
Selenyum	mg/kg	9,38	EPA 3051 A,EPA 6010 D
Talyum	mg/kg	<1,0	EPA 3051 A,EPA 6010 D
Titanyum	mg/kg	4555,25	EPA 3051 A,EPA 6010 D
TOX*	mg/kg	88,20	EPA 9020 B
TPH	mg/kg	<25,0	TS ISO 14507,TS EN 14039
Vanadyum	mg/kg	114,38	EPA 3051 A,EPA 6010 D
VOC	mg/kg	<0,25	EPA 5021 A,EPA 8260 D

Açıklamalar/Remarks:

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DENEY RAPORU / TEST REPORT

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir. firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
Water Samples are sampled according to the standards of TS EN ISO 5667-6. TS ISO 5667-4. TS ISO 5667-11. whereas wastewater. sea water. sludge. solid. soil and sediment samples are sampled according to the standard of TS ISO 5667-10. TS ISO 5667-9. TS EN ISO 5667-13. TS 12090. TS 9923 and TS ISO 5667-12. respectively.
For the samples not taken by the ENCON laboratory Inc.. uncertainty values indicated do not cover the uncertainties arising from the sampling.
The Laboratory does not accept technical and legal responsibility for samples that are not sampled by authorized personnel and/or received under inappropriate conditions. The legal responsibility of the information provided by the customer belongs to the customer. our company waives the consequences arising from this information.

Açıklamalar/Remarks:

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AIR QUALITY

(PM_{10})

(HEAVY METALS in PM_{10})

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2984	**Numune Türü / Sample Type**	PM 10
Numune Kayıt Numarası / Sample Record No	NUM.23.2984	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Yenipazar	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	17.08.2023 10:30

Açıklamalar/Remarks:

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Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

Açıklamalar/Remarks:

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	BGI	02451
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM10 Sonuç /Result ($\mu g/m^3$)
35 S 605505/4186287	0,12724	0,13123	06.08.2023	07.08.2023	21,39	186,54

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Method of Analysis
Kurşun	$\mu g/m^3$	0,094	VDI 2267 Bölüm 1
Talyum	$\mu g/m^3$	<0,02	
Kadmiyum	$\mu g/m^3$	<0,02	

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2985	**Numune Türü / Sample Type**	PM 10
Numune Kayıt Numarası / Sample Record No	NUM.23.2985	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dereköy (Yenipazar)	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	17.08.2023 10:30

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
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		Laboratuvar Müdürü
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29.09.2023		**29.09.2023**

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	BGI	02451
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM10 Sonuç /Result ($\mu g/m^3$)
35 S 601492/4184590	0,12674	0,12837	07.08.2023	08.08.2023	20,96	77,77

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Method of Analysis
Kurşun	$\mu g/m^3$	0,102	VDI 2267 Bölüm 1
Talyum	$\mu g/m^3$	<0,02	
Kadmiyum	$\mu g/m^3$	<0,02	

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2986	**Numune Türü / Sample Type**	PM 10
Numune Kayıt Numarası / Sample Record No	NUM.23.2986	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Alanlı-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	17.08.2023 10:30

Açıklamalar/Remarks:

Deney laboratuvarı olarak faaliyet gösteren ENCON Laboratuvarı A.Ş. TÜRKAK' tan AB-0168-T ile TS EN ISO/IEC 17025 standardına gore akredite edilmiştir. ENCON Laboratuvarı A.Ş. is accredited by TÜRKAK under registration number AB-0168-T for TS EN ISO/IEC 17025 as a test laboratory.

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Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

Açıklamalar/Remarks:

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	BGI	02451
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM10 Sonuç /Result ($\mu g/m^3$)
35 S 0597914/4183834	0,12819	0,13813	08.08.2023	09.08.2023	21,73	457,43

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Method of Analysis
Kurşun	$\mu g/m^3$	0,110	VDI 2267 Bölüm 1
Talyum	$\mu g/m^3$	<0,02	
Kadmiyum	$\mu g/m^3$	<0,02	

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir, firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
For the samples not taken by the ENCON laboratory Inc., uncertainty values indicated do not cover the uncertainties arising from the sampling.
The Laboratory does not accept technical and legal responsibility for samples that are not sampled by authorized personnel and/or received under inappropriate conditions. The legal responsibility of the information provided by the customer belongs to the customer, our company waives the consequences arising from this information.

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2987	**Numune Türü / Sample Type**	PM 10
Numune Kayıt Numarası / Sample Record No	NUM.23.2987	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dalama-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	17.08.2023 10:30

Açıklamalar/Remarks:

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Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	BGI	02451
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM10 Sonuç /Result ($\mu g/m^3$)
35 S 593238/4182857	0,12726	0,13416	09.08.2023	10.08.2023	19,82	348,13

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Method of Analysis
Kurşun	$\mu g/m^3$	0,126	VDI 2267 Bölüm 1
Talyum	$\mu g/m^3$	<0,02	
Kadmiyum	$\mu g/m^3$	<0,02	

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2988	**Numune Türü / Sample Type**	PM 10
Numune Kayıt Numarası / Sample Record No	NUM.23.2988	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dereköy (Merkez)	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	17.08.2023 10:30

Açıklamalar/Remarks:

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	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

Açıklamalar/Remarks:

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	BGI	02451
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM10 Sonuç /Result ($\mu g/m^3$)
35 S 591203/4183693	0,12625	0,12937	10.08.2023	11.08.2023	23,28	134,02

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Method of Analysis
Kurşun	$\mu g/m^3$	0,094	VDI 2267 Bölüm 1
Talyum	$\mu g/m^3$	<0,02	
Kadmiyum	$\mu g/m^3$	<0,02	

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir, firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
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TS EN ISO/IEC 17025
AB-0168-T

AB-0168-T
LR.23.2979
09-23

PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2979	**Numune Türü / Sample Type**	PM 2,5
Numune Kayıt Numarası / Sample Record No	NUM.23.2979	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Yenipazar	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	15.08.2023 10:30

Açıklamalar/Remarks:

Deney laboratuvarı olarak faaliyet gösteren ENCON Laboratuvarı A.Ş. TÜRKAK' tan AB-0168-T ile TS EN ISO/IEC 17025 standardına gore akredite edilmiştir. ENCON Laboratuvarı A.Ş. is accredited by TÜRKAK under registration number AB-0168-T for TS EN ISO/IEC 17025 as a test laboratory.

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Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	Leckel	LVS3-2796105
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM2,5 Sonuç /Result ($\mu g/m^3$)
35 S 605505/4186287	0.12746	0.12930	06.08.2023	07.08.2023	54.90	85,19

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir, firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2980	**Numune Türü / Sample Type**	PM 2,5
Numune Kayıt Numarası / Sample Record No	NUM.23.2980	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dereköy (Yenipazar)	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	15.08.2023 10:30

Açıklamalar/Remarks:

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	Leckel	LVS3-2796105
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM2,5 Sonuç /Result ($\mu g/m^3$)
35 S 601492/4184590	0,12319	0,12440	07.08.2023	08.08.2023	50,96	48,21

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
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LR.23.2981
09-23

PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2980	**Numune Türü / Sample Type**	PM 2,5
Numune Kayıt Numarası / Sample Record No	NUM.23.2981	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Alanlı-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	15.08.2023 10:30

Açıklamalar/Remarks:

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	İrem ÖZKAN	**Tarih**/ Date
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		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

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AB-0168-T

AB-0168-T
LR.23.2981
09-23

PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	Leckel	LVS3-2796105
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM2,5 Sonuç /Result ($\mu g/m^3$)
35 S 0597914/4183834	0,13045	0,13510	08.08.2023	09.08.2023	55,18	186,82

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Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir, firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
For the samples not taken by the ENCON laboratory Inc., uncertainty values indicated do not cover the uncertainties arising from the sampling.
The Laboratory does not accept technical and legal responsibility for samples that are not sampled by authorized personnel and/or received under inappropriate conditions. The legal responsibility of the information provided by the customer belongs to the customer, our company waives the consequences arising from this information.

Açıklamalar/Remarks:
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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2982	**Numune Türü / Sample Type**	PM 2,5
Numune Kayıt Numarası / Sample Record No	NUM.23.2982	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dalama-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	15.08.2023 10:30

Açıklamalar/Remarks:

Deney laboratuvarı olarak faaliyet gösteren ENCON Laboratuvarı A.Ş. TÜRKAK' tan AB-0168-T ile TS EN ISO/IEC 17025 standardına gore akredite edilmiştir. ENCON Laboratuvarı A.Ş. is accredited by TÜRKAK under registration number AB-0168-T for TS EN ISO/IEC 17025 as a test laboratory.

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

Açıklamalar/Remarks:

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	Leckel	LVS3-2796105
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM2,5 Sonuç /Result ($\mu g/m^3$)
35 S 593238/4182857	0,12862	0,13465	09.08.2023	10.08.2023	54,96	235,55

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir, firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi / Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası / Proposal Number	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023 / LR.23.2983	**Numune Türü / Sample Type**	PM 2,5
Numune Kayıt Numarası / Sample Record No	NUM.23.2983	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktası Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dereköy (Merkez)	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Ölçümü Yapan Kişi / Person Conducted Sampling	Hüseyin KALKAN		
Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS EN 12341	**Dolu Filtrenin Laboratuvara Geldiği Tarih/Saat Date/Time the Final Filter Arrives at Laboratory**	14.08.2023 10:50
Boş Filtrenin Tartıldığı Tarih Date of Empty Filter Weighing	04.08.2023 10:00	**Dolu Filtrenin Tartıldığı Tarih Date of Final Filter Weighing**	15.08.2023 10:30

Açıklamalar/Remarks:

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

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PARTİKÜL MADDE (PM) ANALİZ RAPORU / PARTICULATE MATTER (PM) ANALYSIS REPORT

Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis	Cihaz Adı / Device Name	Marka / Model Brand / Model	Seri No / Serial No
	GC Model Tartım Cihazı	Sartorius/GC	18805603
	PM10 Örnekleme Cihazı	Leckel	LVS3-2796105
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Filtrenin Boş Ağırlığı (g) Empty Weight of Filter	Filtrenin Dolu Ağırlığı (g) Final Weight of Filter	Filtrenin Takılma Tarihi Date of Filter Set	Filtrenin Çıkarılma Tarihi Date of Filter Take Off	Geçen Hava Miktarı (m^3) Amount of Air Passes (m^3)	PM2,5 Sonuç /Result ($\mu g/m^3$)
35 S 0591203/4183693	0,12783	0,13008	10.08.2023	11.08.2023	54,96	86,21

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AIR QUALITY

(SETTLED DUST)

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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023/ LR.23.3325	**Numune Türü / Sample Type**	Çöken Toz
Numune Kayıt Numarası / Sample Record No	NUM.23.3325	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Yenipazar	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Açık
Numune Kabul Tarihi Date of Samples Received	11.09.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

Açıklamalar/Remarks:

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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS 2342		
Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis.	**CİHAZ ADI / DEVICE NAME**	**MARKA / MODEL BRAND / MODEL**	**SERİ NO / SERIAL NO**
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542
	Çöken Toz Cihazı		-

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Ölçüm Başlangıç Tarihi / Sampling Start Date	Ölçüm Bitiş Tarihi / Sampling End Date	Sonuç / Result
35S 605505/4186287	07.08.2023	07.09.2023	1097,79 mg/m^{2}gün

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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023/ LR.23.3326	**Numune Türü / Sample Type**	Çöken Toz
Numune Kayıt Numarası / Sample Record No	NUM.23.3326	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dereköy (Yenipazar)	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Açık
Numune Kabul Tarihi Date of Samples Received	11.09.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report Dildar SÜSLÜ Laboratuvar Sorumlusu	**Onaylayan/ Approval Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
29.09.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır 29.09.2023**

Açıklamalar/Remarks:

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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS 2342		
Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis.	**CİHAZ ADI / DEVICE NAME**	**MARKA / MODEL BRAND / MODEL**	**SERİ NO / SERIAL NO**
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542
	Çöken Toz Cihazı		-

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Ölçüm Başlangıç Tarihi / Sampling Start Date	Ölçüm Bitiş Tarihi / Sampling End Date	Sonuç / Result
35S 601492/4184590	07.08.2023	07.09.2023	139,15 mg/m^2gün

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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023/ LR.23.3327	**Numune Türü / Sample Type**	Çöken Toz
Numune Kayıt Numarası / Sample Record No	NUM.23.3327	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dereköy (Merkez)	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Açık
Numune Kabul Tarihi Date of Samples Received	11.09.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS 2342		
Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis.	**CİHAZ ADI / DEVICE NAME**	**MARKA / MODEL BRAND / MODEL**	**SERİ NO / SERIAL NO**
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542
	Çöken Toz Cihazı		-

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Ölçüm Başlangıç Tarihi / Sampling Start Date	Ölçüm Bitiş Tarihi / Sampling End Date	Sonuç / Result
35S 591203/4183693	07.08.2023	07.09.2023	321,32 mg/m^{2}gün

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023/ LR.23.3328	**Numune Türü / Sample Type**	Çöken Toz
Numune Kayıt Numarası / Sample Record No	NUM.23.3328	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Alanlı-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Açık
Numune Kabul Tarihi Date of Samples Received	11.09.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Laboratuvar Sorumlusu	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

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ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS 2342		
Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis.	**CİHAZ ADI / DEVICE NAME**	**MARKA / MODEL BRAND / MODEL**	**SERİ NO / SERIAL NO**
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542
	Çöken Toz Cihazı		-

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Ölçüm Başlangıç Tarihi / Sampling Start Date	Ölçüm Bitiş Tarihi / Sampling End Date	Sonuç / Result
35S 597914/4183834	07.08.2023	07.09.2023	181,25 mg/m^{2}gün

ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
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Test
TS EN ISO/IEC 17025
AB-0168-T

AB-0168-T
LR.23.3329
09.23

ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA		
Teklif Numarası	LT21_0103		
Rapor Tarihi / Numarası Report Date / No	29.09.2023/ LR.23.3329	**Numune Türü / Sample Type**	Çöken Toz
Numune Kayıt Numarası / Sample Record No	NUM.23.3329	**Ölçüm Yöntemi / Sampling Method**	Gravimetrik Yöntem
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Denizli-Aydın Otoyol Projesi Dalama-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Açık
Numune Kabul Tarihi Date of Samples Received	11.09.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Deney laboratuvarı olarak faaliyet gösteren ENCON Laboratuvarı A.Ş. TÜRKAK' tan AB-0168-T ile TS EN ISO/IEC 17025 standardına gore akredite edilmiştir. ENCON Laboratuvarı A.Ş. is accredited by TÜRKAK under registration number AB-0168-T for TS EN ISO/IEC 17025 as a test laboratory.

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Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

Açıklamalar/Remarks:

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09.23

ÇÖKEN TOZ RAPORU / SETTLED DUST REPORT

Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement	TS 2342		
Deneyde Kullanılacak Cihaz ve Malzeme Bilgileri / Device and Equipment Name Used in Analysis.	**CİHAZ ADI / DEVICE NAME**	**MARKA / MODEL BRAND / MODEL**	**SERİ NO / SERIAL NO**
	Sıcaklık ve Nem Veri Toplayıcı Cihazı	CEM (DT-172 Model)	9115542
	Çöken Toz Cihazı		-

Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	Ölçüm Başlangıç Tarihi / Sampling Start Date	Ölçüm Bitiş Tarihi / Sampling End Date	Sonuç / Result
35S 593238/4182857	07.08.2023	07.09.2023	721,51 mg/m^{2}gün

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AIR QUALITY

(SO_2 – NO_X – BENZENE- VOC)

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PASİF ÖRNEKLEME ÖLÇÜM RAPORU

Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı, Bangabandhu Blv. Özçelik İmaj İş Merkezi No:94/39, 06810 Çankaya/Ankara		
Teklif Numarası / Proposal Number	LT21_103		
Rapor Tarihi / Numarası Report Date / No	20.09.2023 / LR.23.2979-1	**Numune Türü / Sample Type**	Pasif Örnekleme
Numune Kayıt Numarası / Sample Record No	NUM.23.2979-1	**Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement**	TS EN 13528-1, TS EN 13528-2, TS EN 13528-3
Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	35S 605505/4186287	**Ölçüm Tarihi / Sampling Date**	07/08-07/09/2023
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Aydın-Denizli Otoyolu Projesi / Yenipazar	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Numune Kabul Tarihi Date of Samples Received	11.09.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

ENCON LABORATUVARI A.Ş.
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PASİF ÖRNEKLEME ÖLÇÜM RAPORU

PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	ANALİZ METODU
NO2	µg/m3	18,61	Pasif Analiz Yöntemi (TS EN 13528-1, TS EN 13528-2, TS EN 13528-3)
SO2	µg/m3	98,05	
VOC	µg/m3	<0,16	
Benzen	µg/m3	<0,16	

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Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı, Bangabandhu Blv. Özçelik İmaj İş Merkezi No:94/39, 06810 Çankaya/Ankara		
Teklif Numarası / Proposal Number	LT21_103		
Rapor Tarihi / Numarası Report Date / No	20.09.2023 / LR.23.2982-1	**Numune Türü / Sample Type**	Pasif Örnekleme
Numune Kayıt Numarası / Sample Record No	NUM.23.2982-1	**Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement**	TS EN 13528-1, TS EN 13528-2, TS EN 13528-3
Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	35S 605505/4186287	**Ölçüm Tarihi / Sampling Date**	07/08-07/09/2023
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Aydın-Denizli Otoyolu Projesi / Dalama-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Numune Kabul Tarihi Date of Samples Received	11.09.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
29.09.2023		**29.09.2023**

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PASİF ÖRNEKLEME ÖLÇÜM RAPORU

PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	ANALİZ METODU
NO2	µg/m3	25,17	Pasif Analiz Yöntemi (TS EN 13528-1, TS EN 13528-2, TS EN 13528-3)
SO2	µg/m3	179,0	
VOC	µg/m3	<0,16	
Benzen	µg/m3	<0,16	

WATER QUALITY

ENCON LABORATUVARI A.Ş.
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Test
TS EN ISO/IEC 17025
AB-0168-T

AB-0168-T
LR.23.2973
09-23

DENEY RAPORU / TEST REPORT

Müşteri Adı / Adresi Client Name / Address	Encon Çevre Danışmanlık Ltd. Şti. Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA
Teklif Numarası *Proposal Number*	LT21_0103
Rapor Tarihi / Sayfa Sayısı Report Date / Number of Pages	29.09.2023 / 2
Numune Kayıt No Sample Record Number	NUM.23.2973
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	ENCON Laboratuvarı A.Ş.
Numune Alınan Yer Sampling Location	Denizli-Aydın Otoyol Projesi (Koordinat : 35S 604693/4188167)
Numune Türü / Numune İşareti Sample Type / Sample Sign	Yeraltı Suyu / YAS-8
Numunenin Alınış Şekli *ve Amacı* *Way and Aim the Sampling*	Anlık / İzleme
Numuneyi Alan Person Conducted Sampling	Hüseyin KALKAN
Numune Alma Standardı *Sampling Standard*	TS EN ISO 5667-6
Numune Alma / Kabul Tarihi Sampling Date / Date of Samples Received	14.08.2023 / 15.08.2023
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Mühürsüz, Plastik Şişe, Cam Şişe, Steril Şişe
Numune Alımında Çevre Şartları Environmental Conditions During Sampling	Açık
Açıklamalar Remarks	Müşteri talebi üzerine özel istek numunesi olarak çalışılmıştır. Bu rapor çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz.
Deneyin Yapıldığı Tarih Date of Test	14.08.2023 / 20.08.2023

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Yayımlandığı Tarih **Date**	**Raporu Hazırlayan** Person in charge of report İrem ÖZKAN Kalite Yöneticisi	**Onaylayan/ Approval** **Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
29.09.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır** **29.09.2023**

Açıklamalar/Remarks:

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09-23

DENEY RAPORU / TEST REPORT

Parametre Parameter	**Birim** Unit	**TABLO ADI / SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 2**			**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		I	II	III		
Renk	m^{-1}	RES 436 nm: ≤ 1,5	RES 436 nm: 3	RES 436 nm: 4,3	0,08	TS EN ISO 7887 B
		RES 525 nm: ≤ 1,2	RES 525 nm: 2,4	RES 525 nm: 3,7	0	
		RES 620 nm: ≤ 0,8	RES 620 nm: 1,7	RES 620 nm: 2,5	0	
pH	-	6-9	6-9	6-9	10,28	SM 4500-H^+ B
İletkenlik	µS/cm	< 400	1000	>1000	1092	SM 2510 B
*Yağ ve Gres	mg/L	< 0,2	0,3	>0.3	0,8	SM 5520 B
Çözünmüş oksijen	mg/L	> 8	6	<6	2,2	SM 4500-O G
Kimyasal oksijen ihtiyacı (KOİ)	mg/L	< 25	50	>50	7,9	SM 5220 B
Biyokimyasal oksijen ihtiyacı ($BOİ_5$)	mg/L	< 4	8	>8	<3,0	SM 5210 B
Amonyum azotu	mg/L	< 0,2	1	>1	<0,02	SM 4500-NH_3 B,C
Nitrat azotu	mg/L	< 3	10	>10	4,8	SM 4110 B
Toplam kjeldahl-azotu	mg/L	< 0,5	1,5	>1.5	1,7	SM 4500-Norg B
Toplam azot	mg/L	< 3,5	11,5	>11.5	6,5	SM 4500-Norg B, SM4110 B, SM 4500-NO_2^- B
Orto fosfat fosforu	mg/L	< 0,05	0,16	>0.16	0,06	SM 4500 P E
Toplam fosfor	mg/L	< 0,08	0,2	>0.2	0,1	SM 4500-P B,E
Florür	µg/L	≤ 1000	1500	>1500	937,0	SM 4110 B
Mangan	µg/L	≤ 100	500	>500	<10,0	EPA 200.7
Selenyum	µg/L	≤ 10	15	>15	<5,0	EPA 200.7
*Sülfür	µg/L	≤ 2	5	>5	<2,0	SM 4500-S^{2-} F

Açıklamalar/Remarks:

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Parametre Parameter	**Birim** Unit	**TABLO ADI/ SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 5**		**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		YO-CKS Nehirler/ Göller	**YO-CKS Kıyı ve Geçiş Suları**		
*Alaklor	µg/L	0,3	0,3	<0,3	EPA 3510 C, EPA 3620 C, EPA 8081 B
Antrasen	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Atrazin	µg/L	0,6	0,6	<0,1	İşletme İçi Metot
Benzen	µg/L	10	8	<0,2	EPA 5030 C, EPA 8260 D
*Bromlu difenileter[1]	µg/L	-	-	<0,005	İşletme İçi Metot
*Kadmiyum ve bileşikleri[2]	µg/L	< 0,08 (Sınıf 1) 0,08 (Sınıf 2) 0,09 (Sınıf 3) 0,15 (Sınıf 4) 0,25 (Sınıf 5)	0,2	<0,08	EPA 6020 B
C10-13-Kloroalkanlar	µg/L	0,4	0,4	<0,005	İşletme İçi Metot
Klorfenvinfos	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Klorpirifos (Klorpirifos-etil)	µg/L	0,03	0,03	<0,03	EPA 3510 C, EPA 3620 C, EPA 8081 B
1,2-dikloroetan	µg/L	10	10	<0,2	EPA 5030 C, EPA 8260 D
Diklorometan	µg/L	20	20	<0,2	EPA 5030 C, EPA 8260 D
Diuron	µg/L	0,2	0,2	<0,05	İşletme İçi Metot
*Endosulfan	µg/L	0,005	0,0005	<0,0005	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Floranten	µg/L	0,0063	0,0063	<0,0063	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-benzen	µg/L	-	-	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-bütadien	µg/L	-	-	<0,1	EPA 5030 C, EPA 8260 D
*Hekzakloro-siklohekzan	µg/L	0,02	0,002	<0,002	EPA 3510 C, EPA 3620 C, EPA 8081 B
Isoproturon	µg/L	0,3	0,3	<0,05	İşletme İçi Metot
Kurşun ve bileşikleri[3]	µg/L	1,2	1,3	<0,5	EPA 6020 B
Cıva ve bileşikleri	µg/L	-	-	<0,1	EPA 6020 B
Naftalin	µg/L	2	2	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Nikel ve bileşikleri[3]	µg/L	4	8,6	<1,0	EPA 6020 B
*Nonilfenoller (4-Nonilfenol)	µg/L	0,3	0,3	<0,30	İşletme İçi Metot
*Oktilfenol ((4-(1,1' ,3,3' -tetrametilbütil)-fenol))	µg/L	0,1	0,01	<0,01	İşletme İçi Metot

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Parametre Parameter	**Birim** Unit	**TABLO ADI/ SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 5**		**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		YO-CKS Nehirler/ Göller	**YO-CKS Kıyı ve Geçiş Suları**		
*Pentakloro-benzen	µg/L	0,007	0,0007	<0,0007	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Pentakloro-fenol	µg/L	0,4	0,4	<0,4	EPA 528, EPA 8041 A
Poliaromatik hidrokarbonlar (PAH)	µg/L	-	-	<0,1	EPA 3510 C EPA 3620 C EPA 8270 E
*Benzo(a)piren	µg/L	$1,7 \times 10^{-4}$	$1,7 \times 10^{-4}$	<0,00017	
Benzo(b)floranten	µg/L	-	-	<0,1	
Benzo(k)floranten	µg/L	-	-	<0,1	
Benzo(g,h,i)perilen	µg/L	-	-	<0,1	
Indeno(1,2,3-cd)piren	µg/L	-	-	<0,1	
Simazin	µg/L	1	1	<0,05	İşletme İçi Metot
*Tributilkalay bileşikleri (Tributilkalay-katyonu)	µg/L	0,0002	0,0002	<0,0002	İşletme İçi Metot
Trikloro-benzenler	µg/L	0,4	0,4	<0,2	EPA 5030 C, EPA 8260 D
Trikloro-metan	µg/L	2,5	2,5	<0,2	EPA 5030 C, EPA 8260 D
*Trifluralin	µg/L	0,03	0,03	<0,03	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Dikofol	µg/L	$1,3 \times 10^{-3}$	$3,2 \times 10^{-5}$	<0,000032	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Perflorooktan sülfonik asit ve türevleri (PFOS)	µg/L	$6,5 \times 10^{-4}$	$1,3 \times 10^{-4}$	<0,00065	İşletme İçi Metot
*Kinoksifen	µg/L	0,15	0,015	<0,015	İşletme İçi Metot
*Aklonifen	µg/L	0,12	0,012	<0,012	İşletme İçi Metot
*Bifenoks	µg/L	0,012	0,0012	<0,0012	İşletme İçi Metot
*Sibutrin	µg/L	0,0025	0,0025	<0,0025	İşletme İçi Metot
*Sipermetrin[5]	µg/L	8×10^{-5}	8×10^{-6}	<0,000008	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Diklorvos	µg/L	6×10^{-4}	6×10^{-5}	<0,00006	İşletme İçi Metot
*Hekzabromo-siklododekanlar (HBCDD)[6]	µg/L	0,0016	0,0008	<0,0008	İşletme İçi Metot
*Heptaklor ve heptaklor epoksit	µg/L	2×10^{-7}	1×10^{-8}	<0,00000001	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Terbutrin	µg/L	0,065	0,0065	<0,0065	İşletme İçi Metot

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Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir. firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
For the samples not taken by the ENCON laboratory Inc.. uncertainty values indicated do not cover the uncertainties arising from the sampling.
The Laboratory does not accept technical and legal responsibility for samples that are not sampled by authorized personnel and/or received under inappropriate conditions. The legal responsibility of the information provided by the customer belongs to the customer. our company waives the consequences arising from this information.

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Müşteri Adı / Adresi Client Name / Address	Encon Çevre Danışmanlık Ltd. Şti. Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA
Teklif Numarası *Proposal Number*	LT21_0103
Rapor Tarihi / Sayfa Sayısı Report Date / Number of Pages	28.09.2023 / 2
Numune Kayıt No Sample Record Number	NUM.23.2974
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	ENCON Laboratuvarı A.Ş.
Numune Alınan Yer Sampling Location	Denizli-Aydın Otoyol Projesi (Koordinat : 35S 594210/4183789)
Numune Türü / Numune İşareti Sample Type / Sample Sign	Yeraltı Suyu / YAS-9
Numunenin Alınış Şekli *ve Amacı* *Way and Aim the Sampling*	Anlık / İzleme
Numuneyi Alan Person Conducted Sampling	Hüseyin KALKAN
Numune Alma Standardı *Sampling Standard*	TS EN ISO 5667-6
Numune Alma / Kabul Tarihi Sampling Date / Date of Samples Received	14.08.2023 / 15.08.2023
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Mühürsüz, Plastik Şişe, Cam Şişe, Steril Şişe
Numune Alımında Çevre Şartları Environmental Conditions During Sampling	Açık
Açıklamalar Remarks	Müşteri talebi üzerine özel istek numunesi olarak çalışılmıştır. Bu rapor çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz.
Deneyin Yapıldığı Tarih Date of Test	14.08.2023 / 20.08.2023

Deney laboratuvarı olarak faaliyet gösteren ENCON Laboratuvarı A.Ş. TÜRKAK' tan AB-0168-T ile TS EN ISO/IEC 17025 standardına gore akredite edilmiştir. ENCON Laboratuvarı A.Ş. is accredited by TÜRKAK under registration number AB-0168-T for TS EN ISO/IEC 17025 as a test laboratory.

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Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Yayımlandığı Tarih **Date**	**Raporu Hazırlayan** Person in charge of report İrem ÖZKAN Kalite Yöneticisi	**Onaylayan/ Approval** **Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
29.09.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır** **29.09.2023**

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DENEY RAPORU / TEST REPORT

Parametre Parameter	**Birim** Unit	**TABLO ADI / SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 2** I	II	III	**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
Renk	m^{-1}	RES 436 nm: ≤ 1,5	RES 436 nm: 3	RES 436 nm: 4,3	0,04	TS EN ISO 7887 B
		RES 525 nm: ≤ 1,2	RES 525 nm: 2,4	RES 525 nm: 3,7	0	
		RES 620 nm: ≤ 0,8	RES 620 nm: 1,7	RES 620 nm: 2,5	0	
pH	-	6-9	6-9	6-9	7,94	SM 4500-H^+ B
İletkenlik	µS/cm	< 400	1000	>1000	2410	SM 2510 B
*Yağ ve Gres	mg/L	< 0,2	0,3	>0.3	1,2	SM 5520 B
Çözünmüş oksijen	mg/L	> 8	6	<6	2,5	SM 4500-O G
Kimyasal oksijen ihtiyacı (KOİ)	mg/L	< 25	50	>50	<5,0	SM 5220 B
Biyokimyasal oksijen ihtiyacı ($BOİ_5$)	mg/L	< 4	8	>8	<3,0	SM 5210 B
Amonyum azotu	mg/L	< 0,2	1	>1	<0,02	SM 4500-NH_3 B,C
Nitrat azotu	mg/L	< 3	10	>10	40,0	SM 4110 B
Toplam kjeldahl-azotu	mg/L	< 0,5	1,5	>1.5	2,3	SM 4500-Norg B
Toplam azot	mg/L	< 3,5	11,5	>11.5	42,4	SM 4500-Norg B, SM4110 B, SM 4500-NO_2^- B
Orto fosfat fosforu	mg/L	< 0,05	0,16	>0.16	0,035	SM 4500 P E
Toplam fosfor	mg/L	< 0,08	0,2	>0.2	0,19	SM 4500-P B,E
Florür	µg/L	≤ 1000	1500	>1500	914,0	SM 4110 B
Mangan	µg/L	≤ 100	500	>500	<10,0	EPA 200.7
Selenyum	µg/L	≤ 10	15	>15	<5,0	EPA 200.7
*Sülfür	µg/L	≤ 2	5	>5	<2,0	SM 4500-S^{2-} F

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Parametre Parameter	**Birim** Unit	**TABLO ADI/ SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 5**		**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		YO-CKS Nehirler/ Göller	**YO-CKS Kıyı ve Geçiş Suları**		
*Alaklor	µg/L	0,3	0,3	<0,3	EPA 3510 C, EPA 3620 C, EPA 8081 B
Antrasen	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Atrazin	µg/L	0,6	0,6	<0,1	İşletme İçi Metot
Benzen	µg/L	10	8	<0,2	EPA 5030 C, EPA 8260 D
*Bromlu difenileter[1]	µg/L	-	-	<0,005	İşletme İçi Metot
*Kadmiyum ve bileşikleri[2]	µg/L	< 0,08 (Sınıf 1) 0,08 (Sınıf 2) 0,09 (Sınıf 3) 0,15 (Sınıf 4) 0,25 (Sınıf 5)	0,2	<0,08	EPA 6020 B
C10-13-Kloroalkanlar	µg/L	0,4	0,4	<0,005	İşletme İçi Metot
Klorfenvinfos	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Klorpirifos (Klorpirifos-etil)	µg/L	0,03	0,03	<0,03	EPA 3510 C, EPA 3620 C, EPA 8081 B
1,2-dikloroetan	µg/L	10	10	<0,2	EPA 5030 C, EPA 8260 D
Diklorometan	µg/L	20	20	<0,2	EPA 5030 C, EPA 8260 D
Diuron	µg/L	0,2	0,2	<0,05	İşletme İçi Metot
*Endosulfan	µg/L	0,005	0,0005	<0,0005	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Floranten	µg/L	0,0063	0,0063	<0,0063	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-benzen	µg/L	-	-	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-bütadien	µg/L	-	-	<0,1	EPA 5030 C, EPA 8260 D
*Hekzakloro-siklohekzan	µg/L	0,02	0,002	<0,002	EPA 3510 C, EPA 3620 C, EPA 8081 B
Isoproturon	µg/L	0,3	0,3	<0,05	İşletme İçi Metot
Kurşun ve bileşikleri[3]	µg/L	1,2	1,3	<0,5	EPA 6020 B
Cıva ve bileşikleri	µg/L	-	-	<0,1	EPA 6020 B
Naftalin	µg/L	2	2	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Nikel ve bileşikleri[3]	µg/L	4	8,6	<1,0	EPA 6020 B
*Nonilfenoller (4-Nonilfenol)	µg/L	0,3	0,3	<0,30	İşletme İçi Metot
*Oktilfenol ((4-(1,1' ,3,3' -tetrametilbütil)-fenol))	µg/L	0,1	0,01	<0,01	İşletme İçi Metot

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Parametre Parameter	**Birim** Unit	**TABLO ADI/ SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 5**		**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		YO-CKS Nehirler/ Göller	**YO-CKS Kıyı ve Geçiş Suları**		
*Pentakloro-benzen	µg/L	0,007	0,0007	<0,0007	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Pentakloro-fenol	µg/L	0,4	0,4	<0,4	EPA 528, EPA 8041 A
Poliaromatik hidrokarbonlar (PAH)	µg/L	-	-	<0,1	EPA 3510 C EPA 3620 C EPA 8270 E
*Benzo(a)piren	µg/L	$1,7 \times 10^{-4}$	$1,7 \times 10^{-4}$	<0,00017	
Benzo(b)floranten	µg/L	-	-	<0,1	
Benzo(k)floranten	µg/L	-	-	<0,1	
Benzo(g,h,i)perilen	µg/L	-	-	<0,1	
Indeno(1,2,3-cd)piren	µg/L	-	-	<0,1	
Simazin	µg/L	1	1	<0,05	İşletme İçi Metot
*Tributilkalay bileşikleri (Tributilkalay-katyonu)	µg/L	0,0002	0,0002	<0,0002	İşletme İçi Metot
Trikloro-benzenler	µg/L	0,4	0,4	<0,2	EPA 5030 C, EPA 8260 D
Trikloro-metan	µg/L	2,5	2,5	<0,2	EPA 5030 C, EPA 8260 D
*Trifluralin	µg/L	0,03	0,03	<0,03	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Dikofol	µg/L	$1,3 \times 10^{-3}$	$3,2 \times 10^{-5}$	<0,000032	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Perflorooktan sülfonik asit ve türevleri (PFOS)	µg/L	$6,5 \times 10^{-4}$	$1,3 \times 10^{-4}$	<0,00065	İşletme İçi Metot
*Kinoksifen	µg/L	0,15	0,015	<0,015	İşletme İçi Metot
*Aklonifen	µg/L	0,12	0,012	<0,012	İşletme İçi Metot
*Bifenoks	µg/L	0,012	0,0012	<0,0012	İşletme İçi Metot
*Sibutrin	µg/L	0,0025	0,0025	<0,0025	İşletme İçi Metot
*Sipermetrin[5]	µg/L	8×10^{-5}	8×10^{-6}	<0,000008	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Diklorvos	µg/L	6×10^{-4}	6×10^{-5}	<0,00006	İşletme İçi Metot
*Hekzabromo-siklododekanlar (HBCDD)[6]	µg/L	0,0016	0,0008	<0,0008	İşletme İçi Metot
*Heptaklor ve heptaklor epoksit	µg/L	2×10^{-7}	1×10^{-8}	<0,00000001	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Terbutrin	µg/L	0,065	0,0065	<0,0065	İşletme İçi Metot

Açıklamalar/Remarks:

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Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir. firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
Water Samples are sampled according to the standards of TS EN ISO 5667-6. TS ISO 5667-4. TS ISO 5667-11. whereas wastewater. sea water. sludge. solid. soil and sediment samples are sampled according to the standard of TS ISO 5667-10. TS ISO 5667-9. TS EN ISO 5667-13. TS 12090. TS 9923 and TS ISO 5667-12. respectively.
For the samples not taken by the ENCON laboratory Inc.. uncertainty values indicated do not cover the uncertainties arising from the sampling.
The Laboratory does not accept technical and legal responsibility for samples that are not sampled by authorized personnel and/or received under inappropriate conditions. The legal responsibility of the information provided by the customer belongs to the customer. our company waives the consequences arising from this information.

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Müşteri Adı / Adresi Client Name / Address	Encon Çevre Danışmanlık Ltd. Şti. Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA
Teklif Numarası *Proposal Number*	LT21_0103
Rapor Tarihi / Sayfa Sayısı Report Date / Number of Pages	28.09.2023 / 2
Numune Kayıt No Sample Record Number	NUM.23.2975
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	ENCON Laboratuvarı A.Ş.
Numune Alınan Yer Sampling Location	Denizli-Aydın Otoyol Projesi (Koordinat : 35S 605076/4190712)
Numune Türü / Numune İşareti Sample Type / Sample Sign	Yüzey Suyu / YS-3
Numunenin Alınış Şekli *ve Amacı* *Way and Aim the Sampling*	Anlık / İzleme
Numuneyi Alan Person Conducted Sampling	Hüseyin KALKAN
Numune Alma Standardı *Sampling Standard*	TS EN ISO 5667-6
Numune Alma / Kabul Tarihi Sampling Date / Date of Samples Received	14.08.2023 / 15.08.2023
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Mühürsüz, Plastik Şişe, Cam Şişe, Steril Şişe
Numune Alımında Çevre Şartları Environmental Conditions During Sampling	Açık
Açıklamalar Remarks	Müşteri talebi üzerine özel istek numunesi olarak çalışılmıştır. Bu rapor çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz.
Deneyin Yapıldığı Tarih Date of Test	14.08.2023 / 20.08.2023

Deney laboratuvarı olarak faaliyet gösteren ENCON Laboratuvarı A.Ş. TÜRKAK' tan AB-0168-T ile TS EN ISO/IEC 17025 standardına gore akredite edilmiştir. ENCON Laboratuvarı A.Ş. is accredited by TÜRKAK under registration number AB-0168-T for TS EN ISO/IEC 17025 as a test laboratory.

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanıma anlaşması imzalamıştır. Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports.

Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Yayımlandığı Tarih **Date**	**Raporu Hazırlayan** Person in charge of report İrem ÖZKAN Kalite Yöneticisi	**Onaylayan/ Approval** **Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
29.09.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır** **29.09.2023**

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DENEY RAPORU / TEST REPORT

Parametre Parameter	**Birim** Unit	**TABLO ADI / SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 2** I	II	III	**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
Renk	m^{-1}	RES 436 nm: ≤ 1,5	RES 436 nm: 3	RES 436 nm: 4,3	0,2	TS EN ISO 7887 B
		RES 525 nm: ≤ 1,2	RES 525 nm: 2,4	RES 525 nm: 3,7	0,08	
		RES 620 nm: ≤ 0,8	RES 620 nm: 1,7	RES 620 nm: 2,5	0,04	
pH	-	6-9	6-9	6-9	9,36	SM 4500-H^+ B
İletkenlik	µS/cm	< 400	1000	>1000	753	SM 2510 B
*Yağ ve Gres	mg/L	< 0,2	0,3	>0.3	0,4	SM 5520 B
Çözünmüş oksijen	mg/L	> 8	6	<6	3,4	SM 4500-O G
Kimyasal oksijen ihtiyacı (KOİ)	mg/L	< 25	50	>50	7,3	SM 5220 B
Biyokimyasal oksijen ihtiyacı ($BOİ_5$)	mg/L	< 4	8	>8	<3,0	SM 5210 B
Amonyum azotu	mg/L	< 0,2	1	>1	<0,02	SM 4500-NH_3 B,C
Nitrat azotu	mg/L	< 3	10	>10	1,6	SM 4110 B
Toplam kjeldahl-azotu	mg/L	< 0,5	1,5	>1.5	2,4	SM 4500-Norg B
Toplam azot	mg/L	< 3,5	11,5	>11.5	4,5	SM 4500-Norg B, SM4110 B, SM 4500-NO_2^- B
Orto fosfat fosforu	mg/L	< 0,05	0,16	>0.16	0,095	SM 4500 P E
Toplam fosfor	mg/L	< 0,08	0,2	>0.2	0,17	SM 4500-P B,E
Florür	µg/L	≤ 1000	1500	>1500	<20,0	SM 4110 B
Mangan	µg/L	≤ 100	500	>500	45,3	EPA 200.7
Selenyum	µg/L	≤ 10	15	>15	<5,0	EPA 200.7
*Sülfür	µg/L	≤ 2	5	>5	<2,0	SM 4500-S^{2-} F

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Parametre Parameter	**Birim** Unit	**TABLO ADI/ SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 5**		**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		YO-CKS Nehirler/ Göller	**YO-CKS Kıyı ve Geçiş Suları**		
*Alaklor	µg/L	0,3	0,3	<0,3	EPA 3510 C, EPA 3620 C, EPA 8081 B
Antrasen	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Atrazin	µg/L	0,6	0,6	<0,1	İşletme İçi Metot
Benzen	µg/L	10	8	<0,2	EPA 5030 C, EPA 8260 D
*Bromlu difenileter[1]	µg/L	-	-	<0,005	İşletme İçi Metot
*Kadmiyum ve bileşikleri[2]	µg/L	< 0,08 (Sınıf 1) 0,08 (Sınıf 2) 0,09 (Sınıf 3) 0,15 (Sınıf 4) 0,25 (Sınıf 5)	0,2	<0,08	EPA 6020 B
C10-13-Kloroalkanlar	µg/L	0,4	0,4	<0,005	İşletme İçi Metot
Klorfenvinfos	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Klorpirifos (Klorpirifos-etil)	µg/L	0,03	0,03	<0,03	EPA 3510 C, EPA 3620 C, EPA 8081 B
1,2-dikloroetan	µg/L	10	10	<0,2	EPA 5030 C, EPA 8260 D
Diklorometan	µg/L	20	20	<0,2	EPA 5030 C, EPA 8260 D
Diuron	µg/L	0,2	0,2	<0,05	İşletme İçi Metot
*Endosulfan	µg/L	0,005	0,0005	<0,0005	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Floranten	µg/L	0,0063	0,0063	<0,0063	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-benzen	µg/L	-	-	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-bütadien	µg/L	-	-	<0,1	EPA 5030 C, EPA 8260 D
*Hekzakloro-siklohekzan	µg/L	0,02	0,002	<0,002	EPA 3510 C, EPA 3620 C, EPA 8081 B
Isoproturon	µg/L	0,3	0,3	<0,05	İşletme İçi Metot
Kurşun ve bileşikleri[3]	µg/L	1,2	1,3	<0,5	EPA 6020 B
Cıva ve bileşikleri	µg/L	-	-	<0,1	EPA 6020 B
Naftalin	µg/L	2	2	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Nikel ve bileşikleri[3]	µg/L	4	8,6	<1,0	EPA 6020 B
*Nonilfenoller (4-Nonilfenol)	µg/L	0,3	0,3	<0,30	İşletme İçi Metot
*Oktilfenol ((4-(1,1' ,3,3' -tetrametilbütil)-fenol))	µg/L	0,1	0,01	<0,01	İşletme İçi Metot

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AB-0168-T

AB-0168-T

LR.23.2975

09-23

DENEY RAPORU / TEST REPORT

Parametre Parameter	**Birim** Unit	**TABLO ADI/ SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 5**		**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		YO-CKS Nehirler/ Göller	**YO-CKS Kıyı ve Geçiş Suları**		
*Pentakloro-benzen	µg/L	0,007	0,0007	<0,0007	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Pentakloro-fenol	µg/L	0,4	0,4	<0,4	EPA 528, EPA 8041 A
Poliaromatik hidrokarbonlar (PAH)	µg/L	-	-	<0,1	EPA 3510 C EPA 3620 C EPA 8270 E
*Benzo(a)piren	µg/L	$1,7 \times 10^{-4}$	$1,7 \times 10^{-4}$	<0,00017	
Benzo(b)floranten	µg/L	-	-	<0,1	
Benzo(k)floranten	µg/L	-	-	<0,1	
Benzo(g,h,i)perilen	µg/L	-	-	<0,1	
Indeno(1,2,3-cd)piren	µg/L	-	-	<0,1	
Simazin	µg/L	1	1	<0,05	İşletme İçi Metot
*Tributilkalay bileşikleri (Tributilkalay-katyonu)	µg/L	0,0002	0,0002	<0,0002	İşletme İçi Metot
Trikloro-benzenler	µg/L	0,4	0,4	<0,2	EPA 5030 C, EPA 8260 D
Trikloro-metan	µg/L	2,5	2,5	<0,2	EPA 5030 C, EPA 8260 D
*Trifluralin	µg/L	0,03	0,03	<0,03	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Dikofol	µg/L	$1,3 \times 10^{-3}$	$3,2 \times 10^{-5}$	<0,000032	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Perflorooktan sülfonik asit ve türevleri (PFOS)	µg/L	$6,5 \times 10^{-4}$	$1,3 \times 10^{-4}$	<0,00065	İşletme İçi Metot
*Kinoksifen	µg/L	0,15	0,015	<0,015	İşletme İçi Metot
*Aklonifen	µg/L	0,12	0,012	<0,012	İşletme İçi Metot
*Bifenoks	µg/L	0,012	0,0012	<0,0012	İşletme İçi Metot
*Sibutrin	µg/L	0,0025	0,0025	<0,0025	İşletme İçi Metot
*Sipermetrin[5]	µg/L	8×10^{-5}	8×10^{-6}	<0,000008	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Diklorvos	µg/L	6×10^{-4}	6×10^{-5}	<0,00006	İşletme İçi Metot
*Hekzabromo-siklododekanlar (HBCDD)[6]	µg/L	0,0016	0,0008	<0,0008	İşletme İçi Metot
*Heptaklor ve heptaklor epoksit	µg/L	2×10^{-7}	1×10^{-8}	<0,00000001	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Terbutrin	µg/L	0,065	0,0065	<0,0065	İşletme İçi Metot

Açıklamalar/Remarks:

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ENCON Laboratuvarı A.Ş. tarafından alınmayan numuneler için belirtilen ölçüm belirsizliği değerlerine numune almadan kaynaklanan belirsizlik değerleri dahil edilmemektedir.
Laboratuvar yetkili personel tarafından alınmayan ve/veya uygun koşullarda teslim alınmayan numunelerden teknik ve hukuki olarak sorumluluk kabul etmemektedir. Müşteri tarafından sağlanan bilgilerin hukuki sorumluluğu müşteriye aittir. firmamız bu bilgilerden kaynaklanacak sonuçlardan feragat eder.
For the samples not taken by the ENCON laboratory Inc.. uncertainty values indicated do not cover the uncertainties arising from the sampling.
The Laboratory does not accept technical and legal responsibility for samples that are not sampled by authorized personnel and/or received under inappropriate conditions. The legal responsibility of the information provided by the customer belongs to the customer. our company waives the consequences arising from this information.

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Test
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Müşteri Adı / Adresi Client Name / Address	Encon Çevre Danışmanlık Ltd. Şti. Prof. Dr. Ahmet Taner Kışlalı Mah. Bangabandhu Bulvarı No:94/39 Özçelik İmaj İş Merkezi Kat 4 ÇANKAYA/ANKARA
Teklif Numarası *Proposal Number*	LT21_0103
Rapor Tarihi / Sayfa Sayısı Report Date / Number of Pages	28.09.2023 / 2
Numune Kayıt No Sample Record Number	NUM.23.2976
Numuneyi Alan Kurum / Kuruluş Sampler Institution / Company	ENCON Laboratuvarı A.Ş.
Numune Alınan Yer Sampling Location	Denizli-Aydın Otoyol Projesi (Koordinat : 35S 592249/4185935)
Numune Türü / Numune İşareti Sample Type / Sample Sign	Yüzey Suyu / YS-13
Numunenin Alınış Şekli *ve Amacı* *Way and Aim the Sampling*	Anlık / İzleme
Numuneyi Alan Person Conducted Sampling	Hüseyin KALKAN
Numune Alma Standardı *Sampling Standard*	TS EN ISO 5667-6
Numune Alma / Kabul Tarihi Sampling Date / Date of Samples Received	14.08.2023 / 15.08.2023
Numunenin Teslim Koşulları Delivery Conditions of the Sample	Mühürsüz, Plastik Şişe, Cam Şişe, Steril Şişe
Numune Alımında Çevre Şartları Environmental Conditions During Sampling	Açık
Açıklamalar Remarks	Müşteri talebi üzerine özel istek numunesi olarak çalışılmıştır. Bu rapor çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz.
Deneyin Yapıldığı Tarih Date of Test	14.08.2023 / 20.08.2023

Deney laboratuvarı olarak faaliyet gösteren ENCON Laboratuvarı A.Ş. TÜRKAK' tan AB-0168-T ile TS EN ISO/IEC 17025 standardına gore akredite edilmiştir. ENCON Laboratuvarı A.Ş. is accredited by TÜRKAK under registration number AB-0168-T for TS EN ISO/IEC 17025 as a test laboratory.

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınırlığı konusunda Avrupa Akreditasyon Birliği (EA) ile Çok Taraflı Anlaşma ve Uluslararası laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanıma anlaşması imzalamıştır. Turkish Accreditation Agency (TURKAK) is a signatory to the European co-operation for Accreditation (EA) Multilateral Agreement (MLA) and to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for the recognition of test reports.

Deney ve /veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir. The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Yayımlandığı Tarih **Date**	**Raporu Hazırlayan** Person in charge of report İrem ÖZKAN Kalite Yöneticisi	**Onaylayan/ Approval** **Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
29.09.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır** **29.09.2023**

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DENEY RAPORU / TEST REPORT

Parametre Parameter	**Birim** Unit	**TABLO ADI / SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 2** I	II	III	**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
Renk	m^{-1}	RES 436 nm: ≤ 1,5	RES 436 nm: 3	RES 436 nm: 4,3	0,32	TS EN ISO 7887 B
		RES 525 nm: ≤ 1,2	RES 525 nm: 2,4	RES 525 nm: 3,7	0,12	
		RES 620 nm: ≤ 0,8	RES 620 nm: 1,7	RES 620 nm: 2,5	0,4	
pH	-	6-9	6-9	6-9	8,78	SM 4500-H^+ B
İletkenlik	µS/cm	< 400	1000	>1000	934,0	SM 2510 B
*Yağ ve Gres	mg/L	< 0,2	0,3	>0.3	1,0	SM 5520 B
Çözünmüş oksijen	mg/L	> 8	6	<6	1,9	SM 4500-O G
Kimyasal oksijen ihtiyacı (KOİ)	mg/L	< 25	50	>50	13,9	SM 5220 B
Biyokimyasal oksijen ihtiyacı ($BOİ_5$)	mg/L	< 4	8	>8	4,3	SM 5210 B
Amonyum azotu	mg/L	< 0,2	1	>1	<0,02	SM 4500-NH_3 B,C
Nitrat azotu	mg/L	< 3	10	>10	1,7	SM 4110 B
Toplam kjeldahl-azotu	mg/L	< 0,5	1,5	>1.5	<0,5	SM 4500-Norg B
Toplam azot	mg/L	< 3,5	11,5	>11.5	2,9	SM 4500-Norg B, SM4110 B, SM 4500-NO_2^- B
Orto fosfat fosforu	mg/L	< 0,05	0,16	>0.16	0,16	SM 4500 P E
Toplam fosfor	mg/L	< 0,08	0,2	>0.2	0,27	SM 4500-P B,E
Florür	µg/L	≤ 1000	1500	>1500	<20,0	SM 4110 B
Mangan	µg/L	≤ 100	500	>500	120,7	EPA 200.7
Selenyum	µg/L	≤ 10	15	>15	<5,0	EPA 200.7
*Sülfür	µg/L	≤ 2	5	>5	<2,0	SM 4500-S^{2-} F

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Parametre Parameter	**Birim** Unit	**TABLO ADI/ SINIR DEĞER Yerüstü Su Kalitesi Yönetmeliği TABLO 5**		**Analiz Sonucu** Test Result	**Analiz Metodu** Method of Analysis
		YO-CKS Nehirler/ Göller	**YO-CKS Kıyı ve Geçiş Suları**		
*Alaklor	µg/L	0,3	0,3	<0,3	EPA 3510 C, EPA 3620 C, EPA 8081 B
Antrasen	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Atrazin	µg/L	0,6	0,6	<0,1	İşletme İçi Metot
Benzen	µg/L	10	8	<0,2	EPA 5030 C, EPA 8260 D
*Bromlu difenileter[1]	µg/L	-	-	<0,005	İşletme İçi Metot
*Kadmiyum ve bileşikleri[2]	µg/L	< 0,08 (Sınıf 1) 0,08 (Sınıf 2) 0,09 (Sınıf 3) 0,15 (Sınıf 4) 0,25 (Sınıf 5)	0,2	<0,08	EPA 6020 B
C10-13-Kloroalkanlar	µg/L	0,4	0,4	<0,005	İşletme İçi Metot
Klorfenvinfos	µg/L	0,1	0,1	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Klorpirifos (Klorpirifos-etil)	µg/L	0,03	0,03	<0,03	EPA 3510 C, EPA 3620 C, EPA 8081 B
1,2-dikloroetan	µg/L	10	10	<0,2	EPA 5030 C, EPA 8260 D
Diklorometan	µg/L	20	20	<0,2	EPA 5030 C, EPA 8260 D
Diuron	µg/L	0,2	0,2	<0,05	İşletme İçi Metot
*Endosulfan	µg/L	0,005	0,0005	<0,0005	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Floranten	µg/L	0,0063	0,0063	<0,0063	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-benzen	µg/L	-	-	<0,1	EPA 3510 C, EPA 3620 C, EPA 8081 B
Hekzakloro-bütadien	µg/L	-	-	<0,1	EPA 5030 C, EPA 8260 D
*Hekzakloro-siklohekzan	µg/L	0,02	0,002	<0,002	EPA 3510 C, EPA 3620 C, EPA 8081 B
Isoproturon	µg/L	0,3	0,3	<0,05	İşletme İçi Metot
Kurşun ve bileşikleri[3]	µg/L	1,2	1,3	<0,5	EPA 6020 B
Cıva ve bileşikleri	µg/L	-	-	<0,1	EPA 6020 B
Naftalin	µg/L	2	2	<0,1	EPA 3510 C, EPA 3620 C, EPA 8270 E
Nikel ve bileşikleri[3]	µg/L	4	8,6	<1,0	EPA 6020 B
*Nonilfenoller (4-Nonilfenol)	µg/L	0,3	0,3	<0,30	İşletme İçi Metot
*Oktilfenol ((4-(1,1' ,3,3' -tetrametilbütil)-fenol))	µg/L	0,1	0,01	<0,01	İşletme İçi Metot

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*Pentakloro-fenol	µg/L	0,4	0,4	<0,4	EPA 528, EPA 8041 A
Poliaromatik hidrokarbonlar (PAH)	µg/L	-	-	<0,1	EPA 3510 C EPA 3620 C EPA 8270 E
*Benzo(a)piren	µg/L	$1,7 \times 10^{-4}$	$1,7 \times 10^{-4}$	<0,00017	
Benzo(b)floranten	µg/L	-	-	<0,1	
Benzo(k)floranten	µg/L	-	-	<0,1	
Benzo(g,h,i)perilen	µg/L	-	-	<0,1	
Indeno(1,2,3-cd)piren	µg/L	-	-	<0,1	
Simazin	µg/L	1	1	<0,05	İşletme İçi Metot
*Tributilkalay bileşikleri (Tributilkalay-katyonu)	µg/L	0,0002	0,0002	<0,0002	İşletme İçi Metot
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*Kinoksifen	µg/L	0,15	0,015	<0,015	İşletme İçi Metot
*Aklonifen	µg/L	0,12	0,012	<0,012	İşletme İçi Metot
*Bifenoks	µg/L	0,012	0,0012	<0,0012	İşletme İçi Metot
*Sibutrin	µg/L	0,0025	0,0025	<0,0025	İşletme İçi Metot
*Sipermetrin[5]	µg/L	8×10^{-5}	8×10^{-6}	<0,000008	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Diklorvos	µg/L	6×10^{-4}	6×10^{-5}	<0,00006	İşletme İçi Metot
*Hekzabromo-siklododekanlar (HBCDD)[6]	µg/L	0,0016	0,0008	<0,0008	İşletme İçi Metot
*Heptaklor ve heptaklor epoksit	µg/L	2×10^{-7}	1×10^{-8}	<0,00000001	EPA 3510 C, EPA 3620 C, EPA 8081 B
*Terbutrin	µg/L	0,065	0,0065	<0,0065	İşletme İçi Metot

Açıklamalar/Remarks:

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Test
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AB-0168-T

AB-0168-T
LR.23.2976
09-23

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Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı, Bangabandhu Blv. Özçelik İmaj İş Merkezi No:94/39, 06810 Çankaya/Ankara		
Teklif Numarası / Proposal Number	LT21_103		
Rapor Tarihi / Numarası Report Date / No	26.10.2023 / LR.23.2989_1	**Numune Türü / Sample Type**	Gürültü
Numune Kayıt Numarası / Sample Record No	NUM.23.2989	**Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement**	TS ISO 1996-2
Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	605505/4186287	**Ölçüm Tarihi / Sampling Date**	06-07/08/2023
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Aydın-Denizli Otoyolu Projesi / Yenipazar	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Numune Kabul Tarihi Date of Samples Received	14.08.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
26.10.2023		**26.10.2023**

Açıklamalar/Remarks:			
			Sayfa No 1/2

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PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	ÇEVRESEL GÜRÜLTÜ KONTROL YÖNETMELİĞİ EK 2 TABLO 1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-19:00)	**dBA**	50.7	65.0
Eşdeğer Gürültü $*L_{Eq}$ Akşam (19:00-23:00)	**dBA**	50.1	60.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (23:00-07:00)	**dBA**	44.4	55.0

PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	IFC Tablo 1.7.1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-22:00)	**dBA**	50.8	55.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (22:00-07:00)	**dBA**	44.2	45.0

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Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı, Bangabandhu Blv. Özçelik İmaj İş Merkezi No:94/39, 06810 Çankaya/Ankara		
Teklif Numarası / Proposal Number	LT21_103		
Rapor Tarihi / Numarası Report Date / No	26.10.2023 / LR.23.2990_1	**Numune Türü / Sample Type**	Gürültü
Numune Kayıt Numarası / Sample Record No	NUM.23.2990	**Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement**	TS ISO 1996-2
Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	601492/4184590	**Ölçüm Tarihi / Sampling Date**	07-08/08/2023
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Aydın-Denizli Otoyolu Projesi / Dereköy	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Numune Kabul Tarihi Date of Samples Received	14.08.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report İrem ÖZKAN Kalite Yöneticisi	**Onaylayan/ Approval** **Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
26.10.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır** **26.10.2023**

Açıklamalar/Remarks:

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PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	ÇEVRESEL GÜRÜLTÜ KONTROL YÖNETMELİĞİ EK 2 TABLO 1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-19:00)	**dBA**	46.0	65.0
Eşdeğer Gürültü $*L_{Eq}$ Akşam (19:00-23:00)	**dBA**	45.3	60.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (23:00-07:00)	**dBA**	40.0	55.0

PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	IFC Tablo 1.7.1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-22:00)	**dBA**	46.1	55.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (22:00-07:00)	**dBA**	40.1	45.0

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Teklif Numarası / Proposal Number	LT21_103		
Rapor Tarihi / Numarası Report Date / No	26.10.2023 / LR.23.2991_1	**Numune Türü / Sample Type**	Gürültü
Numune Kayıt Numarası / Sample Record No	NUM.23.2991	**Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement**	TS ISO 1996-2
Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	0597914/4183834	**Ölçüm Tarihi / Sampling Date**	08-09/08/2023
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Aydın-Denizli Otoyolu Projesi / Alanlı-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Numune Kabul Tarihi Date of Samples Received	14.08.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report	**Onaylayan/ Approval**
	İrem ÖZKAN	**Tarih**/ Date
	Kalite Yöneticisi	Hüseyin TEKİN
		Laboratuvar Müdürü
	e-imza ile imzalanmıştır	**e-imza ile imzalanmıştır**
26.10.2023		**26.10.2023**

Açıklamalar/Remarks:

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PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	ÇEVRESEL GÜRÜLTÜ KONTROL YÖNETMELİĞİ EK 2 TABLO 1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-19:00)	**dBA**	51.3	65.0
Eşdeğer Gürültü $*L_{Eq}$ Akşam (19:00-23:00)	**dBA**	50.3	60.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (23:00-07:00)	**dBA**	44.7	55.0

PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	IFC Tablo 1.7.1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-22:00)	**dBA**	51.1	55.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (22:00-07:00)	**dBA**	44.6	45.0

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Müşteri Adı / Client Name	Encon Çevre Danışmanlık Ltd. Şti.		
Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı, Bangabandhu Blv. Özçelik İmaj İş Merkezi No:94/39, 06810 Çankaya/Ankara		
Teklif Numarası / Proposal Number	LT21_103		
Rapor Tarihi / Numarası Report Date / No	26.10.2023 / LR.23.2992_1	**Numune Türü / Sample Type**	Gürültü
Numune Kayıt Numarası / Sample Record No	NUM.23.2992	**Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement**	TS ISO 1996-2
Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	593238/4182857	**Ölçüm Tarihi / Sampling Date**	09-10/08/2023
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Aydın-Denizli Otoyolu Projesi / Dalama-2	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Numune Kabul Tarihi Date of Samples Received	14.08.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report İrem ÖZKAN Kalite Yöneticisi	**Onaylayan/ Approval** **Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
26.10.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır** **26.10.2023**

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PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	ÇEVRESEL GÜRÜLTÜ KONTROL YÖNETMELİĞİ EK 2 TABLO 1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-19:00)	**dBA**	48.1	65.0
Eşdeğer Gürültü $*L_{Eq}$ Akşam (19:00-23:00)	**dBA**	46.9	60.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (23:00-07:00)	**dBA**	41.4	55.0

PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	IFC Tablo 1.7.1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-22:00)	**dBA**	48.1	55.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (22:00-07:00)	**dBA**	41.2	45.0

Açıklamalar/Remarks:

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Müşteri Adresi /Client Address	Prof. Dr. Ahmet Taner Kışlalı, Bangabandhu Blv. Özçelik İmaj İş Merkezi No:94/39, 06810 Çankaya/Ankara		
Teklif Numarası / Proposal Number	LT21_103		
Rapor Tarihi / Numarası Report Date / No	26.10.2023 / LR.23.2993_1	**Numune Türü / Sample Type**	Gürültü
Numune Kayıt Numarası / Sample Record No	NUM.23.2993	**Ölçümde Uygulanacak Standart ve Kaynaklar / Standard and Resources Applied in Measurement**	TS ISO 1996-2
Ölçümün Yapıldığı Yerin Koordinatları / Coordinates of Sampling Location	0591203/4183693	**Ölçüm Tarihi / Sampling Date**	10-11/08/2023
Proje Adı / Cihaz Kurulum Noktasi Project Name / Sampling Location	Aydın-Denizli Otoyolu Projesi / Dereköy (Merkez)	**Ölçüm Yapıldığında Çevre Şartları / Environmental Conditions During Sampling**	Güneşli
Numune Kabul Tarihi Date of Samples Received	14.08.2023	**Örneklemeyi Yapan Personel Kurum /Kişi Person /Firm Conducted Sampling**	Hüseyin KALKAN

Yayımlandığı Tarih Date	**Raporu Hazırlayan** Person in charge of report İrem ÖZKAN Kalite Yöneticisi	**Onaylayan/ Approval** **Tarih**/ Date Hüseyin TEKİN Laboratuvar Müdürü
26.10.2023	**e-imza ile imzalanmıştır**	**e-imza ile imzalanmıştır** **26.10.2023**

Açıklamalar/Remarks:

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PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	ÇEVRESEL GÜRÜLTÜ KONTROL YÖNETMELİĞİ EK 2 TABLO 1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-19:00)	**dBA**	51.3	65.0
Eşdeğer Gürültü $*L_{Eq}$ Akşam (19:00-23:00)	**dBA**	50.3	60.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (23:00-07:00)	**dBA**	44.9	55.0

PARAMETRE	BİRİM	ÖLÇÜM/ ANALİZ SONUCU	IFC Tablo 1.7.1
Eşdeğer Gürültü $*L_{Eq}$ Gündüz (07:00-22:00)	**dBA**	51.3	55.0
Eşdeğer Gürültü $*L_{Eq}$ Gece (22:00-07:00)	**dBA**	44.7	45.0

Açıklamalar/Remarks:

ANNEX–6

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Annex-6 ENVIRONMENTAL and SOCIAL MANAGEMENT PLAN and THE SUB-PLANS FOR THE SOUTH ALTERNATİVE PROJECT

A. ENVIRONMENTAL MANAGEMENT PLAN

A.1 AIR QUALITY AND EMISSIONS MANAGEMENT PROCEDURE

A.1.1 Purpose and Scope

This procedure is prepared in order to identify and present means of management of air emission sources. The procedure will provide mitigation alternatives and an impact monitoring schedule in accordance with Turkish and international regulations and standards. This procedure will cover the activities during construction and operation phases of the project.

The main emission sources on site could be listed as follows:

- Construction Site
- Borrow Sites and facilities (crushing, concrete batching, etc.)
- Administrative and social units (camp sites)
- Construction machines and activities
- On site and off site access roads (i.e. roads used outside the construction site) construction and traffic on these roads (haulage of materials, etc.).
- Excavation material storage sites
- Operation of the motorway

A.1.2 References

- Turkish Environmental Legislation
- Environmental Law
- Regulation on Assessment and Management of Air Quality
- Industrial Air Pollution Control Regulation
- Regulation on Control of Exhaust Gas Emission
- Regulation Concerning Follow up of Greenhouse Gas Emissions
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 3
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads
- World Health Organization (WHO) Ambient Air Quality Guidelines

A.1.3 Air Quality and Emissions Management Approach

Main pollutants emitted from motorway projects are nitrogen oxides (NO_x (NO_2 and NO)), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), hydrocarbons (HC) and carbon dioxide (CO_2). PM_{10} and $PM_{2.5}$ is expected to be emitted mainly during operation phase of the project as a result of material extraction and supply; motorway construction, cut and fill operations and storage of excavated material. Particles can vary according to size and composition. $PM_{2.5}$ (particulate matter with aerodynamic diameter smaller than 2.5 µm) standard is set to define the particles that are likely to inhale and able to travel deeply into the respiratory tract, reaching the lungs has become the general measure of particulate matter. In this sense, generally limit values are defined for $PM_{2.5}$.

Other potential pollutants are expected to arise from operation of construction machinery and equipment during construction, and traffic flow during operation of the motorway.

- Project construction activities are expected to result in dust emissions during land preparation, cut-fill operations and activities of quarries operated in scope of the project.

In addition, exhaust emissions are also expected to result $PM_{2.5}$, PM_{10}, NO_x, CO, SO_2, VOC, benzene, NH_3 and N_2O. During the construction phase of the project, fuel will be used for construction machinery, transport vehicles and power engines and for heating at the work sites. The type of fuel will directly affect the air pollutant emissions. Emissions from transportation and material transfer will mainly emerge during working hours. Emissions for heating will increase during winter season. Asphalt plants and concrete plants are considered as other emission sources of construction activities.

- Main pollutants expected to be generated during the operation of the motorway will include NO_x, $PM_{2.5}$, PM_{10}, CO, VOCs and SO_2.
- GHGs will be generated due to project activities during both construction and operation phases of the project.

Impacts of air emissions will be prevented or at least minimized by ensuring that emissions do not result in pollutant concentrations that reach or exceed ambient quality guidelines and standards by applying Turkish Regulation on Assessment and Management of Air Quality and the current World Health Organization Air Quality Guidelines.

A.1.3.1 Management of Air Emissions

Air quality emissions; sulphur dioxide, oxides of nitrogen, hydrocarbons, and particulate matter would be evaluated through the use of ambient air quality assessments/measurements and monitoring. Based on baseline and other measurements mitigation activities proposed in this procedure will be applied.

A.1.3.2 Management of Greenhouse Gases (GHG)

The six greenhouse gases of concern include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluolorocarbons (PFCs), and sulphur hexafluoride (SF_6). Afforestation activities will be carried out through the project in order to enhance carbon capture capacity.

A.1.4 Mitigation Measures for Impacts on Air Quality

The following measures will be implemented throughout the project sites to reduce air pollution due to construction activities:

- Dust will be minimized from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house filters or cyclones)
- Dust will be minimized from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content
- Speed limitations will be defined and obeyed for construction vehicles.
- Well and adequate maintained vehicles will be used. Regular maintenance of machinery and equipment will be ensured.
- The drop height of potentially dust generating materials will be kept as low as possible.
- Construction vehicles will not be permitted to keep engines running while waiting to enter the site or waiting on-site.
- Dust suppression methods (i.e. watering with water trucks, applying non-toxic chemicals, speed limits for mobile vehicles, use of well-maintained vehicles/machinery) will be applied at road construction sites, service roads and quarry/material borrow/storage sites to mitigate project-related dust emissions. In this respect, upper layers of the work sites/materials will be kept at a humidity level of about 10%. Watering will be applied at any time necessary including night time, weekends or off-days by using pressurized distribution or spraying systems that would ensure even distribution of water.

- If there is traffic flow on the existing roads near the work sites, dust suppression measures will be continuously applied to ensure traffic safety. If there is no traffic existing in the local roads, dust suppression measures will be applied only at local residential and business areas.
- All the dust-emitting components of the crushing-screening plants will be put in closed spaces and equipped with dust suppression systems.
- Loading and unloading operations will be performed without throwing/scattering.
- During transportation, excavated materials will be covered with nylon canvas or materials with grain size larger than 10 mm.
- In the supply of construction materials, local licensed quarries (existing or new) will be preferred to reduce transportation distance to minimize associated impacts and costs.
- Wind shields/barriers will be placed at work sites such as material storage areas to prevent dust dispersion where necessary.
- Relevant provisions of the Regulation on Assessment and Management of Air Quality, Regulation on the Industrial Air Pollution Control Regulation, Regulation on Control of Exhaust Gas Emission and Regulation Concerning Follow up of Greenhouse Gas Emissions will be complied with to minimize air emissions sourced from construction machinery and trucks.
- Blasting operations will be conducted in line with the legislation in force and good industry practices/modern techniques.
- Roads to be used for access to quarry sites will be upgraded by the FOIAS to minimize dust emissions during transport. These roads will have sufficient width.
- Driving through settlements will be avoided wherever alternative roads are present.
- Any damage caused by insufficient or lack of dust suppression measures will be compensated.
- Best available techniques will be used for the storage of fuels.

The following measures will be implemented throughout the project sites to reduce air pollution due to operation activities:

- At the service areas, a green buffer strip will be formed between the outer lane of the motorway and the facilities. This strip will be properly planted (e.g. with shrubs that start growing from the base and are resistant to dust and gaseous emissions) to form a barrier against dust to be sourced from the motorway traffic.
- The application of automatic toll systems along the motorway will contribute to an optimization of traffic flows and thus lower emissions.

Above-mentioned measures will reduce emission and dust production considerably. The possible adverse effects on living organisms and their environment will be minimized and environmental pollution will be reduced.

FOIAS will be responsible from implementing the mitigating measures against emission and dust production in accordance with the points specified in the Turkish Environment Law and relevant regulations.

This procedure will be implemented throughout the construction phase and it will be continued at the operation phase of the motorway. The on-site specification, implementation and supervision of measures will be under the responsibility of the Environmental and Social Interaction Department.

A.1.5 Monitoring of Air Quality and Emissions Management

An independent monitoring program will be implemented for evaluation of the efficiency of management strategies and mitigation measures. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- PM_{10}, $PM_{2.5}$, settled dust, NO_x, SO_X and VOC will be measured at selected settlements (quarterly or upon grievance) during construction phase and compared with legal limit values/project standards.
- $NO_{x,}$ SO_X and VOC levels will be monitored at selected settlements (annual) during operation and compared with legal limit values/project standards.
- Number of water trucks used for dust suppression and frequency of road watering activities will be monitored.
- Grievances received on impacts related with dust/air emissions will be monitored and evaluated to develop corrective actions, as required throughput the project.
- Presence and validity of environmental permits for concrete plants, asphalt plants, etc. will be checked.

In addition, daily general site overview would be done by the Environmental and Social Interaction Department in order to provide basic information on construction progress, site organization, etc. Monthly coordination meetings with project management will also be held by the Environmental and Social Interaction Department in order to provide feedback on environmental matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the FOIAS.

A.2 WATER QUALITY, WASTEWATER AND STORMWATER MANAGEMENT PROCEDURE

A.2.1 Purpose and Scope

This procedure is developed in order to provide proper management of the stormwater and wastewater that is generated by construction, maintenance, resting areas and toll booth area. The procedure will be based on Turkish and international regulations and standards.

A.2.2 References

- Turkish Environmental Legislation
- Environmental Law
- Water Pollution Control Regulation
- Surface Water Quality Regulation
- Regulation on the Control of Pollution Caused by Dangerous Substances in and around the Water Bodies
- Regulation Concerning Protection of Groundwaters against Pollution and Deterioration
- Ordinance on Groundwater Resources
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 3
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

A.2.3 Water Quality, Wastewater and Stormwater Management Approach

Wastewater will be generated during land preparation and construction activities and also during operation phases of the project. The basic approach will be to reuse the wastewater generated by project activities in activity cycle during construction. This approach will not require any water discharge to environmental media. If reusing will not be an option due to water quality, the wastewater will be treated before discharging into receiving environment in order to reduce or eliminate the contaminants. Wastewater management will be carried out in compliance with national legislation and international standards.

Water Quality Management

Treated wastewater and stormwater will be analyzed in order to ensure that the quality and quantity of the wastewater to be discharged will be in compliance with the limit values indicated in national and international regulations and standards. In addition necessary permits will be obtained if required by regulating administrations.

Wastewater Management

Wastewater will be generated during land preparation and construction activities of the project from construction sites and accommodation facilities for workers (camp site, kitchen, cafeteria, etc.). In operation phase rest and maintenance areas and toll booth area will be the sources of wastewater generation. Generated wastewater may contain organic and inorganic pollutants, suspended solids, heavy metals or toxic materials, etc. Wastewater will be either discharged into the local/municipal sewage network or treated prior to discharge to the suitable receiving environment or collected onsite and transported via vacuum trucks for disposal to the nearest sewerage network or WWTP.

Stormwater Management

Stormwater accumulated in construction sites may be contaminated due to run-offs. The water may drag certain pollutants such as; chemicals, debris, sediments, etc. Therefore, measures will be taken in order to avoid/minimize stormwater discharge to receiving bodies.

Final structure of the motorway will lead to an increase on impermeable surface area because of its nature. This situation leads increase on the rate of surface water runoff and high storm water flow rates can lead erosion and flooding. During flood times, bridges, culverts and diversion channels may impede flow. Therefore, this situation cause increase at water level on upstream of relevant structures.

Surface Water Management

Maintenance activities like using de-icing agents may affect surface water quality but this impact can be classified as temporary.

During operation of the motorway, there may be spills resulting from road accidents and spillages / leakages might also occur from filling stations. These events may lead to discharge of water that is contaminated with hazardous substances, to a surface water body. The risk of water pollution is also high within all road sections close to surface water bodies. Even though, this impact can also be classified as temporary since accidents and/or spillages / leakages can be considered as one-time events.

Routine deposits (tyre and brake deposits, hydrocarbons from engines, liquid exhaust emissions etc.) of vehicles travelling on motorway and leakage of road body itself (tar soils) and road marking materials will likely affect the surface water quality. As these events are continuous, impact can be considered as permanent.

Construction of viaducts, bridges and culverts is likely to change the hydrological regime with potential impacts on the beds and banks of rivers (scour, erosion, deposition etc.). Within this respect, a possible change on hydrological regime is considered as temporary. On the other hand, in case of an inappropriate design, physical interference of a stream by installation of temporary culverts and roadways has possibility to impact hydrological regime of a stream significantly.

Measures for surface water management will be taken in order to comply with national legislations and international standards.

Groundwater management

Especially on areas with shallow overburden, accidental discharges of hazardous materials to the ground have possibility to contaminate aquifers.

Site clearance, earthwork, spillages/leakages from construction sites and refueling vehicles may contaminate bedrock aquifers.

All wastewater generated from construction activities (sanitary or industrial) poses a risk to the water environment if not treated properly before discharge.

Some deeper excavation works may require permanent dewatering of a groundwater component.

During earthworks and other soil-related activities; in sections cut into the bedrock or shallow overburden, any fissure permeability is at risk of blockage by infiltrating sediment/fines.

Drainage and Flooding Management

Final structure of a motorway will lead to an increase on impermeable surface area because of its nature. This situation leads to increase on the rate of surface water runoff and high storm water flow rates can lead erosion and flooding.

During flood times, bridges, culverts and diversion channels may impede flow. Therefore, this situation cause increase at water level on upstream of relevant structures.

A.2.4 Mitigation Measures for Impacts on Water Quality

As some of the impacts would be mitigated during design phase of the project, the mitigation measures are divided into three phases namely; design, land preparation and construction and operation. This procedure will not involve the mitigation measures to be taken in design phase since it will be implemented starting with the construction activities.

Mitigation measures listed below will be implemented in order to reduce the amount of wastewater generation, manage stormwater and floods, and prevent/minimize the impacts of wastewater resulting from reuse and/or discharges;

Land Preparation & Construction

Mitigation Measures for Surface and Groundwater Quality

- All chemicals and hazardous materials will be stored in designated hazardous materials storage area that has lean-to roof, concrete floor, secondary containment of at least 110% of the stored volume and proper drainage for spills/leaks.
- Fueling of equipment and vehicles will not be conducted within excavated areas.
- In the selection of temporary storage sites for oil, fuel and chemicals, location of the water resources will be taken into consideration.
- Waste oils will be stored in tanks/containers located on impervious surfaces.
- Spill kits and fire extinguishers will be kept available at storage sites, if necessary.
- Volume of containment structures allocated for the storage of fuel, oil or other chemicals will be sufficiently greater than the volume of contained liquid.
- Hazardous materials will not be stored within excavated areas. Supervision will be used during handling of all hazardous materials. Impervious bunds and other containment techniques will be used where hazardous materials are handled.
- All wastewater discharges from all components of the construction must comply with relevant legal requirements. Treated water will be reused where possible and feasible.
- Wastewater from all construction compounds and associated buildings will be either discharged into the local/municipal sewage network or treated prior to discharge to the suitable receiving environment or collected onsite and transported via vacuum trucks for disposal to the nearest sewerage network or WWTP.
- If needed, quarry pond dredging activities will be designed and implemented in material quarries to minimize drawdown with consideration of potential impacts to surface and groundwater resource flow and availability.
- If water quality of stormwater is applicable to the related regulations and standards, stormwater will also be used as a resource for water needs of project whenever feasible.
- Drainage from excavations will be collected and treated to remove contaminants, before discharging according to relevant legal requirements.
- Perimeter drains will be constructed around all working areas to collect potentially contaminated run-off and direct it to a system of settlement tanks before discharging in accordance with required permits.
- Direct discharge of contaminated run-off from work sites will not be allowed.

- In order to provide direct run-off to the collection system; channels, bunds and sandbag barriers will be used.
- In order to keep roads and other surfaces clear from dust, sweeping will be used rather than washing.
- In order to remove asphalt residues, biodegradable cleaning agents will be used.
- In order to ensure proper and efficient construction process, maintenance and inspection of all facilities and structures will be done regularly; especially after heavy rainfall. Sediment deposits will be regularly removed and disposed of at either by spreading on site (if uncontaminated) or at a suitably licensed facility.
- High sediment generating activities such as road paving will be avoided and exposed surfaces and stored materials will be covered if necessary to reduce erosion of sediments into surface waters.
- During construction, Emergency Preparedness and Response Plan will be implemented.

Mitigation Measures for Surface Water Bodies and Channels

- Whenever and wherever possible; construction of bridges, viaducts, retaining walls and other structures will be carried out during dry weathers.
- Fencing will be used at sensitive areas of rivers and drains for protection.
- During construction, isolation techniques such as beaming or diversion will be used during in-stream works to limit the exposure of disturbed sediments to moving water.
- In order to protect small drains within the construction areas, they will be covered with metal plates which can be passed over by construction machines.
- For stream crossings the work will be carried out from the banks above the channel and direct intervention in the watercourse will be avoided unless the existing bank reinforcement needs to be replaced. The works will be undertaken during periods of low flow. Duration of in-stream activities will also be restricted.
- Use of grass turf from adjacent areas to cover the soil surface, use of erosion control blankets or mats and other relevant soil erosion prevention measures will be implemented after the finalization of an earth work.
- Groundwater from dewatering will be drained to a near surface water course.
- The turbidity of water bodies will be monitored and if needed a settling tank will be established.

Operation Phase

Mitigation Measures for Surface and Groundwater Quality

- Storage areas with lean-to roof, concrete floor, secondary containment of at least 110% of the stored volume and proper drainage for spills/leaks will be used at the storage of fuels and other hazardous substances.
- Throughout the motorway, spill response kits will be provided. They will be held at secure and clearly signposted locations. Kits will have instructions and relevant personnel will be trained.
- In case of a spillage, spillage will be contained and cleaned up immediately via spill kits and biodegradable cleaning agents and collected in closed and labelled containers - temporarily stored in specially designed spaces until delivery to an operator. Soils contaminated by the spill will be removed and hauled to an approved disposal site as quickly and safely possible.
- Sand layers as filters in seepage pits (detritus basins in the form of a shallow pit connected to drain trenches), allow hardly any harmful substances to percolate into deeper soil layers or into the groundwater. However, these findings are not applicable to highly vulnerable ground water systems or alluvial aquifers with high water tables and thin soil coverage.

- Inspection and maintenance of permanent erosion and runoff control features will be done regularly.
- Oil separators will be installed at fuel stations.
- Motorway will be paved in dry weather to prevent runoff of asphalt or cement materials.
- In need of deicing, mechanical deicing methods (sweepers and plows) will be used firstly, it will be complemented by chemical means if necessary. In addition to that, anti-icing and deicing agents will selectively applied based on expected pavement temperatures and the use of road weather information systems. Furthermore, employees in the application of anti-icing and deicing agents will be trained to use these at optimum rates and times. Anti-icing and deicing agents will be selected based on the location of environmentally sensitive areas and the potential impacts of the particular agent.

Mitigation Measures for Groundwater Flow Regime

- Measures will be developed to ensure that no indirect impacts on any important groundwater resources occur.
- Where medium to long-term or permanent dewatering is required the water will be drained to the motorway drainage system but to a near surface water course.
- In order to supply water to groundwater wells during possible water depletion times, infiltration will be promoted.

FOIAS will be deemed to be responsible for wastewater management in accordance with the matters indicated in the Environment Law and its relevant regulations.

Wastewater management measures will be implemented throughout the construction and operation phases of the project. The on-site specification, implementation and supervision of measures will be under the responsibility of the Environmental and Social Interaction Department.

The project will also be required to be in compliance with the national legal requirements relating to water management. The Environmental and Social Interaction Department will be responsible during the operation phase for fulfilling this need.

A.2.5 Monitoring of Water Quality, Wastewater and Stormwater Management

An independent monitoring program will be implemented for evaluating the efficiency of management strategies and mitigation measures. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- Water quality in selected water resources will be monitored quarterly (by means of sampling and analyses to be done by accredited laboratories) at selected settlements.
- Sources and amount of water supplied for the project will be monitored and water supply permits will be checked.
- Environmental permits for package domestic wastewater treatment plant discharges, wastewater disposal agreements/channel connection permits to be done with municipalities and capacity of package domestic wastewater treatment plant will be checked/monitored.
- Discharge/disposal volumes will be monitored.
- Effluent water quality of the package domestic wastewater treatment plants will be monitored quarterly (by means of sampling and analyses to be done by accredited laboratories).
- Wastewater management practices at concrete plants will be monitored.
- Presence and functionality of drainage system will be monitored annually at the operation phase.

In addition, daily general site overview would be done by the Environmental and Social Interaction Department in order to provide basic information on construction progress, site organization, etc.. Monthly coordination meetings with project management will also be held by the Environmental and Social Interaction Department in order to provide feedback on environmental matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the FOIAS.

A.3 SOLID WASTE MANAGEMENT PROCEDURE

A.3.1 Purpose and Scope

This procedure is prepared in order to address main solid waste sources and propose measures to prevent or at least minimize solid waste generation. Procedure sets out the general principles for waste management hierarchy during the construction and operation phases of the project.

The main waste sources of the project are:

- Quarries and material borrow sites
- Construction areas
- Administrative and social units (accommodation units, administrative buildings, social facilities, etc.)
- Security units (police stations, security points, etc.)
- Toll collection area and booths
- Rest/service areas
- Maintenance and operation areas
- Storm water drainage systems
- Right-of-way maintenance
- Maintenance of bridges and motorway

Within the scope of the project, domestic waste will be generated mainly from the project employees that will work at the construction and operation phases. Excavation waste will be generated as a result of the excavation and similar activities that are performed during the land arrangement of the motorway structures such as; road base, shoulders, side slope arrangements, etc. and material borrow sites. Construction waste will be created during construction of the motorway structures. Packaging waste will be created as a result of the consumption of the materials (construction materials, food, clothes, etc.) that will be used throughout the project.

A.3.2 References

- Turkish Environmental Legislation
- Environmental Law
- Regulation on Waste Management
- Regulation on the Control of Packaging Wastes
- Hazardous Wastes Control Regulation
- Regulation on the Control of Medical Wastes
- Regulation on the Control of Waste Oils
- Regulation on the Control of Waste Batteries and Accumulators
- Regulation on the Control of Waste Tires
- Regulation on the Control of Waste Vegetable Oils
- Regulation on the Control of Excavation Soil, Construction and Demolition Wastes
- Regulation on Mining Wastes
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 3
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

A.3.3 Solid Waste Management and Recycling Approach

Solid waste to be generated in the construction site will be available for categorization. During construction activities waste is expected to be generated due to material use for construction, accommodation of the workers in the area and daily use of paper/plastic/metal/glass containers, excavation, etc. Within this regard, waste will be separated according to their types. During operation phase, solid waste will be generated in the maintenance/rest areas and toll booth area.

For solid waste management the basic principle is to prevent waste generation and consider reduction/reuse/recycle options where waste generation is inevitable. The solid waste generated on site will be stored and disposed in compliance with the national and international regulations.

Reusing is also an alternative for waste types such as; wood/timber, metals, topsoil, excavation material etc. This alternative will create an opportunity to reduce the waste material to be disposed.

Recycling is another important alternative for solid waste management to for making disposed material useful. Recycling will be applied for paper/plastic/metal/glass materials that are not contaminated with any hazardous materials. Waste tires will also be recycled.

Separate recycling containers will be provided for each of the above group of solids, labeled according to the waste to be disposed, recyclable waste will be collected on a regular basis and taken to permitted/licensed facilities to be recovered/recycled and/or disposed in an environmentally sound manner.

It's important to create awareness on solid waste management. The Project Sponsor will inform workers on site through environmental trainings.

Domestic waste that is not suitable for reuse or recycling will be collected and disposed at a landfill in compliance with related Turkish legislation, which is in line with the European Union (EU) requirements.

A.3.4 Mitigation Measures for Impacts of Solid Waste

Although the main principle for solid waste management is to prevent waste generation; there will be mitigation measures for the solid waste generated during construction and operation activities. These measures are listed below:

- Wastes to be generated within the scope of the project will be managed in accordance with the waste management hierarchy (i.e. prevention, reduction, reuse, recycle, recovery and disposal).
- Cooperation will be made with the licensed local service providers, other private licensed waste transportation/recycling/recovery firms and written agreements/protocols will be made regarding the regular and sound management/disposal of project-sourced wastes.
- Amount of wastes to be sent to off-site management will be minimized with the implementation of the Waste Management Plan that relies on the waste management hierarchy.
- Amount of excavated materials to be sent to disposal will be minimized by reusing as fill material in the construction of road base, shoulders, side slope arrangements, etc. to the extent the quality and quantity of materials allows.
- Relevant forestry permits will be obtained from the forestry authorities.
- Sites will not be located on dense forest areas with primary ecological functions.
- Proper temporary waste storage areas will be built.
- Excavated materials will be disposed of at designated storage sites only.
- Waste Management Plan will be implemented.

- Trainings will be provided to project personnel regarding the proper implementation of waste management procedures in line with the requirements of national legislation and good site practices.

The measures that are taken for solid waste management will ensure the reduction of environmental pollution and the use of natural resources such as energy and raw materials with maximum efficiency by minimizing the negative effects of the created solid wastes on the environment.

FOIAS will be deemed to be the “owner” of the solid waste that will be created and it will be responsible for the management of it in accordance with the matters indicated in the Environment Law and its relevant regulations.

The solid waste management measures will be implemented throughout the construction and operation phases of the project. The on-site specification, implementation and supervision of measures will be under the responsibility of the Environmental and Social Interaction Department.

The project will also be required to be in compliance with the national legal requirements relating to solid waste management. The Environmental and Social Interaction Department will be responsible during the operation phase for fulfilling this need.

A.3.5 Monitoring of Solid Waste Management and Recycling

Solid waste management will be achieved through periodical monitoring activities to be carried out on site. National regulations and international standards will be applied for setting the basic principles for waste management. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- Type (i.e. municipal, packaging, waste oil, etc.) and amount of wastes produced/disposed of will be reviewed
- Waste management/disposal agreements done with licensed companies will be controlled
- Waste Management Plans will be reviewed
- Temporary Waste Storage Areas will be inspected.
- Site practices on waste management (e.g. general housekeeping rules, source separation practice, containers, containment structures, etc.) will be monitored.

In addition, daily general site overview would be done by the Environmental and Social Interaction Department in order to provide basic information on construction progress, site organization, etc. Monthly coordination meetings with project management will also be held by the Environmental and Social Interaction Department in order to provide feedback on environmental matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the FOIAS.

A.4 HAZARDOUS WASTE MANAGEMENT PROCEDURE

A.4.1 Purpose and Scope

This procedure is prepared for setting the basic principles for hazardous waste management and disposal rules taking into account national and international regulations and standards. The project will result in hazardous waste generation during both construction and operation phases. The main areas of concern for hazardous waste generation are:

- Construction areas
- Administrative and social units (accommodation units, administrative buildings, social facilities, etc.)
- Rest/service areas
- Maintenance and operation areas
- Storm water drainage systems
- Right-of-way maintenance
- Maintenance of bridges and motorway

A.4.2 References

- Turkish Environmental Legislation
- Environmental Law
- Regulation on Waste Management
- Hazardous Wastes Control Regulation
- Regulation on Safety Data Sheet on Harmful Substances and Mixture
- Regulation on the Preparing and Distributing Safety Data Sheets Regarding Dangerous Materials and Preparations
- Regulation on the Classification, Labeling and Packaging of Materials and Mixtures
- Waste Oil Management Regulation
- Medical Waste Control Regulation
- Regulation on the Control of Waste Batteries and Accumulators
- Regulation on Transportation of Hazardous Goods on Highways
- Medical Waste Control Regulation
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 3
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

A.4.3 Hazardous Waste Management Approach

For hazardous waste management the basic principle is to prevent waste generation and when it is unavoidable, hazardous waste will be managed in compliance with the national and international regulations and standards. Hazardous waste shares the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed.

For South Alternative the main substances that will be considered as hazardous waste will contain at least the following:

- Chemical solutions used for construction and maintenance activities,
- Containers of chemicals,
- Explosives,
- Flammable materials,

- Waste oils; (petroleum derived or vegetable)
- Contaminated soils,
- Asphalt material used for construction of the motorway and also generated from scraping activities during operation phase,
- Any contaminated material used for construction and maintenance activities such as; clothes, personal protection equipment, etc.

Hazardous waste will be stored on site during construction and operation activities. The waste will be stored in such a manner to prevent any contact with water and soil environments, fauna flora components, on-site personnel and also community who might potentially be affected. Hazardous wastes will be stored in properly labeled impermeable containers separately.

Transportation of the hazardous waste will be carried out preventing any leakages or spills and contact of the personnel handling the waste. Transportation will be done by licensed companies. Proper labeling is important for transportation as well. Transported waste will be disposed by licensed facilities/companies; the disposal methodology will based on waste type.

A procedure for hazardous waste storage, labeling, transportation and disposal will be developed taking into account national requirements and international standards.

A.4.4 Mitigation Measures for Impacts of Hazardous Waste

The following measures will be taken within the scope of the Hazardous Waste Management Procedure in order to properly handle, store, transport and dispose hazardous waste that would be generated:

- In accordance with international standards and international common practice, hazardous wastes will be stored in containers that are non-damaged, leak-proof, safe and appropriate. In line with related legislation, a dedicated area with concrete floor will be used for storage.
- All necessary measures will be taken to prevent or reduce production of hazardous wastes and to minimize the quantity and environmental impacts of waste produced.
- Hazardous wastes will in no way be disposed of (incinerated, buried, etc.) at the site where they have been produced, and will not be discharged into surface or ground waters or in locations where they would have an adverse impact on the environment
- Oil and oily wastes will be disposed of in an appropriate manner such that they will be collected according to the measures described in this section and selling of these wastes to the facilities, which uses waste oil in their manufacturing processes, will be considered as appropriate. Waste oil for recycling will not be mixed with degreasers, solvents, antifreeze, or brake fluid.
- Proper regular inspection and maintenance of equipment and machinery will be conducted as required for different types of equipment and these actions will hinder pollution of water by these sources.
- Oil change, battery change, tire change, etc. will be done at reserved areas for this work (with appropriate drainage). An impermeable cover will be laid under vehicles to prevent soil contamination and these maintenance activities will be conducted away from the water resources. When any oil/fuel/lubricant spill or leakage occurs at site, the contamination will be controlled by using absorbents and the contaminated soil (if any) will be stripped to the adequate depth and stored also as hazardous waste.
- Information including Material Safety Data Sheets (MSDS) of the manufacturer regarding to environmental, health and safety risk, safe handling, storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials will be obtained.

- All relevant Turkish legislation regarding to safe handling, storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials will be complied with (in particular, Turkish Hazardous Wastes Control Regulation (HWCR))
- For wastes in solid or liquid state, types of container and transport suitable for the nature of the waste will be identified and the type, source, quantity and storage date of the waste will be clearly written on the container.
- Absorbent material will be kept in all of the vehicles used for transportation against any leakage or spill. Information will be given to workers on the use and disposal of materials. Filters or materials saturated with petroleum products will be drained into an appropriate container to remove any free product prior to disposal.
- Hazardous wastes might be transferred to third parties for handling and disposal. Wastes will only be transferred to third parties who have suitably authorized/licensed facilities with the capabilities of management, handling, recovery, recycling and disposal in a safe, reliable manner for the environment.
- Hazardous products will be labeled as required by the national legislation.
- On the hazardous waste containers, there will be descriptive labels showing the content, quantity and storage date of the waste. Such labels will be affixed to a readily visible surface of the container and so as not to fall off. The warning signs and waste labels will be in conformity with the hazardous waste labeling system determined in the current Hazardous Wastes Control Regulation.
- Labels will be secured to prevent falling off.
- During usage or coming into contact with hazardous material, personal protective equipment (PPE) will be used.
- Corrosive liquids will be stored and kept separate from flammable liquids.
- Information posters about the hazardous materials will be hanged on open, conspicuous, and accessible locations.
- Employees and subcontractors will be inspected by the Environmental and Social Interaction Department regularly throughout the construction phase of the project to ensure that appropriate practices are being employed.
- The limited amounts of hospital type, medical wastes generated in the infirmary/medical facility will be handled, temporarily stored in sealed, labeled containers in a secured area of the infirmary facility until they are sent to disposal in compliance with Turkish Medical Waste Control Regulation.
- Waste explosives will be stored in their original type of container, but marked as explosive waste and will be transported by licensed firms.
- Solid or liquid materials that may contain hazardous substances will be properly handled and stored in a manner that minimizes or eliminates the discharge of these materials to watercourses and natural environment. Such substances can be summarized as; detergents; gypsum plaster; petroleum products such as fuel, oil, and grease; asphalt and concrete related compounds.

A.4.5 Monitoring of Hazardous Waste Management

Hazardous waste management will be achieved through periodical monitoring activities to be carried out on site. National and international regulations will be applied for setting the basic principles for waste management. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- List of hazardous materials/chemicals supplied, stored and used (inc. information on type and amount/volume) will be controlled.
- Hazardous waste management/disposal agreements done with licensed companies will be controlled
- Waste Management Plans will be reviewed
- Hazardous waste compartments of the Temporary Waste Storage Areas will be inspected.

- Site practices on hazardous waste management (e.g. general housekeeping rules, source separation practice, containers, containment structures, etc.) will be monitored.

In addition, daily general site overview would be done by the Environmental and Social Interaction Department in order to provide basic information on construction progress, site organization, etc. Monthly coordination meetings with project management will also be held by the Environmental and Social Interaction Department in order to provide feedback on environmental matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the FOIAS.

The measures taken in hazardous waste management will minimize the adverse environmental impacts of wastes produced and thus ensure that environmental pollution is reduced and that natural resources such as energy and raw materials are used at maximum efficiency.

FOIAS will be deemed to be the “owner” of the hazardous waste that will be created and it will be responsible for the management of it in accordance with the matters indicated in the Environment Law and its relevant regulations.

The hazardous waste management measures will be implemented throughout the construction and operation phases. The on-site specification, implementation and supervision of measures will be under the responsibility of the Environmental and Social Interaction Department.

As mentioned above; hazardous waste management will be important for the operation phase as well. Administrative and social units (accommodation units, administrative buildings, social facilities, etc.), rest/service areas, maintenance and operation areas, storm water drainage systems, right-of-way maintenance, maintenance of bridges and motorway will require special attention in order to be in compliance with the national legal requirements relating to waste management. The Environmental and Social Interaction Department will be responsible during the operation phase for fulfilling this need.

A.5 NOISE MANAGEMENT PROCEDURE

A.5.1 Purpose and Scope

"Noise Management Procedure" is developed to manage significant sources of noise and its impacts on the receiving environment (including humans and wildlife), as well as monitoring the noise levels generated by project activities. The overall aim is to keep the noise impacts below the accepted limits in accordance with Turkish and international regulations and standards.

A.5.2 References

- Turkish Environmental Legislation
- Environmental Law
- Regulation on Assessment and Management of Environmental Noise
- Regulation on Environmental Noise Emission Caused by Equipment Used Outdoors
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 3
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads
- World Health Organization (WHO) Ambient Air Quality Guidelines

A.5.3 Noise Management Approach

Land preparation and construction activities within construction phase and motorway operation will cause increases in noise levels in the vicinity of the motorway route. These effects will be temporary for construction phase where during operation the traffic noise will constitute a negative impact. Traffic noise levels are reduced by distance, terrain, vegetation, and natural and manmade obstacles.

In this context, noise prevention and mitigation measures would be applied at construction sites during the construction phase and at relevant sections of the highway route for the operation phase to keep the noise levels below the acceptable national and international regulations and standards at the closest sensitive receptors to the source.

A.5.4 Mitigation Measures for Impacts of Noise

FOIAS will be deemed to be responsible for noise and vibration management in accordance with the provisions indicated in the Environment Law and its relevant regulations.

Noise management measures will be implemented throughout the construction and operation phases. The on-site specification, implementation and supervision of measures will be under the responsibility of the Environmental and Social Interaction Department.

The project will also be required to be in compliance with the national legal requirements relating to noise management. The Environmental and Social Interaction Department will be responsible during the operation phase for fulfilling this need.

Land Preparation and Construction Phase

In order to keep noise levels below acceptable national and international regulations and standards at the closest sensitive receptors to the source of noise, the following mitigation measures will be applied:

- Equipment and machinery with lower sound power levels and sound reduced models will

be preferred.

- New vehicles, machinery and equipment will be used.
- Maintenance of construction machinery and equipment will be carried out regularly.
- Silencers will be installed on exhausts of vehicles and other equipment such as mechanical plants.
- Portable barriers and acoustic enclosures will be used where appropriate (such as around equipment like generators).
- Speed limitations will be defined and obeyed for construction vehicles, particularly near sensitive use areas.
- Traffic through residential areas will be avoided wherever possible and dedicated site access roads will be used to approach work sites, quarries and storage areas. New access roads will be constructed where required to avoid disturbance in residential areas.
- According to the environmental monitoring plan, noise monitoring will be conducted during the construction phase and the effect of noise in near neighborhoods will be controlled regularly. In case of any inconsistencies with regulation limits, measures will be immediately taken to diminish the noise levels and to satisfy the standards.
- Potentially affected buildings such as hospitals, which are sensitive to night time disturbance, will be identified prior to construction works in the vicinity and night construction works will be limited accordingly.
- A community consultation program to inform the nearby residences, businesses and the local community will be undertaken when noise impacts are planned to occur.
- If any complaint related with noise is received through Project's Grievance and Comment Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.
- Construction vehicles will not be permitted to keep engines running while waiting to enter the site or waiting on-site.
- The machinery and equipment to be used during the construction activities will not be operated at the same point/location but homogeneously distributed in the site.
- Ancillary components in camp sites such as generators will be established by taking into account potential noise disturbances.
- Motorway alignment will be used for transportation whenever possible.
- Roads used during construction of the motorway will be well maintained.
- Site personnel will be trained to undertake construction activities using methods to reduce noise.

Operation Phase

- At the service areas, a green buffer strip will be formed between the outer lane of the motorway and the facilities. This strip will be properly planted (e.g. with shrubs that start growing from the base and are resistant to dust and gaseous emissions as well as noise) to form a barrier against noise to be sourced from the motorway traffic.
- Application of action plans near suggested locations as a result of noise modeling study will be evaluated during further stages of project development. In addition, noise barrier establishment will be considered according to results of noise monitoring at specified locations as detailed in Environmental and Social Monitoring Plan (see Chapter 20).
- Action plans in accordance with Technical Specifications of KGM will be applied where applicable.
- If any complaint related with noise is received through Project's Grievance Mechanism, the complaint will be evaluated and where necessary, corrective actions will be planned and implemented.
- Annual noise measurements will be done at critical receptors determined by noise modeling during the whole operation phase and the noise barriers will be provided in case the measurements would approach (2Dba) to the thresholds specified at IFC guidelines. If noise barriers are insufficient for reducing the noise level at those areas additional measures such as landscaping will be implemented. Therefore, noise modeling

and critical receptors will be revised based on design changes or other mitigation measures applicable at critical locations.

A.5.5 Monitoring of Noise Management

An independent monitoring program will be implemented for evaluating the efficiency of management strategies and mitigation measures. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- Environmental noise level (dBA) will be measured at selected settlements during construction (quarterly or upon grievance) and operation (annual) phases and compared with legal limit values/project standards.
- Ground vibration values will be measured quarterly at the selected settlements during construction phase.
- Statistics on the grievances received on impacts related with noise generation will reviewed on both construction and operation phases.
- Statistics on the grievances received on impacts related with blasting operations will be reviewed at construction phase.

In addition, daily general site overview would be done by the Environmental and Social Interaction Department in order to provide basic information on construction progress, site organization, etc. Monthly coordination meetings with project management will also be held by the Environmental and Social Interaction Department in order to provide feedback on environmental matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the FOIAS.

A.6 HABITAT ALTERATION, FRAGMENTATION AND WILDLIFE MANAGEMENT PROCEDURE

A.6.1 Purpose and Scope

This procedure is developed to manage the project activities that are causing habitat alteration and fragmentation in a way that the impact on wildlife habitats and species are minimized in line with national and international regulations / standards / requirements.

A.6.2 References

- Turkish Environmental Legislation
- Environmental Law
- Law on National Parks
- Law on Terrestrial Hunting
- Law on Forests
- Regulation on the Protection of Wetlands
- Regulation on Procedures and Principles Concerning the Protection of Game and Wild Animals and their Habitats and Combat with their Pests
- Regulation on Wildlife Conservation and Wildlife Development Areas
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standard 6
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

A.6.3 Habitat Alteration, Fragmentation and Wildlife Management Approach

The construction and operation of the motorway will involve a wide range of activities that have the potential to affect ecology. Impacts of project activities can be further divided into the target group of biological elements as terrestrial and aquatic. Important impacts of motorway construction and operation activities on biological environment are mainly habitat fragmentation.

The ecological effects of transportation include disturbance in terms of noise and visual nuisance and pollution, which act to reduce the suitability of adjacent areas for wildlife. The infrastructure itself contributes significantly towards habitat fragmentation by creating barriers to animal movement. This may result in the isolation and extinction of vulnerable species.

To provide habitat and ecology management, the habitats and species of high importance identified studies continue.

Best practice dictates that project planning and design should aim to avoid ecological damage, especially to protected or sensitive habitats and/or species. The avoidance of fragmentation will be considered before resorting to mitigation measures. Following articles are general principles to consider against the habitat fragmentation:

- The fragmentation of natural habitats by transportation infrastructure is a problem, which can only be solved through acceptance of the issue at a policy level. Only an interdisciplinary approach involving planners, economists, engineers, ecologists and landscape architects etc., can provide the necessary tools for successfully addressing fragmentation. Public involvement is also essential to ensure the success of the chosen solutions.
- Habitat connectivity is a vital property of landscapes and is especially important for sustaining animal movement across the landscape. The preservation of habitat connectivity would be a strategic goal in the environmental policy of the transport sector.
- Avoiding and mitigation will be applied from the start of the planning process.

A.6.4 Mitigation Measures for Habitat Alteration, Fragmentation and Impacts on Wildlife

General mitigation measures will be implemented during the construction phase to protect ecological receptors as follows:

- Study areas will be clearly defined before vegetation clearance where construction activities will be taking place.
- Access roads will be clearly defined before the onset of construction activities in order not to harm flora elements that are outside the construction sites.
- Project construction sites and access roads will be separated from other areas with appropriate signboards, signs and fences. Therefore, staff and vehicle access to the area will be limited to the construction site.
- Vegetation clearance will take place gradually, so fauna elements will be allowed to leave construction sites.
- During vegetation clearance, equipment will be selected so as not to harm plant roots.
- Intrusion of any invasive flora species into the project area and its surroundings will be prevented. For this purpose, especially vehicles used for vegetation clearance and/or plant transfer will be checked beforehand.
- Construction waste generated due to project activities will first be stored at designated storage areas and then disposed. Solid waste will not be allowed to be left at natural habitats,
- Project workers will not be allowed to bring any live animals or plants into the construction site to avoid the risk of pest/invasive species establishing in the Project Area.
- The construction phase will be carried out with a biologist to take mitigation measures and interfere with some impacts from construction activities taken where necessary.
- To minimize the population loss of the regionally endemic *Ziziphora taurica subsp cleonioides* species that will be damaged as a result of the activity, seeds will be collected within the scope of in-situ conservation and planted in suitable habitats that will not be affected by the activity.

Mitigation measures for operation phase are listed below:

General structures for creating routes, passages will be built in order to minimize disturbance of animal habitats such as;

- Ecological Bridge: In order to allow the crossing of wild animals between their habitats and reduce traffic accidents, it is essential to prepare highway projects considering wildlife habitats and design ecological bridges within this scope. Ecological bridges have been recommended for regions where terrestrial fauna species can cross. These recommendations can be updated with field and desk studies, and the most suitable ones from an engineering and ecological point of view are determined. With the field and desk studies carried out so far, one point has been recommended.
- Viaducts: Viaducts are used to overcome road or infrastructure obstacles between natural habitats or ecosystems. When designed correctly, viaducts can connect habitats, facilitating wildlife passage. Viaducts can prevent traffic accidents by limiting interactions between wildlife and humans.
- Culverts: Culverts for animals are primarily constructed as safe crossing points for mammals. They are a suitable solution particularly in hilly areas or where the infrastructure is built on an embankment. Target species are usually mammals. Smaller mammals may readily use these culverts as well.
- Fences: Fences will be erected to prevent the access of animals onto roads only for high risk areas. They are mostly constructed to reduce accidents due to collisions between large mammals and cars, but also to reduce the number of smaller animals killed on the roads.
- Warning signs: Warning signs aim at influencing the behavior of drivers in order to reduce

the number and severity of collisions between large mammals and cars.

- Adaptation of the habitat alongside the infrastructure: By avoiding animals moving onto the road or attracting them elsewhere
- Lights: In sensitive areas the need to establish road lights is to be balanced against the consequences for nature. To prevent collisions of insects the use of sodium lights is recommended.

A.6.5 Monitoring of Habitat Alteration, Fragmentation and Wildlife Management

In order to ensure that the Habitat Alteration, Fragmentation and Wildlife Management Procedure is being implemented successfully, key sites within surrounding habitats and species of higher sensitivity will be monitored throughout the construction phase of the project, and afterwards if necessary. Monitoring program will consider the following points:

- Monitoring will be carried out at least once a year in the construction period and for two years in the operation period in order to control the presence of the identified endemic flora species in the South Alternative and their impact on the project and to take emergency measures if necessary. Monitoring will be carried out in the spring and/or autumn vegetation periods. Terrestrial flora monitoring will be carried out by an expert biologist.
- *Ziziphora taurica subsp cleonioides* species distributed in the South Alternative will be monitored. In case of negative impact from the activity, its seeds will be collected and delivered to the Türkiye Seed Gene Bank within the scope of ex-situ conservation.
- All identified sensitive fauna species will be monitored during the construction and operation phases, autumn and spring periods.
- After the Ecological Bridge planting works, vegetation conditions will be monitored. In the first year of operation, the Ecological Bridge will be monitored in the spring and autumn to determine whether fauna species are using it. Animal tracks and signs will be monitored, and a camera trap will be set up.
- Alternative habitats identified shall be monitored periodically for any sign of stress or disturbance.
- Accidents involving wildlife or observing live animals or carcasses along the access road or on the construction site will be recorded. Additional mitigation measures will be taken to discourage wildlife presence on site and avoid roadkill if needed.
- The presence of *Streptopelia turtur* and *Falco vespertinus* nests in and around the South Alternative will be monitored before construction works. Streptopelia turtur and *Falco vespertinus* nest monitoring study must be performed in April and May 2024. The data regarding date, location, population extension and number of individuals will be recorded.
- After one year of monitoring fauna species and habitats in the operation period, the monitoring program will be reassessed considering the results. An expert biologist will carry out terrestrial fauna monitoring.
- An expert hydrobiologist will monitor all critical fish species detected in and around the South Alternative and AQ3 sampling points, twice a year (in spring and autumn) during the construction. In the operation phase, monitoring will be carried out twice in the first year; then, the monitoring period will be re-evaluated by considering the monitoring results.

A.7 QUARRY MANAGEMENT PROCEDURE

A.7.1 Purpose and Scope

This procedure is prepared in order to address necessary environmental compliance implementations in quarry areas. The procedure also identifies the basic rehabilitation implementation to be completed following the closure of the quarries.

A.7.2 References

- Turkish Environmental Legislation
- Environmental Law
- Mining Law
- Forestry Law
- Pasture Law
- Pasture Regulation
- Regulation Concerning the Rehabilitation of the Lands Disturbed by Mining Activities
- Mining Waste Regulation
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1, 3 and 4
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads
- World Business Council for Sustainable Development (WBCSD), December 2011. Guidelines on Quarry Rehabilitation

A.7.3 Quarry Management Approach

Quarries and materials borrow sites will be used within the scope of the project.

The main construction activities in quarry areas will be; isolation of the slope line on the terrain, stripping the topsoil material off the underlying rock as required, transportation to the storage area by trucks, drilling and blasting works. During this progress various impacts will be created. Environmental impacts of quarry operation will be involving; air pollution, noise, wastewater generation, risk of accidents, and change in the land use. All these impacts will be minimized by implementing the other environmental management procedures prepared within the scope of Environmental and Social Management Plan, on quarry sites.

All the impacts except land use change will be minimized to a minimal level when the quarries will be closed. Rehabilitation activities will be carried out in order to minimize the effects of change in land use pattern.

Management of Quarries

The implementation of quarry management plan will begin at the construction phase, and it will continue until the completion of the extraction of materials from the quarries and the restoration of the quarries to a state that is in harmony with the nature. The specification and supervision of the measures related to quarry operations would be under the responsibility of the Environmental and Social Interaction Department.

Rehabilitation Works

The measures, which will be implemented during quarry operation in order to prevent/reduce the negative effects on the environment, are provided below:

- The post-closure land use needs to be clearly assessed when initiating a quarry rehabilitation plan, even if this can evolve over the lifetime of the quarry. The quarry rehabilitation plan will be based on a clear set of objectives reflecting the legislative requirements (as the highest priority), and encompassing the local social, economic and environmental (including biodiversity) considerations for the future use of the site. The objectives will be technically and financially sustainable.
- Legal compliance must be the minimum requirement when establishing each quarry rehabilitation plan. The rehabilitation guidelines will never be in conflict with, but would always complement and go beyond legal compliance.
- The rehabilitation plan will ensure that the quarry site is left in a safe and stable condition. The safety of the rehabilitated quarry includes the stability of slopes, roads and raw materials piles. Safety will always be considered as paramount for the rehabilitation plan.
- Stakeholders will be listened to, and relevant stakeholders will be involved at all stages. The quarry rehabilitation plan must address stakeholder expectations, and be aligned with, or leverage from, the stakeholder view, experience, culture and customs.
- An assessment of the baseline conditions will enable identification of the impacts and measurement of the changes that may arise as a result of quarrying activity. The assessment of baseline conditions will include air and water, flora and fauna, site safety, landscape integration, human activities and cultural heritage.
- The rehabilitation plan will be developed prior to the commencement of mining for new sites, but will also be developed for operating quarries, where such a plan does not already exist. It will be aligned with the mining plan. Depending on the objectives and priorities set, the development and monitoring of management plans for biodiversity would, at a minimum, be considered as a supplement to the quarry rehabilitation plan, and in other cases, as core parts of the plan
- A monitoring plan and appropriate corrective measures (if necessary) will be included in the rehabilitation plan, thereby ensuring the documentation and measurement of performance against the objectives

FOIAS will be responsible for rehabilitation of the quarries in accordance with the points specified in the legislation stated above.

A.7.4 Monitoring of Quarry Management

An independent monitoring program will be implemented for evaluating the efficiency of management strategies and mitigation measures. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- Operation licenses will be controlled for the sites to be operated.
- Mining method applied, blasting activities, production amounts, slope stabilities, borders of work sites and management of waste rock will be monitored
- During operation phase of the project rehabilitated areas will be inspected annually.

In addition, daily general site overview would be done by the Environmental Department in order to provide basic information on construction progress, site organization, etc.. Monthly coordination meetings with project management will also be held by the Environmental and Social Interaction Department in order to provide feedback on environmental matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the FOIAS.

B. OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT PLAN

Procedures under the Occupational Health and Safety Management Plan define the main safety principles to be implemented for employees during the project construction and operation phases. Occupational Health and Safety Procedures are prepared in order to provide guidance on ensuring compliance of materials and equipment used in the context of the project to national and international requirements and standards. The procedures will support creation of a safe working environment for the employees where possible accidents/incidents are reduced to a minimum level.

References

- Occupational Health and Safety Law
- Labor Law
- Regulation on Duties, Authorities, Responsibilities and Trainings of Occupational Physician and Other Health Personnel
- Regulation on Occupational Health and Safety Risk Assessment
- Regulation on Occupational Health and Safety Services
- Regulation on Occupational Health and Safety Signs
- Regulation on Emergencies in Workplaces
- Regulation on Occupational Health and Safety in Mining Workplaces
- Regulation on the Procedures and Principles of Employee's Occupational Health and Safety Training
- Regulation on Health and Safety Measures to be taken in Workplace Buildings and Additions
- Regulation on the Health and Safety Conditions on the Use of Work Equipment
- Regulation on the Occupational Health and Safety in Construction Works
- Regulation on the Use of Personal Protective Equipment in Workplaces
- Regulation on Occupational Health and Safety in Temporary or Fixed-Term Works
- Regulation on Protection of Employees from Noise Related Risks
- Regulation on Health and Safety Measures in Working with Chemical Substances
- Regulation on the Protection of Employees from the Hazards of Explosive Environments
- Regulation on Fire Protection of Buildings
- Regulation on First Aid
- Regulation Concerning Water Intended for Human Consumption
- Regulation on the Protection of Employees from Vibration Related Risks
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 2
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

B.1 PHYSICAL HAZARDS MANAGEMENT PROCEDURE

B.1.1 Purpose and Scope

This procedure is prepared to define strategies in accordance with national and international regulations/standards to prevent and control potential physical hazards that project personnel may be exposed to.

B.1.2 Physical Hazards Management Approach

Physical hazards represent potential for accident or injury or illness due to repetitive exposure to mechanical action or work activity. Road construction and maintenance personnel may be exposed to physical hazards during the land preparation and construction phase of the project. These hazards may be due to the operation of heavy construction vehicles during the earthworks, working at height for the construction of bridges, overpasses, viaducts, exposure to severe weather conditions, exposure to high noise levels caused by construction machinery and equipment, etc. Poorly trained or inexperienced drivers would increase risk of accident with other vehicles, pedestrians, and equipment. Additionally, heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. These risks would be similar to any large scale infrastructure project and can be managed effectively with good management and implementation of occupational health and safety measures (IFC, April 2007).

Similar to the construction phase, operation, maintenance and landscaping personnel working on the motorway may be subject to the chemical hazards due to exhaust emissions of the vehicles driving on the road or passing through the toll plazas, or due to hazardous dust or asphalt fumes generated during activities such as pavement, painting, vegetation removal, etc.

The main approach in management of physical hazards is prevention. Measures will be taken especially in terms of moving machinery, elevated work places, and fall protection in order to prevent any physical hazard that on-site workers may be exposed to in order to avoid any injury that may occur due to physical hazards.

B.1.3 Mitigation Measures for Impacts of Physical Hazards

Following measures will be taken to ensure safety during the road maintenance or landscaping works:

- For the construction works to be conducted at location where traffic exists, safe work zones will be established by taking relevant measures (closure of roads, diversion of traffic, use of protective barriers, cones, warning lights, etc.)
- The area around which elevated work is taking place will be barricaded to prevent unauthorized access and working under personnel on elevated structures will be avoided.
- Hoisting and lifting equipment will be rated and properly maintained, and operators trained in their use. Elevating platforms will be maintained and operated according to established safety procedures including use of fall protection measures (e.g. railings), equipment movement protocols (e.g. movement only when the lift is in a retracted position), repair by qualified individuals, and installation of locks to avoid unauthorized use by untrained individuals.
- Ladders will be used according to pre-established safety procedures for proper placement, climbing, standing, as well as the use of extensions.
- When working at height, proper fall protection measures will be implemented. Fixtures will be installed on bridge components. Safety belts with proper thickness and of suitable materials ensuring sufficient strength will be used. Rope safety belts will be replaced before signs of aging or fraying of fibers become evident. When operating power tools at height, workers will use a second (backup) safety strap.
- Personnel exposed to high levels of noise will be required to use personal hearing

protection devices/equipment that will be provided by the FOIAS at no cost.

- Where required for specific works, work rotation programs will be implemented to reduce cumulative exposure.
- Weather forecasts will be monitored for outdoor work to provide advance warning of extreme weather and schedule the work accordingly. Protective clothing will be used where required.
- Safe work zones will be established to separate workers on foot from the traffic by using proper methods/devices (e.g. use of protective barriers, traffic cones, barrels).
- When possible, traffic will be route to alternative roads.
- Proper land closure or traffic diversion measures will be taken in consideration of the width of the road.
- Protective barriers will be used to shield workers where required.
- Traffic flow will be primarily regulated by warning lights and use of flaggers will be avoided where possible.
- Maximum speed limits will be reduced in the work zones.
- Blind spots will be avoided to the maximum extent possible by means of proper design of the work space.

B.2 CHEMICAL HAZARDS MANAGEMENT PROCEDURE

B.2.1 Purpose and Scope

This procedure is prepared in order to prevent chemical hazards to employees within the project site in compliance with Turkish and international regulations/standards.

B.2.2 Chemical Hazards Management Approach

Significant volumes of earthworks and paving activities will be conducted within the long construction corridor of the project. The dust to be emitted during earthworks, exhaust emissions from large number construction machinery, hazardous materials used for painting and paving operations are among main sources of chemical hazards for construction workforce. Prevention of chemical hazards to employees will require a sequence of steps:

- Proper storage and handling and of hazardous waste in order to avoid human contact, periodical disposal of the waste according to regulations.
- Foreseeing potential accidents in areas where chemicals are stored and handled,
- Setting up emergency response procedures for cases of accidents in order to avoid major injuries and exposure of large populations.
- Periodical trainings on chemical hazards management.

B.2.3 Mitigation Measures for Impacts of Chemical Hazards

Following measures will be enforced for prevention of chemical hazards:

- Dangers posed by certain materials within the project site will be identified by using MSDS sheets.
- MSDS sheets of chemicals will also be provided in native language for site employees.
- Trainings will be provided to on-site personnel on the presence, handling, transport and disposal of these materials, and also on emergency response management.
- Fire extinguishers will be placed close to areas that have fire risks such as chemical storage and welding areas.
- Spill kits, protective equipment, and other necessary equipment will be available where hazardous materials are handled, to enable any spills to be cleaned up.
- Pavers with exhaust ventilation systems will be used and proper maintenance of such systems will be ensured to maintain worker exposure to crystalline silica (millers and grinders) and asphalt fumes (pavers) below applicable occupational exposure levels.
- Correct asphalt product will be used for each specific application and application at the correct temperature will be ensured to reduce the fuming of bitumen during normal handling.
- Adequate ventilation will be provided in necessary areas with limited natural air circulation.
- Tollbooths will be equipped with proper ventilation and air filtration systems;
- Protective clothing will be used when working with cutbacks (a mixture of asphalt and solvents for the repair of pavement), diesel fuel, or other solvents.
- Appropriate respiratory protection equipment will be used when removing paints.

B.3 NOISE MANAGEMENT PROCEDURE

B.3.1 Purpose and Scope

This procedure is prepared in order to prevent or at least minimize the impacts of noise on project personnel that will result from project activities and traffic during operation phase in compliance with national and international regulations/standards.

B.3.2 Noise Management Approach

Noise is considered as a serious physical hazard considering its impacts like hearing loss, stress and effects on performance and behavior. The main approach in noise management is preventing noise at its source. However, considering the nature of the project, it would, for the most part, not be possible to do so. Therefore, measures will be taken in order to control the level of noise and workers' exposure to it.

B.3.3 Mitigation Measures for Impacts of Noise

Measures to be taken in order to reduce and control noise can be listed as the following:

- Personnel exposed to high levels of noise will be required to use personal hearing protection devices/equipment that will be provided by the FOIAS at no cost. Where required for specific works, work rotation programs will be implemented to reduce cumulative exposure.
- No employee shall be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C).
- Employees will receive information and training about the dangers of noise and how to avoid the risk of impaired hearing through correct working practices and the use of protective equipment.
- Before the issuance of hearing protective devices as the final control mechanism, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible.
- Project-specific grievance mechanisms established.
- If the measurement results or the grievance mechanism indicate impacts on public health and welfare at certain locations, effective and feasible corrective measures will be planned and implemented by the FOIAS.
- Arrangements on the construction site layout will be done in order to locate away processes of higher noise levels from workers.
- Portable barriers around equipment like generators will be used.
- Medical examination of workers will be done in order to ensure that hearing of the workers are is not impaired/damaged due to their working conditions and necessary medical measures to avoid further damage will be taken.

B.4 PERSONAL PROTECTIVE EQUIPMENT (PPE) MANAGEMENT PROCEDURE

B.4.1 Purpose and Scope

This procedure underlines how workers at the project site would be protected against hazards described above by using additional protective equipment.

B.4.2 PPE Management Approach

After taking all necessary measures for workers' safety PPE will be considered as an additional protection for workers, in order to avoid major injuries in case of accidents. Appropriate PPE will be determined based on the job to be performed and the kind of hazard that the workers are potentially exposed to.

Trainings on PPE usage will be given to all employees and the employees must be encouraged to use PPE where needed.

Various types and numbers of PPE are used at during construction and operation phases as found necessary in line with Turkish and international regulations/standards. IFC Environmental, Health, and Safety (EHS) General Guidelines provides a good summary of PPE according to the potential hazard that would be encountered during various project activities. This summary is provided in Table 1 below. The types of PPE to be used during the construction and operation of the project would include, but not limited to, these PPE provided in Table 1, as necessary.

Table 1 IFC Recommended PPE

Objective	Hazard	PPE
Eye and face protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation	Safety Glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords	Plastic Helmets with top and side impact protection
Hearing protection	Noise, ultra-sound	Hearing protectors (ear plugs or ear muffs)
Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids	Safety shoes and boots for protection against moving & falling objects, liquids and chemicals
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic materials (Neoprene), leather, steel, insulating materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors	Facemasks with appropriate filters for dust removal and air purification (chemicals, mists, vapors and gases). Single or multi-gas personal monitors, if available.
	Oxygen deficiency	Portable or supplied air (fixed lines). On-site rescue equipment.
Body/Leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration.	Insulating clothing, body suits, aprons etc. of appropriate materials

B.5 COMMUNICATION AND TRAINING MANAGEMENT PROCEDURE

B.5.1 Purpose and Scope

In addition to orientation trainings, all the direct and contracted workers will be provided with relevant trainings prior to commencement of new assignments (change of workplace/task, change of working machinery and equipment, introduction of new technologies, etc.). Workers with rescue and first-aid duties will be provided with dedicated training. Through appropriate contract specifications and monitoring, Project Sponsor will ensure that service providers, as well as contracted and subcontracted labor, are trained adequately before assignments begin.

A visitor orientation and control program will be established to ensure visitors do not enter hazard areas unescorted. In this respect, relevant checkpoints and record keeping practices will be used for ensuring both safety of the works and the visitors.

This procedure is developed to manage Occupational Health and Safety (OHS) trainings of both the contracted or subcontracted employees and the site visitors, while at the same time it aims to manage on-site communication arrangements specific to South Alternative.

B.5.2 Communication and Training Management Approach

The rate of accidents is highly dependent on the consciousness and cautiousness of the personnel regarding the specific hazards of the construction work they are involved in.

Training of the project workers and other personnel including the management, supervisors, and even occasional visitors is a key in reducing the number of accidents during the construction phase. Basic occupational health and safety orientation trainings will be provided to all new personnel including direct and contracted workers, management, supervisors and occasional visitors.

An OHS Training Program specific to South Alternative will be developed and implemented in accordance with a specified schedule. These trainings will include specific occupational health and safety subjects that include, but not limited to the following:

- Basic site rules and hazard awareness
- Hygiene requirements
- Potential risks to health
- Site-specific hazards
- Safe work practices
- Knowledge of materials, equipment and tools
- Wearing and use of protective equipment and clothing
- Hazards of working on foot around equipment and vehicles
- Preventing injury to fellow workers
- Safe practice for work at night and in other low-visibility conditions (e.g. use of high-visibility safety apparel and proper illumination for the work space while controlling glare)
- Emergency procedures (e.g. during fires, natural disasters, etc.)

These trainings will be particularly given in the following situations:

- Prior to the start of work for all new project workers
- When the working place and/or task of a worker is changed
- When working machinery and equipment are changed
- When new technologies are applied at the workplace
- When a new hazard is introduced to the worker

As the OHS training aims to provide a safe and healthy work environment for employees, subcontractors and visitors, “a visitor orientation and control program” will be established to ensure visitors do not enter hazard areas unescorted. In this respect, relevant checkpoints and record keeping practices would be used for ensuring both safety of the works and the visitors.

Basic OHS trainings given both to the contracted and subcontracted employees and to site visitors will adequately cover:

- Knowledge of materials, equipment and tools
- Known hazards in the operations and how they are controlled
- Potential risks to health
- Precautions to prevent exposure
- Hygiene requirements
- Wearing and use of protective equipment and clothing
- Appropriate reasons to operation extremes, incidents and accidents

Signs and labels, which will be used to mark hazardous areas and/or substances, will be in accordance with national and international regulations/standards and be well known to and easily understood by workers, visitors and the general public.

Copies of this hazard coding system will be posted outside the facility at emergency entrance doors and fire emergency connection systems where they are likely to come to the attention of personnel. Information regarding the types of hazardous materials stored, handled or used at the facility will be shared proactively with emergency services and security personnel to expedite emergency response when needed.

B.6 WORKERS ACCOMMODATION PROCEDURE

B.6.1 Purpose and Scope

The general purpose of the Workers Accommodation Procedure is to describe various measures in compliance with national and international regulations/standards to avoid adverse impacts on the health and safety of project personnel due to the accommodation activities during the construction and operation phases of the project.

B.6.2 Workers Accommodation Approach

FOIAS and all its sub-contractors who provide accommodation ensure that following standards apply to all workers' accommodations both on-site and off- site:

- Off-site houses will be located within a reasonable distance from the worksite.
- Transport from off-site houses to worksite will be safe and free.
- The living facilities will be built with adequate materials, kept in good condition, clean and free from rubbish and other refuse.
- Rooms/houses will be adequately drained.
- During winter, the room temperature of the houses will be kept at a level of around 20°C.
- During summer, adequate ventilation and/or air conditioning systems will be provided.
- Both natural and artificial lighting will be provided and maintained in houses.
- Access to an adequate and convenient supply of free potable water will be always available to employees (in between 80-180 litres per person per day).
- Drinking water quality will meet national legislation and WHO drinking water standards.
- Wastewater, sewage, food, and any other waste materials will be adequately discharged without causing any significant impacts on the biophysical environment or surrounding communities.
- Pest examination, vector control and disinfection will be carried out throughout the houses.
- Rooms will be kept in good conditions.
- Rooms will be aired and cleaned at regular intervals.
- Separate sanitary facilities and accommodation will be provided for male and female workers.
- For each resident, 10-12.5 m^3 volume or 4-5.5 m^2 area will be provided.
- Minimum ceiling height of the houses/rooms will be 2.10 m.
- In collective rooms, which will be minimized, in order to provide workers with some privacy, only a reasonable number of workers will be allowed to share the same room. Standards range from 2 to 8 workers.
- A separate bed for each worker will be provided.
- Each resident will be provided with a comfortable mattress, pillow, cover and clean bedding.
- Bed linen will be washed frequently.
- Separate storage for work boots and other personal protective equipment (PPE) will be provided.
- Number of toilets will be in between 1 unit to 15 persons to 1 unit to 6 persons.
- Toilets will be accessible without any individual passing through any sleeping room.
- Number of shower/bathroom facilities will be in between 1 unit to 15 persons to 1 unit to 6 persons. For urinals, usual standards are 1 unit to 15 persons.
- Shower cabins will be heated sufficiently according to the season; this temperature will not be lower than 25°C and will be adequately illuminated.
- Canteen, cooking and laundry facilities will be built adequate and easy to clean materials.
- Adequate facilities for washing and drying clothes will be provided.
- For on-site accommodation sites, canteens will have a reasonable amount of space per worker. Standards range from 1 square meter to 1.5 square meters.

- Hair restrains, aprons, gloves, etc. will be provided to the employees in the cafeterias.
- Against any possible poisoning, samples will be taken from the meals prepared at the camp site and will be stored for at least 72 hours. If meals will be provided from any private catering company, presence of these samples will be ensured.
- A number of first aid kits adequate to the number of residents will be available.
- TV, satellite, and internet service will be provided for each off-site accommodation.
- Cleaning and general maintenance staffs will receive basic OHS training.
- All electrical circuits and equipment will be earthed.
- Fire extinguishers will be provided at all exit doors of on-site dormitories.
- Restriction of workers' freedom of movement to and from the site will be limited and duly justified.
- Housing regulations, including those relating to allocation of housing, will be non-discriminatory.
- Residents will be trained on the Project's Grievance Mechanism.
- If alcohol is allowed, may need training/policies around interactions with those who have consumed.

Security measures will be put into place to ensure that the safe and secure management are satisfied in on-site accommodation and for its residents. These security measures will include:

- Adequate day-time and night-time lighting will be provided.
- An access control program will be implemented and followed for identifying the employees, visitors and subcontractors. The access will be provided only from dedicated gates. The access control program will also include the vehicles.
- A 24/7 security will be provided for on-site accommodation site.
- Security staff will be trained on communication with residents, crowd management, conflict management and problem solving, grievance mechanism, code of conduct and human rights subjects.
- Persons entering the on-site camp site due to various reasons will be subjected to an entrance control procedure on the entrance gate.
- As long as COVID-19 pandemic outbreak conditions prevail, the entrance of visitors to site will be minimized.
- All new visitors will be given an induction training including showing muster points, any exercises planned, waste segregation, etc.

Monitoring of Occupational Health and Safety

An independent monitoring program will be implemented for evaluation of the efficiency of management strategies and mitigation measures. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- Employment agreements will be reviewed.
- Number of work incidents/accidents/near misses will be monitored.
- Number of personnel who are infected with an infectious disease will be monitored quarterly during the construction phase of the project.
- Source and quality of drinking water will be monitored quarterly (by means of sampling and analyses to be done by accredited laboratories).
- Use of PPEs, health and safety signs, fire safety equipment/systems, accommodation conditions will be monitored.
- Accommodation conditions of the project workers will be audited.
- Number of health and safety trainings provided will be reviewed.
- Emergency Preparedness and Action Plan and number of drills conducted within this regard will be reviewed.

- Grievance mechanism and received grievances regarding to project personnel will be reviewed.

In addition, daily general site overview would be done by the Occupational Health and Safety Department in order to provide basic information on construction progress, site organization, etc. Monthly coordination meetings with project management will also be held by the Occupational Health and Safety Department in order to provide feedback on OHS matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the FOIAS.

C. COMMUNITY HEALTH AND SAFETY PLAN

The procedures under the Community Health and Safety Plan are developed in order to address possible impacts of the project on human health and safety. The procedure aims to prevent or at least minimize the possible adverse effects on the community residing in close neighborhoods by offering mitigation measures.

References

- Regulation on Risk Assessment of Health and Safety
- Regulation on Occupational Health and Safety Services
- Regulation on Occupational Health and Safety Signs
- Regulation on Emergency Situations in the Workplaces
- Regulation on Health and Safety Measures to be taken in Workplace Buildings and Additions
- Regulation on Principles and Procedures for Occupational Health and Safety Training of Employees
- Regulation on the Occupational Health and Safety in Construction Works
- Regulation on Occupational Health and Safety in Mining Workplaces
- Regulation on Safety and Health in Working with Chemical Substances
- Regulation on the Protection of Buildings from Fire
- Regulation on Emergencies in Workplaces
- Regulation on Duty, Authority, Responsibility of Occupational Physicians
- Regulation on the Protection of Employees from the Hazards of Explosive Environments
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standards 1 and 4
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

C.1 FIRE MANAGEMENT PROCEDURE

C.1.1 Purpose and Scope

This procedure is developed to prevent, minimize and control risks of fire which may occur due to the activities conducted during the construction phase of the project to the facilities, employees and the environment. Fire prevention measures will also be taken into account in operation phase.

C.1.2 Fire Management Approach

FOIAS will be providing fire prevention measures and foresee the risks of fire in order to ensure safety of employees and community. A Fire Management Plan will be prepared based on the national and international legal requirements and/or standards.

C.1.3 Mitigation Measures for Fire Prevention

Mitigation measures for fire prevention and principles to be applied in the event of fire are detailed below:

- Necessary trainings on fire management will be provided to all employees.
- Fire preparedness and response programs will be developed.
- Firefighting equipment (i.e. water lagoons, ladders, ventilating devices, fire extinguishers, etc.) will be purchased and kept available, in good working order.
- Firefighting equipment will be labeled/marked according to the regulations and will be placed in locations easy to access.
- Fire extinguishers will be placed close to the areas that poses fire risk such as; welding, chemical handling, etc.
- Hot works will be carried out during the cooler periods of the day using appropriate guards.
- Employees will not be allowed to make interventions to electrical appliances; only responsible personnel will make changes in the electrical installation. When not used electrical appliances will be turned off and unplugged,
- Responsible personnel will be appointed and trained for handling flammable materials, storage, transportation and usage of these materials will be in compliance with national and international regulations/standards.
- Flammable liquid leaks and spills will be repaired and cleaned up immediately.
- Fire exits and exit gates will be built both in temporary and permanent structures; the exit doors will not be locked and kept open all the times.
- A smoking area will be designated outside of facilities and a fire extinguisher will be provided for this area.
- Fire drills will be carried out periodically according to health and safety regulations.

C.1.4 Monitoring of Fire Management

Detection and alarm systems will be installed where appropriate to monitor any incidents of fire. These systems will involve all measures, including communication and public address systems needed to detect a fire and alert personnel, emergency response teams, public authorities and public as appropriate.

C.2 TRAFFIC MANAGEMENT PROCEDURE

C.2.1 Purpose and Scope

This procedure is developed to prevent, minimize and control risks and adverse impacts on community health and safety, natural environment, work and workers' safety from traffic accidents, which may occur due to the behavior of the driver or the quality of the vehicle and/or to the road design or construction and maintenance issues.

C.2.2 Traffic Management Approach

Traffic rules will minimize the risk of accidents, emissions and noise due to the traffic during the construction and operation phases. During the construction phase of the project, safety aspects among the drivers and project workers will be emphasized and relevant measures regarding transportation of construction material and equipment will be taken.

During the operation phase, relevant national and international regulations/standards applicable to highways and toll roads would be implemented.

C.2.3 Mitigation Measures for Traffic Safety

Following measures will be taken in accordance with the KGM's Technical Specifications for motorways and relevant international standards to ensure traffic safety at the construction sites and minimize the risk of accidents:

- Construction works on existing roads will not be started until relevant traffic safety measures (including traffic signing and placement of equipments) are taken on roads serving pedestrian and vehicle traffic. These measures will be designed to ensure the safety of life and property of the local people and the users of the roads.
- In the scope of better working organization, construction traffic routes will be strictly defined and road construction machinery will use only these routes.
- Passage of the routes through the settlements (i.e. neighborhoods) will be avoided where alternative routes are available. Dangerous routes that are to be avoided, if there is any, will be specified and informed. In this scope, construction subcontractors will construct service roads in order not the affect (such as increasing the heavy traffic load) the natural flow on the existing roads and for avoiding the passage of heavy vehicles through residential areas to the extent possible. In addition service roads will be constructed where the traffic will be temporarily diverted. Furthermore, service roads will be used for transportation of the construction machinery, equipment and materials used for project.
- Pedestrian interaction with construction vehicles will be minimized by taking appropriate measures in and around the construction corridor.
- Valid licenses for the drivers and operators will be obtained.
- Drivers and operators will be provided with relevant trainings that emphasize the safety aspects.
- Working hours of the day for the drivers/operators will be specified and informed to relevant personnel.
- Limits will be defined for the working/trip duration for the drivers and operators to avoid overtiredness.
- Speed limit will be defined as 50 km/h in the project site and 20 km/h in the construction sites.
- Speed control devices will be used on trucks.
- All the construction machinery and equipment will be operated in alignment with the direction of the traffic flow.
- Rigid objects will not be used for the purpose of traffic diversion.

- Unused construction materials, equipment or machinery will not be left on the road in an uncontrolled way. They will be put in designated places.
- Regular maintenance of vehicles will be carried out and manufacturer approved parts will be used to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- Moving equipment with restricted rear visibility will be outfitted with audible back-up alarms.
- Construction-related traffic delays will be minimized. Flow of traffic will be allowed in every 30 minutes.
- Road signing for night traffic will be provided with reflectors and flashing signals of sufficient number.
- Relevant dust control measures will be taken at the road construction sites so that safe sight distances could be maintained on the existing roads under service.
- Upon the completion of works, signing equipment will be immediately removed and standard signing will be provided.
- To reduce transportation distances, services and materials required for construction works will be aimed to be primarily supplied from the local sources, wherever possible.

The following general safeguards will be taken during operation to prevent, minimize, and control risks to the community from traffic accidents:

- Horizontal (i.e. shoulder lines, traffic lines, parking lines, etc.) and vertical signing (i.e. traffic signs, plates, etc.) of the motorway will be in accordance with KGM's technical specifications.
- Rescue vehicles and tow trucks will be kept ready in adequate numbers to promptly respond to probable accidents and slippery vehicles that may cause the closure of the road.
- Pavement structure of the motorway will be subject to routine maintenance works in order to remove any impairment on the road surface that may risk traffic safety, reduce driving comfort and decrease the structural strength. Large-scale repair and reconstruction works will also be conducted as required to maintain the functionality of the road.
- Wire fences will be installed along the expropriation border of the motorway to minimize the risk of collisions between animals and vehicles and direct the animals towards crossing structures (i.e. culverts) to be built.
- Wire fences, welded wires, walls to be used to enclose the area to be allocated to the motorway will be continuously checked to prevent any uncontrolled intrusion of wild animals to the motorway corridor that may pose risk to traffic safety and damage the landscape components. Any damaged enclosure component will be immediately repaired/maintained.
- Intelligent Traffic System (ITS) will be installed in the scope of the project. By means of the ITS, real-time warning systems with signage to warn drivers of congestion, accidents, adverse weather road conditions, and other potential hazards ahead will be used.
- Snow and ice removal works will be conducted within the motorway corridor when the temperature is between 0^0C and -12^0C to ensure safe and secure driving conditions for the vehicles and users of the road (including interchanges, access roads, service areas) during severe winter conditions.
- If necessary, precautionary salt application will be done before the start of snowfall.
- Where required, road deicing will be done by application of a suitable agent in solid or solution forms such as salt (NaCl), calcium chloride ($CaCl_2$), magnesium chloride ($MgCl_2$), etc. directly or blended in proper ratios depending on road and weather temperature.
- In case of continuous snowfall periods, effectiveness of the chemicals applied may become insufficient in removing snow and ice. In such situations, mechanical snow and ice removal works will be conducted by using suitable and adequate vehicles and/or

equipment.

- In case of oil spill or spill of other hazardous liquids, road surface will be washed with plenty of water after the removal of spill.
- Measures will be taken to prevent parking vehicles at the entrance and exit roads of the services areas.

C.2.4 Monitoring of Traffic Management

Automated systems and communication links will be used for obtaining, recording and reporting for the traffic weather and road conditions, as well as traffic incidents. Any adverse conditions, accidents and/or illegitimate incident will be recorded and monitored by the personnel in charge of traffic management during the construction phase. For the operation phase relevant public authorities are responsible for the monitoring of traffic management.

D. SUBCONTRACTOR MANAGEMENT PLAN

D.1 Purpose and Scope

This procedure is prepared in order to describe various measures to avoid adverse impacts of the project on the health and safety of the subcontractors, FOIAS employees, and community and ensuring control on the FOIAS's possible subcontractors. The plan aims to achieve these by incorporation of Turkish and international regulations and standards. This plan will cover the activities during construction and operation phases of the project.

D.2 References

- Turkish Environmental Legislation
- Environmental Law
- Occupational Health and Safety Law
- Labor Law
- Regulation on Risk Assessment of Health and Safety
- Regulation on Occupational Health and Safety Services
- Regulation on Occupational Health and Safety Signs
- Regulation on Emergency Situations in the Workplaces
- Regulation on Health and Safety Measures to be taken in Workplace Buildings and Additions
- Regulation on the Health and Safety Conditions on the Use of Work Equipment
- Regulation on the Use of Personal Protective Equipment at Workplaces
- Regulation on the Occupational Health and Safety Requirements for Temporary or Fixed-Term Employment
- Regulation on the Occupational Health and Safety in Construction Works
- Regulation on the Protection of Workers from Risks Related to Noise
- Regulation on Safety and Health in Working with Chemical Substances
- Regulation on the Protection of Buildings from Fire
- Regulation on Emergencies in Workplaces
- Regulation on First Aid
- Regulation on Duty, Authority, Responsibility of Occupational Physicians
- Waste Management Regulation
- Regulation on the Control of Waste Oil
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standard 2
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

D.3 Subcontractor Management Approach

All subcontractors will be responsible of full compliance with the legislation, standards, procedures, rules and objectives identified in detail in of this plan. Within this scope, Project Sponsor will manage the subcontractor and supplier evaluation mechanism with criteria targeting the assessment of sufficiency and compliance of existing environmental and social management structure and labor practices of the subcontractor/supplier that is being considered. Following selection of the subcontractors and suppliers, the Scope of Work to be agreed on will ensure compliance of the subcontractor/supplier with project Standards through contractual terms.

D.3.1 Subcontractor Selection Process

The subcontractor selection process will involve a multidisciplinary team involving Environmental and Social Interaction Manager. Primary responsibility of the team will be the project's E&S matters, including E&S performance, worker and community health, safety and security, and human resources (HR).

The participation and engagement of the Environmental and Social Interaction Manager in the subcontractor selection process is aimed at providing an early consideration of E&S matters and variables when selecting a subcontractor.

The first step in the subcontractor procurement process is the preparation of a Request for Proposal (RfP). This RfP is typically prepared by procurement staff with input from the project manager, internal counsel and legal advisor, technical specialists (for example, engineers and environmental and social experts), and lawyers.

For the contracts, "Subcontractor E&S Requirements" which is a document summarizing the general expectations in terms of occupational health and safety, and E&S, will be shared with all subcontractors. This is a common industry practice that helps clarify FOIAS's main Environmental, Social, Health, and Safety (ESHS) requirements, conditions, and provisions that every subcontractor must follow when entering into an agreement with the FOIAS. In this way, management of project risks and anticipated impacts and E&S performance will be done more effectively.

A high-level definition of ESHS expectations allows the subcontractor to better understand the minimum requirements that must be met. It also helps FOIAS to set basic expectations of the HSE framework that will govern the FOIAS–subcontractor relationship from the outset.

The E&S Requirements include all relevant E&S requirements, commitments, and provisions derived from a number of source documents, including as applicable:

- Equator Principles (EPs) IV;
- IFC General Toll Roads EHS Guidelines;
- IFC PS2;
- Commitments included in the Supplementary ESIA Report and E&S related permits;
- Legal obligations and applicable codes and standards; and
- Company policies and internal procedures.

D.3.2 Proposal Evaluation and Subcontractor Selection

Evaluation methodology, criteria, key performance indicators (KPIs), and weightings need to be established in discussion with the rest of the project team. The following questions should be asked when developing the weightings: "What answers are we looking for?" and "What KPI scores are acceptable?" Significant E&S records and safety metrics are important, and poor records related to these matters should preclude the subcontractor from qualifying, regardless of technical aspects or price.

The subcontractor's existing management systems, its capacity to implement E&S requirements and the subcontractor-supplied information on past E&S performance will be among the key criteria used to evaluate subcontractors. Capacity may be judged by past performance, existing or projected management, technical ability, and resources. The latter can include solutions or options proposed by the subcontractor to implement the mitigations described in the E&S documentation, such as management plans that are contained in the bid package. A lack of capacity to establish an ESMS (if one does not exist), implement E&S requirements, and meet applicable standards will disqualify a subcontractor from further consideration. Referees should be asked to validate claims regarding E&S performance.

As FOIAS evaluates proposals, past E&S performance and key personnel of bidders can be evaluated on a numerical basis, which can then be included in overall comparisons (including technical and financial).

While the evaluation methodology varies according to the project, scope of work of the activity, and any project-specific feature, it will need to be agreed on by the project team. The following will be considered grounds for disqualification:

- Failure to provide information on past E&S performance, including health and safety records;
- Reports of past performance deemed unacceptable for the current project;
- Notices of material labor issues between workers and management;
- Fines and sanctions imposed by E&S and labor regulators and authorities;
- Poor security management records from previous projects; and
- Material community grievances and high profile adverse press reports on E&S matters.

The team evaluating proposals will include at least one qualified and experienced E&S professional, who has been involved in the tendering processes and the establishment of the criteria that will be used to evaluate bidders' E&S qualifications.

If a prospective subcontractor propose to substitute personnel for any proposed key E&S position(s) at any stage of the selection and or contract negotiation process, FOIAS may require that the replacement(s) have at least equivalent qualifications and experience of the previous professional and that they be approved by FOIAS, or the entire proposal may be re-evaluated using the substitute personnel.

At the end of the evaluation and selection process, FOIAS will issue a letter of intention to place a contract subject to certain conditions, including E&S requirements and conditions, which should be listed. These could be over and above those in the offer, but they must have been discussed with the subcontractor during the selection process. In Figure D.1, the subcontractor management process that FOIAS will comply with is presented.

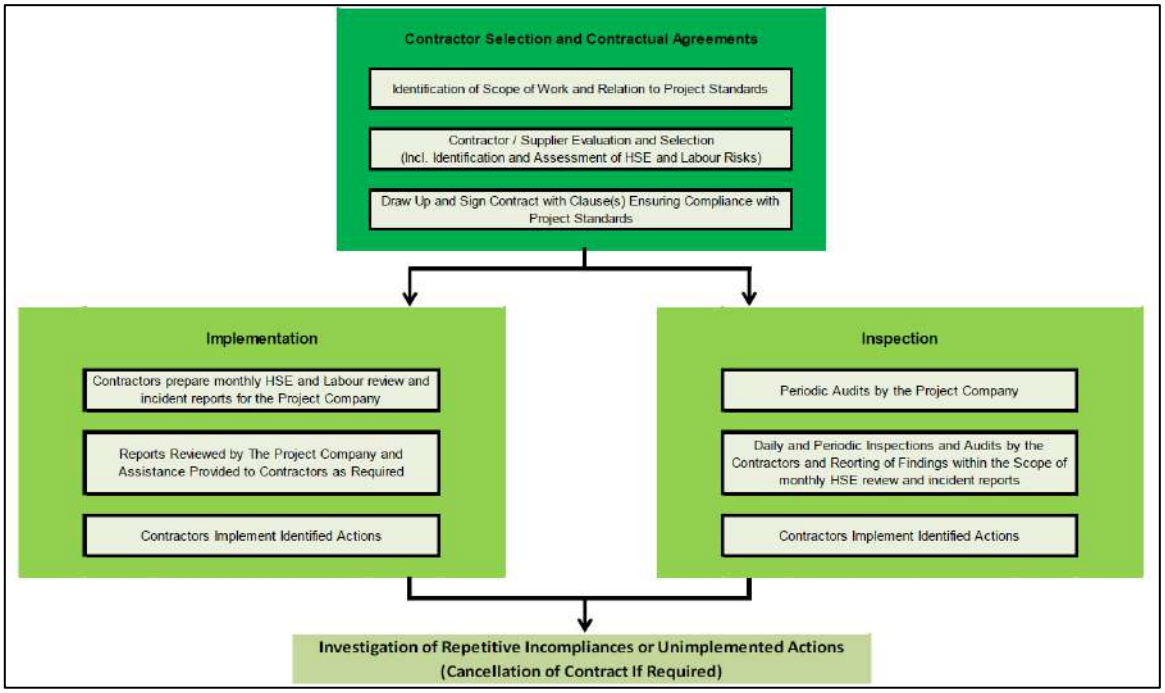

Figure D.1 Subcontractor Management Process

D.3.3 Subcontracting and Procurement

It is FOIAS's responsibility to comply with IFC Guidelines, EHS Guidelines, loan agreement commitments, Supplementary ESIA, EIA, Turkish laws and regulations, and permits and standards, ensuring that any subcontractor providing services of any kind to FOIAS duly follows these requirements throughout the duration of the contract, including any activity or services performed by third parties undertaking a contract from the subcontractor.

D.3.4 Existing Clients – Managed Contracts (Amending Existing Contracts)

For large development projects, there may be existing, smaller contracts managed by FOIAS that will continue into the construction phase alongside major contracts. For consistency, these contracts and the performance requirements associated with them shall be reviewed and, if necessary, brought in line with the other contracts through amendments to properly incorporate all applicable E&S requirements.

D.4 Monitoring of Subcontractor Management

An independent monitoring program will be implemented for evaluation of the efficiency of management strategies. The proposed scope of the monitoring activities is as follows, which may be revised within the course of the project as required:

- FOIAS will monitor subcontractor E&S performance and ensure the subcontractor monitors its own E&S performance throughout the project, including mobilization, the main construction phase, and demobilization. Clear responsibilities and reporting lines are essential to avoid duplication of effort or, conversely, gaps in monitoring.
- FOIAS requires subcontractors to report on an agreed frequency their E&S performance and metrics (which shall include relevant information and data as applicable). Timely reporting of E&S performance and results enables FOIAS to identify opportunities for improvement, prevent poor performance issues, and assist subcontractors if remedial action is to be taken. Evidence and results of the monitoring (measurements) activities have to be described in detail in monitoring reports.

In addition, daily general site overview would be done by the Environmental and Social Interaction Department in order to provide basic information on construction progress, site organization, etc. Monthly coordination meetings with project management will also be held by the Environmental and Social Interaction Department and Occupational Health and Safety Department in order to provide feedback on environmental and OHS matters and present main findings of the monitoring processes.

In addition to the independent monitoring, the experts who work in various institutions including the Ministry of Environment, Urbanization and Climate Change, Ministry of Health, Ministry of Labor and Social Security and the provincial organizations of these ministries may inspect the activities. The timing and frequency of these inspections would be determined by the relevant institutions.

If non-compliance is found as a result of the monitoring and inspection activities, all the work that is required to eliminate the non-compliance will be carried out by the subcontractor and FOIAS.

E. CHANGE MANAGEMENT PROCEDURE

E.1 Purpose and Scope

This procedure is prepared in order to describe process for identifying, documenting, evaluating, approving, and implementing project changes. With the implementation of the Procedure, it will be ensured that adequate mitigation is adopted to minimize and avoid effects where any deviations to the scheme described in the Supplementary ESIA study are proposed. The procedure aims to achieve these by incorporation of Turkish and international regulations and standards. This procedure will cover the construction and operation phases of the project.

E.2 References

- Turkish Environmental Legislation
- Environmental Law
- Electricity Market Law
- Energy Efficiency Law
- Expropriation Law
- Forestry Law
- Groundwater Law
- Labor Law
- Law on the Conservation of Cultural and Natural Assets
- Law on Improvement of Olive Cultivation and Budding of Wild Species
- Law on Soil Protection and Land Use
- Mining Law
- Municipality Law
- National Parks Law
- Occupational Health and Safety Law
- Pasture Law
- Public Health Law
- Resettlement Law
- Traffic Law
- Equator Principles (EPs) IV
- International Finance Corporation (IFC) Performance Standard 1
- IFC Environmental, Health, and Safety General Guidelines
- IFC Environmental, Health and Safety Guidelines – Toll Roads

E.3 Change Management Approach

Changes in such infrastructure projects are considered typical, within this regard there might be changes required for the design and construction methods of the project. While the most of the changes will be technical with little to no Supplementary ESIA relevance, the others are expected to be issues that are already covered by the Supplementary ESIA studies.

An overview of the Change Management Procedure is provided in the figure below.

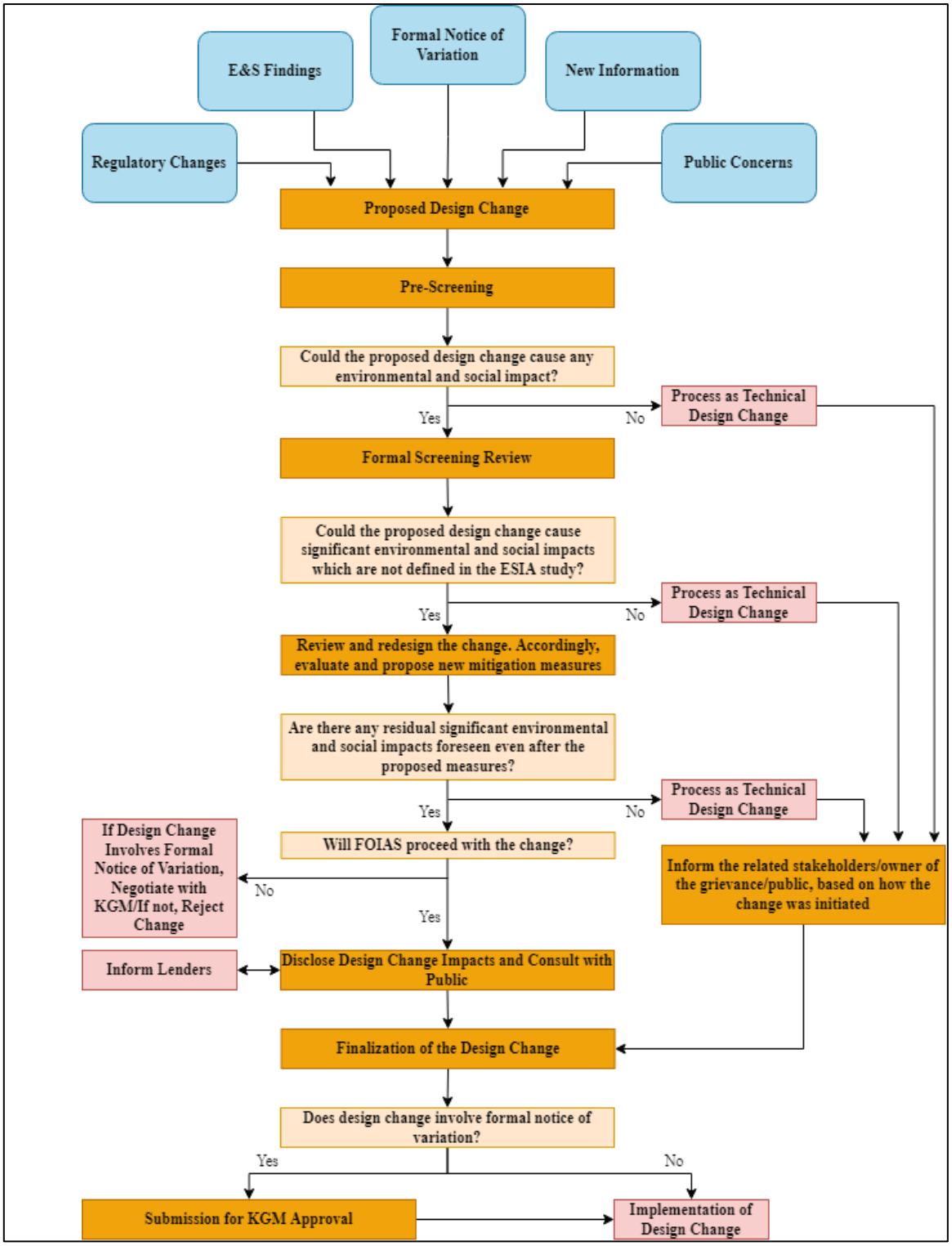

Figure E.1 Overview of Change Management Procedure

E.4 Sources for Consideration of Change

Possible design changes might occur due to various reasons given below:

- Requests from KGM;
- Detailed design development;
- Changes in construction methodologies;
- Changes in regulations;
- The accepted considerations of the stakeholders raised through the grievance mechanism,
- Concerns expressed by public/stakeholders/lenders; and
- Results of field surveys and monitoring activities.

In addition to the above given cases, change management procedure must be processed formally regardless of the case.

E.5 Pre-Screening and Screening

E.5.1 Pre-Screening

Pre-screening will ensure that proposed design changes that are not related with the environmental and social issues or that are low in significance in terms of project implementation, will not be evaluated for further screening. If the proposed design changes will not be subjected to further screening, the change will be processed as technical design change.

Pre-screening will be performed by Environmental and Social Interaction Department of the FOIAS with the support from independent experts, if needed.

E.5.2 Screening

For any proposed design changes that could result in new or additional significant impacts which are not defined in the Supplementary ESIA study, the screening will cover the following process:

1. Compliance with Turkish and international regulations and standards;
2. Compliance with Supplementary ESIA-related legal standards and permitting requirements;
3. Any new impacts on current stakeholders and impact to new/additional stakeholders which are not considered in Supplementary ESIA study;
4. Any expansion of project's footprint that requires additional land acquisition and expropriation;
5. Impacts on cultural heritage/archaeology; and
6. Any additional/different Supplementary ESIA -related topics that are not evaluated in the Supplementary ESIA studies.

The screening will be performed by Environmental and Social Interaction Department of the FOIAS with the support from independent experts, if needed. Screening results will be logged and recorded in a suitable format (to be determined by FOIAS and Lenders). The screening results will be available for review by the Lenders.

The potential outcomes of the screening of design changes can be grouped as given below:

- **No Significant Environmental and/or Social Impacts:** No significant implications or additional negative impacts are identified compared to the evaluations performed in the

Supplementary ESIA study and change does not require any additional or new mitigation measures. Within this case, the change will be processed as technical design change.

- **Significant Environmental and/or Social Impacts:** Significant or potentially significant implications with respect to Supplementary ESIA-related topics that could not be mitigated without any additional mitigation and were not evaluated in the Supplementary ESIA studies. Within this case, screening results will be logged and Change ESIA Review process will be undertaken.

E.6 Review and Redesign of Change

For the proposed changes that could have significant/potentially significant Supplementary ESIA-related impacts, Environmental and Social Interaction Department of the FOIAS will undertake consultation internally and with independent experts regarding any further mitigation or other measures such as design review, to comply with the relevant Supplementary ESIA commitments. The significance of a potential impact will be determined based on the corresponding definitions in the Supplementary ESIA studies for the relevant environmental and social topics. If no further residual significant environmental and social impact is foreseen, the change will be processed as technical design change.

E.7 Stakeholder Engagement

E.7.1 Informing Stakeholders

FOIAS will directly inform related stakeholders in written format where the design change process was initiated on their initial suggestion.

E.7.2 Disclosure of Results and Consultation with Affected Stakeholders

If the design change results in significant environmental and/or social impacts that cannot be mitigated without any additional mitigation and/or affect additional stakeholders which are not considered in the Supplementary ESIA studies and FOIAS will proceed with the change, then, further disclosures on the project web-site and local public consultation with the directly affected stakeholders should be undertaken. The type and extent of disclosure and consultation will depend on the significance and scope of the impacts resulted from the change. A time-line of not more than 30 days will be proposed for receipt/inclusion of any feedback as appropriate on a case-by-case basis. Any regulatory requirement and other formal procedures will also be completed during this stage.

FOIAS will also notify Lenders about significant environmental and social impacts of the change and public consultation with supplementary documents.

Upon agreeing on the reporting process with the Lenders, this document will be revised by Environmental and Social Interaction Department of the FOIAS with the support from independent experts to indicate the agreed change notification process.

A summary of relevant changes and mitigation of foreseen E&S impacts will also be included in disclosure documents and will be disclosed on ADMP website.

E.8 Finalization of the Design Change

Environmental and Social Interaction Department of the FOIAS, with the support from independent experts, will review and compile any feedback received from Lenders, public and other affected parties, and will prepare a final design change version that incorporates consideration of the feedback and comments received. Further evaluations of the measures may be needed based on the stakeholder engagement findings.

E.9 Submission for KGM Approval

If the change is related to a KGM-approved change, then formal notice of variation will be prepared that includes relevant mitigation measures and considerations, and will be submitted to KGM for their approval. After the approval, FOIAS will implement the agreed changes.

If the change is not related to a KGM-approved change, then FOIAS will implement the changes defined in finalized version of the design change.

ANNEX–7

SUPPLEMENTARY DOCUMENTS FOR ECOLOGY AND BIODIVERSITY STUDIES

Annex-7 SUPPLEMENTARY DOCUMENTS FOR ECOLOGY and BIODIVERSITY

➢ Annex-7/A List of Flora and Fauna Species Identified in the Project Area

- Table 7.1 Flora Species List of the Project Area
- Table 7.2 Amphibian-Reptilian-Mammalian Species List of the Project Area
- Table 7.3 Bird Species List of The Project Area
- Table 7.4 Fish species sampled in AQ3 station
- Table 7.5 Freshwater Algae of the ADMP Sampling Stations
- Table 7.6 Zooplanktonic Organisms of the ADMP Sampling Stations
- Table 7.7 Benthic Invertebrates of the ADMP Sampling Stations

Legend for Flora and Fauna Tables

IUCN (International Union for Conservation of Nature) Red List of Threatened Species)	
EX:	Extinct
EX:	Extinct in the wild
CR:	Critically endangered
EN:	Endangered
VU:	Vulnerable
NT:	Near Threatened
LC:	Least Concern
DD:	Data deficient
NE:	Not evaluated
BERN CONVENTION (for flora and fauna species)	
Annex 1	Protected Flora Species
Annex 2	Strictly Protected Fauna Species
Annex 3	Protected Fauna Species
CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora	
Annex 1	Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
Annex 2	Species not necessarily threatened with extinction, but their trade must be controlled to avoid utilization incompatible with their survival.
Annex 3	Species protected in at least one country, and their trading is under control by CITES
Turkish Red Data Book of Turkish Plants (TRDB; Appim et al., 2000) Based on IUCN Red List Categories and Criteria (ver. 2.3)	
EX	Extinct
EW	Extinct in the Wild
CR	Critically Endangered
EN	Endangered
VU	Vulnerable
LR	Lower risk
cd	conservation dependent
nt	near threatened
lc	least concern
DD	Data Deficient
NE	Not evaluated
National Threat Categories	
E	Endangered
Ex	Extinct
I	In Determinate
K	Insufficient Known
nt	widespread
O	Out of Danger
R	Rare
V	Vulnerable
NATIONAL HUNTING STATUS (According to Central Hunting Commission, 2020-2021) (for fauna species)	
APP I	Includes game animals which are protected by the CHC
APP II	Includes game animals which are allowed to be hunted in seasons predefined by CHC

NATIONAL THREAT CATEGORIES (for bird species) (Kiziroğlu,İ., 2009. The Pocket Book for Birds of Türkiye, ISBN: 975-7460-01-X, Ankamat Matbaası, Ankara, 564 s		
Category A:		
A.1.2.		**(CR)** Critically endangered and breeding species in Turkey
A.2.		**(EN)** Endangered and breeding species in Turkey
A.3.		**(VU)** Vulnerable and breeding species in Turkey
A.3.1.		**(D)** Declining, vulnerable and breeding species in Turkey
A.4.		**(NT)** Near threatened. Breeding species do not face to risk now but are likely to qualify for threatened category in the near future in Turkey
A.5.		**(LC)** Least Concern. Breeding species that are widespread in Turkey
A.6.		**(DD)** Not Evaluated. Breeding species which have not been evaluated in Turkey
A.7.		**(NE)** Critically endangered and non-breeding species in Turkey
Category B:		
B.1.2.		**(CR)** Critically endangered and non-breeding species in Turkey
B.2.		**(EN)** Endangered and non-breeding species in Turkey
B.3.		**(VU)** Vulnerable and non-breeding species in Turkey
B.3.1.		**(D)** Declining, vulnerable and non-breeding species in Turkey
B.4.		**(NT)** Near threatened, non-breeding species do not face to risk now but are likely to qualify for threatened category in the near future in Turkey
B.5.		**(LC)** Least Concern, non-breeding species that are widespread in Turkey
B.6.		**(DD)** Data Deficient, non-breeding species on which there is deficient information in Turkey
B.7.		**(NE)** Not Evaluated, non-breeding species which have not been evaluated in Turkey
RELATIVE ABUNDANCE (based on observation)		
1		Very Rare
2		Rare
3		Moderate
4		Abundant
5		Very Abundant
ENDEMISM (for flora species)		
R: Regional Endemic		
W: Widespread Endemic		
HABİTAT		
2	**F5.2**	Maquis
5	**G3.F**	Plantation area of Pinus brutia
7	**G2.9**	Evergreen orchards and groves
8	**I1.1**	Intensive unmixed crops

Table 7.1 Flora Species List of the Project Area

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		RDB	BERN	CITES			HABITAT				ABUNDANCE				
					R	W		Anx1	App1	App2	App3	1	2	3	4	1	2	3	4	5
PTERIDOPHYTA																				
CYSTOPTERIDACEAE	1	*Cystopteris fragilis* (L.) Bernh.	Gevrekeğrelti	Widespread								x					x			
ASPLENIACEAE	2	*Asplenium trichomanes* L.	Saçakotu	Widespread								x					x			
	3	*Asplenium onopteris* L.	Kalkaneğreltisi	Widespread								x					x			
	4	*Asplenium ceterach* L.	Dalakotu	Widespread								x					x			
MAGNOLIOPHYTA																				
GYMNOSPERMAE																				
EPHEDRACEAE	5	*Ephedra foeminea* Forssk.	Borotu	Mediterrenian								x					x			
PINACEAE	6	*Pinus brutia* Ten.	Kızılçam	Mediterrenian									x						x	
	7	*Pinus pinea* L.	Fıstıkçamı	Widespread									x						x	
CUPRESSACEAE	8	*Juniperus oxycedrus* L. subsp. *oxycedrus*	Katran ardıcı	Widespread								x					x			
	9	*Cupressus sempervirens* L.	Selvi	Plantation									x					x		
ANGIOSPERMAE																				
DICOTYLEDONES																				
RANUNCULACEAE	10	*Ranunculus arvensis* L.	Dugun cicegi	Mediterrenian								x	x				x			
	11	*Ranunculus constantinopoliatanus* (DC.) d'Urv.	Düğün çiçeği	Widespread								x	x				x			
.	12	*Ranunculus repens* L.	_	Widespread									x				x			
	13	*Clematis cirrhosa* L.	baharsarmaşığı	Mediterrenian								x					x			
	14	*Nigella segetalis* Bieb.	Çörek otu	Widespread											x		x			
	15	*Adonis flammea* Jacq.	Kan damlası	Widespread										x	x		x			
	16	*Delphinium peregrinum* L.		Widespread								x					x			
PAPAVERACEAE	17	*Papaver rhoeas* L.	Gelincik	Widespread											x		x			
BRASSICACEAE	18	*Thlaspi perfolatum* L.	Kulakçıklı akça çiçeği	Widespread											x	x				
	19	*Cardaria draba* (L.) Desv. Subsp. *draba*	–	Widespread											x		x			
	20	*Hirschfeldia incana* (L.) Lag.-Foss.	–	Widespread										x	x		x			
	21	*Raphanus raphanistrum* L.	Yabani turp	Widespread										x	x		x			
	22	*Camelina rumelica* Vel.	–	Widespread										x	x		x			
	23	*Capsella bursa-pastoris* (L.) Medik.	Cobancantasi	Widespread											x		x			
	24	*Lepidium perfoliatum* L.	–	Widespread									x				x			
	25	*Rapistrum rugosum* (L.) All.		Widespread											x		x			
	26	*Descurainia sophia* (L.) Webb ex Prantl	–	Widespread											x		x			
	27	*Sinapis arvensis* L.	Hardal	Widespread											x			x		
	28	*Sisymbrium loeselii* L.	–	Widespread											x		x			
CAPPARACEAE	29	*Capparis ovata* Desf. Var. *herbacea* (Willd.) Zoh.	Gebere	Widespread									x				x			
RESEDACEAE	30	*Reseda lutea* L. var. *lutea*	–	Widespread									x	x			x			
CISTACEAE	31	*Helianthemum ledifolium*(L.) Miller var. *ledifolium*	–	Widespread								x	x				x			
	32	*Tuberaria guttata* (L.) Fourr. Var. *plantaginea* (Willd.) Gross.		Widespread								x					x			
	33	*Cistus creticus* L.	karağan	Mediterrenian								x							x	
CARYOPHYLLACEAE	34	*Holosteum umbellatum* L. var. *umbellatum*	–	Widespread								x			x		x			
	35	*Dianthus zonatus* Fenzl var. *zonatus*	Yabani karanfil	Widespread								x					x			
	36	*Petrorhagia velutina* (Guss.) Ball. & Heywood		Widespread								x					x			
	37	*Silene supina* Bieb. Subsp. *pruinosa* (Boiss.) Chowdh.	–	Widespread									x				x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		RDB	BERN	CITES			HABITAT				ABUNDANCE				
					R	W		Anx1	App1	App2	App3	1	2	3	4	1	2	3	4	5
	38	*Silene dichotoma* Ehrh. Subsp. *dichotoma*		Widespread										x	x		x			
	39	*Silene squamigera* Boiss. subsp. *squamigera*		Mediterrenian										x	x		x			
	40	*Arenaria serpyllifolia* L.	–	Widespread								x					x			
	41	*Minuartia hamata* (Hausskn.) Mattf.	_	Widespread								x					x			
	42	*Bufonia tenuifolia* L.	–	Widespread									x				x			
CHENOPODIACEAE	43	*Chenopodium album* L. Subsp. *album* var. *album*	–	Widespread										x	x			x		
AMARANTHACEAE	44	*Amaranthus blitoides* S. Wats.	Sirken	Widespread										x	x		x			
RHAMNACEAE	45	*Paliurus spina-christi* Miller	karaçalı	Widespread									x					x		
	46	*Rhamnus rhodopeus* Velenovsky	Cehri	Widespread								x						x		
HYPERICACEAE	47	*Hypericum triquetrifolium* Turra	kantaron	Widespread										x	x		x			
MALVACEAE	48	*Malva sylvestris* L.	Ebegümeci	Widespread									x		x		x			
	49	*Malva neglecta* Wallr.	Ebegümeci	Widespread											x		x			
	50	*Alcea pallida* Waldst. & Kit.	Hatmi	Widespread											x		x			
GERANIACEAE	51	*Erodium hoefftianum* C.A. Meyer	Turna gagası	Widespread												x				
RUTACEAE	52	*Ruta chalepensis* L.		Widespread									x				x			
	53	*Haplophyllum suaveolens* (DC.) G. Don var. *suaveolens*		Widespread									x				x			
ANACARDIACEAE	54	*Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engler	Menengiç	Mediterrenian								x						x		
	55	*Pistacia vera* L.	Antepfıstığı	Cultivation										x	x			x		
	56	*Rhus coriaria* L.	Sumak	Widespread								x					x			
VITACEAE	57	*Vitis sylvestris* Gmelin	Yabani üzüm	Widespread									x				x			
	58	*Vitis vinifera* L.	Üzüm	Cultivation											x					x
FABACEAE	59	*Medicago minima* L. var. *minima*	_	Widespread											x		x			
	60	*Medicago sativa* L. subsp. *sativa*	Yonca	Widespread									x		x		x			
	61	*Lotus corniculatus* L. var. *corniculatus*	Gazalboynuzu	Widespread									x				x			
	62	*Spartium junceum* L.	katırtırnağı	Mediterrenian								x						x		
	63	*Anagyris foetida* L.	zivircik	Mediterrenian								x					x			
	64	*Lupinus angustifolius* L. subsp. *angustifolius*	acıbakla	Widespread								x	x				x			
	65	*Vicia cracca* L. subsp. *stenophylla* Vel.	Fiğ	Widespread								x					x			
	66	*Trifolium stellatum* L. var. *stellatum*	Ucgul	Widespread								x					x			
	67	*Trifolium campestre* Schreb.	Ucgul	Widespread								x					x			
	68	*Trifolium arvense* L. Var. *arvense*	Üçgül	Widespread								x			x		x			
	69	*Trifolium purpureum* Lois. Var. *purpureum*	Üçgül	Widespread								x		x	x		x			
	70	*Coronilla varia* L. subsp. *varia*	Körigen	Widespread								x					x			
	71	*Coronilla emerus* L. subsp. *emeroides* (Boiss. & Sprun.) Uhrova	Körigen	Widespread								x					x			
	72	*Lathyrus aphaca* L.	–	Widespread								x					x			
	73	*Ononis adenotricha* Boiss. var. *adenotricha*		Mediterrenian								x					x			
	74	*Gonocytisus angulatus* (L.) Spach		Mediterrenian								x					x			
	75	*Glycyrrhiza echinata* L.	dikenli meyen	Widespread											x		x			
	76	*Calicotome villosa* (Poiret) Link	Azgan	Mediterrenian								x					x			
	77	*Trigonella monantha* C.A. Meyer subsp. *monanatha*	Boy otu	Irano-Turanian								x					x			
	78	*Cercis siliquastrum* L. Subsp. *siliquastrum*	Erguvan	Widespread										x			x			
	79	*Hedysarum varium* Willd.	–	Irano-Turanian									x				x			
	80	*Pisum sativum* L.	Yabani bezelye	Widespread								x					x			
	81	*Onobrychis armena* Boiss. et Huet.	–	Widespread									x				x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		RDB	BERN	CITES			HABITAT				ABUNDANCE				
					R	W		Anx1	App1	App2	App3	1	2	3	4	1	2	3	4	5
ROSACEAE	82	*Pyrus elaeagnifolia* Pallas subsp. *elaeagnifolia*	Ahlat	Widespread								x					x			
	83	*Crataegus monogyna* Jacq. Subsp. *monogyna*	Alıç	Widespread									x				x			
	84	*Crataegus orientalis* Pallas & Bieb. Var. *orientalis*	Alıç	Widespread									x				x			
	85	*Prunus divaricata* Ledeb. subsp. *divaricata*	Yabani erik	Widespread								x					x			
	86	*Rubus sanctus* Schreber	Böğürtlen	Widespread									x				x			
	87	*Rosa canina* L.	Kusburnu	Widespread									x					x		
MYRTACEAE	88	*Myrtus communis* L.	Mersin	Mediterrenian								x					x			
APIACEAE	89	*Eryngium campestre* L. var. *virens* (Link) Weins	Şekerdikeni	Widespread								x	x					x		
	90	*Ammi majus* L.	Dişotu	Mediterrenian											x		x			
	91	*Scandix iberica* Bieb.	–	Widespread								x				x				
	92	*Tordylium apulum* L.	–	Mediterrenian									x				x			
	93	*Ainsworthia trachycarpa* Boiss.		Mediterrenian									x				x			
	94	*Daucus carota* L.	Yabani havuc	Widespread									x	x	x		x			
	95	*Daucus guttatus* Sm.		Widespread								x	x				x			
	96	***Peucedanum chryseum* (Boiss. Heldr.) Chamberlain**	**Hınzırotu**	**Widespread**		**x**	**LC**					**x**	**x**	**x**			**x**			
	97	*Scaligeria napiformis* (Sprengel) Grande		Mediterrenian										x			x			
	98	*Johrenia dichotoma* DC. Subsp. *dichotoma*		Widespread								x					x			
	99	*Opopanax hispidus* (Friv.) Gris.		Widespread									x				x			
	100	*Pimpinella cretica* Poiret var. *cretica*	Yabani anason	Widespread									x	x			x			
	101	*Torilis arvensis* (Huds.) Link subsp. *arvensis*		Widespread								x					x			
	102	*Lagoecia cuminoides* L.		Mediterrenian								x	x				x			
	103	*Echinophora tournefortii* Jaub. & Spach	–	Irano-Turanian								x					x			
	104	*Conium maculatum L.*	–	Widespread									x				x			
	105	*Bifora radians* Bieb.	–	Widespread												x				
	106	*Astrodaucus orientalis* (L.) Drude	–	Irano-Turanian								x					x			
CRASSULACEAE	107	*Sedum album* L.	Damkoruğu	Widespread								x					x			
	108	*Sedum pallidum* Bieb. Var. *pallidum*	Damkoruğu	Widespread								x					x			
	109	*Umbilicus horizontalis* (Guss.) DC. var. *horizontalis*	kalaba	Mediterrenian								x					x			
DIPSACACEAE	110	*Scabiosa argentea* L.	–	Widespread								x					x			
	111	*Scabiosa rotata* Bieb.	Yastıkuyuzotu	Irano-Turanian								x				x				
	112	*Knautia integrifolia* (L.) Bert. Var. *bidens* (Sm.) Borbas	–	Mediterrenian									x				x			
	113	*Dipsacus laciniatus L.*	–	Widespread									x				x			
	114	*Pterocephalus plumosus* (L.) Coulter		Widespread										x			x			
VALERIANACEAE	115	*Valerianella vesicaria* (L.) Moench		Widespread									x				x			
ASTERACEAE	116	*Senecio vernalis* Waldst. et Kit	–	Widespread									x				x			
	117	*Senecio vulgaris* L.		Widespread									x				x			
	118	*Cichorium intybus L.*	–	Widespread									x				x			
	119	*Picris strigosa* Bieb.	–	Irano-Turanian									x				x			
	120	*Cnicus benedictus* L.	Bostan otu	Widespread								x					x			
	121	*Bellis sylvestris* Cyr.	koyungözü	Mediterrenian								x					x			
	122	*Bellis perennis* L.	koyungözü	European-Siberia								x					x			
	123	*Inula viscosa* (L.) Aiton		Mediterrenian										x			x			
	124	*Anthemis tinctoria* L. var. *tinctoria*	Papatya	Widespread								x					x			
	125	*Anthemis cretica* L. subsp. *pontica* (Willd.) Grierson	Papatya	Widespread								x					x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		RDB	BERN	CITES			HABITAT				ABUNDANCE				
					R	W		Anx1	App1	App2	App3	1	2	3	4	1	2	3	4	5
	126	*Picnomon acarna* (L.) Cass.	–	Mediterrenian									x	x			x			
	127	*Achillea wilhelmsii* C. Koch	Pelin otu	Irano-Turanian									x				x			
	128	*Notobasis syriaca* (L.) Cass.		Mediterrenian									x		x		x			
	129	*Onopordum myriacanthum* Boiss.	aladiken	Mediterrenian								x					x			
	130	*Onopordum turcicum* Danin	Kenger	Irano-Turanian									x				x			
	131	*Carduus nutans* L. sensu lato	Kenger	Widespread								x	x				x			
	132	*Carduus pycnocephalus* L. subsp. *albidus* (Bieb.) Kazmi	kenger	Widespread								x					x			
	133	*Atractylis cancellata* L.		Mediterrenian									x	x			x			
	134	*Carlina corymbosa* L.	–	Mediterrenian										x			x			
	135	*Logfia arvensis* (L.) Holub.	–	Widespread									x	x		x				
	136	*Chondrilla juncea* L. var. *juncea*	–	Widespread									x	x				x		
	137	*Centaurea urvillei* DC. Subsp. *stepposa* Wagenitz	Peygamber çiçeği	Irano-Turanian										x			x			
	138	*Centaurea virgata* Lam.	Peygamber çiçeği	Widespread										x			x			
	139	*Centaurea triumfettii* All.	Peygamber çiçeği	Widespread										x			x			
	140	*Centaurea solstitialis* L. subsp. *solstitialis*	Peygamber çiçeği	Widespread										x	x		x			
	141	*Centaurea depressa* Bieb.	Peygamber çiçeği	Widespread										x			x			
	142	*Silybum marianum* (L.) Greuter	Devedikeni	Mediterrenian									x	x				x		
	143	*Scolymus hispanicus* L.		Mediterrenian											x		x			
	144	*Carthamus lanatus* L.	kınadikeni	Widespread									x				x			
	145	*Artemisia austriaca* Jacq.	Pelin otu	Widespread										x				x		
	146	*Crupina crupinastrum* (Moris) Vis.	–	Widespread										x			x			
	147	*Cirsium vulgare* (Savi) Ten.	Yaygınkangal	Widespread									x					x		
	148	*Scorzonera cana* (C.A. Meyer) var. *cana*	–	Widespread								x				x				
	149	*Lactuca serriola* L.	–	Widespread								x				x				
	150	*Crepis sancta* (L.) Babcock	–	Widespread								x				x				
	151	*Crepis reuterana* Boiss. subsp. *reuterana*	–	East Mediterrenian								x				x				
	152	*Xeranthemum annuum* L.	–	Widespread								x	x	x			x			
	153	*Xanthium strumarium* L.	kocapıtrak	Widespread										x			x			
CAMPANULACEAE	154	*Asyneuma virgatum* (Labill.) Bornm.subsp. *virgatum*	–	Widespread								x				x				
	155	*Campanula lyrata* Lam. Subsp. *lyrata*	çançiçeği	Widespread								x					x			
ERICACEAE	156	*Arbutus andrachne* L.	Sandalağacı	Widespread								x					x			
PRIMULACEAE	157	*Androsace maxima* L.	–	Widespread								x					x			
	158	*Lysimachia atropurpurea* L.	Morkargaotu	Mediterrenian										x			x			
STYRACACEAE	159	*Styrax officinalis* L.	ayıfındığı	Widespread								x					x			
OLEACEAE	160	*Jasminum fruticans* L.	Yasemin	Mediterrenian								x					x			
	161	*Olea europaea* L. var. *sylvestris* (Miller) Lehr.	yabani zeytin	Mediterrenian								x						x		
	162	*Olea europaea* L. var. *europaea*	zeytin	Cultivation								x								x
	163	*Phillyrea latifolia L.*	akçakesme	Mediterrenian								x							x	
APOCYNACEAE	164	*Nerium oleander* L.	Zakkum	Mediterrenian									x				x			
ASCLEPIADACEAE	165	*Cionura erecta* (L.) Griseb.		Mediterrenian									x				x			
	166	*Cyanchum acutum* L. subsp. *acutum*		Widespread									x				x			
BORAGINACEAE	167	*Rochelia disperma* (L. fil.) C. Koch var. *disperma*	–	Widespread								x					x			
	168	*Lappula barbata* (Bieb.) Gürke	–	Irano-Turanian								x					x			
	169	*Buglossoides arvensis* (L.) Johnston	–	Mediterrenian								x		x			x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		RDB	BERN	CITES			HABITAT				ABUNDANCE				
					R	W		Anx1	App1	App2	App3	1	2	3	4	1	2	3	4	5
	170	*Onosma frutescens* Lam.	Emzik otu	Mediterrenian								x					x			
	171	*Heliotropium dolosum* De Not	Bambulotu	Widespread										x			x			
	172	*Echium italicum* L.	–	Mediterrenian									x		x		x			
	173	*Anchusa azurea* Miller var. *azurea*	Sığırdili	Widespread									x		x		x			
	174	*Anchusa undulata* L. subsp. *hybrida* (ten.) Coutinho	–	Mediterrenian										x			x			
	175	*Alkanna orientalis* (L.) Boiss. var. *orientalis*	Havaciva otu	Irano-Turanian									x				x			
	176	*Alkanna tinctoria* (L.) Tausch subsp. *tinctoria*	Havaciva otu	Mediterrenian									x				x			
SOLANACEAE	177	*Solanum nigrum* L.	İtüzümü	Widespread										x			x			
SCROPHULARIACEAE	178	*Veronica grisebachii* S.M. Walters	–	Mediterrenian									x				x			
	179	*Veronica anagallis-aquatica* L.	–	Widespread									x				x			
	180	*Verbascum cheiranthifolium* Boiss. var. *cheiranthifolum*	Sığırkuyruğu	Widespread								x					x			
	181	*Bungea trifida* (Vahl) C.A. Meyer	–	Irano-Turanian								x				x				
CONVOLVULACEAE	182	*Convolvulus arvensis L.*	–	Widespread									x				x			
OROBANCHACEAE	183	*Orobanche anatolica* Boiss. & Reut.	Anadolu canavar otu	Widespread									x				x			
VEBENACEAE	184	*Vitex agnus-castus* L.	hayıt	Mediterrenian									x				x			
LAMIACEAE	185	*Melissa officinalis* L. subsp. *officinalis*	Oğul otu	Widespread									x				x			
	186	*Acinos rotundifolius* Pers.	–	Widespread									x				x			
	187	*Ajuga chameapitys* (L.) Schreber subsp. *chia* (Schreber) arcangeli var. *chia*	_	Widespread										x			x			
	188	*Teucrium polium* L.	Acı yavşan	Widespread								x					x			
	189	*Ballota acetabulosa* (L.) Bentham	hoşnemnem	Mediterrenian								x					x			
	190	*Marrubium parviflorum* Fisch. & mey. Var. *parviflorum*	–	Irano-Turanian								x					x			
	191	*Origanum onites* L.	bilyalıkekik	Mediterrenian								x					x			
	192	*Origanum vulgare* L. Subsp. *hirtum* (Link) ıetswaart	Karamercan	Mediterrenian								x		x			x			
	193	*Sideritis montana* L. subsp. *montana*	–	Mediterrenian								x	x				x			
	194	*Sideritis montana* L. subsp. *remota* (d'Urv.) P.W. Ball ex Heywood	–	Mediterrenian									x				x			
	195	*Sideritis lanata* L.		Mediterrenian								x					x			
	196	***Stachys cretica* L. subsp. *smyrnaea* Rech fil.**	**deliçay**	**Mediterrenian**		**x**	**LC**						**x**				**x**			
	197	*Salvia tomentosa* Miller	Adaçayı	Mediterrenian								x						x		
	198	*Salvia virgata* Jacq.	Adaçayı	Irano-Turanian								x					x			
	199	*Calamintha nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball		Widespread								x		x				x		
	200	*Satureja thymbra* L.	Kekik	Mediterrenian								x					x			
	201	*Lamium amplexicaule* L.	Ballıbaba	European-Siberia									x				x			
	202	*Thymbra spicata* L. var. *spicata*	eşekçayı	Mediterrenian								x					x			
	203	*Ziziphora tenuior* L.	–	Irano-Turanian									x	x			x			
	204	***Ziziphora taurica* Bieb. Subsp. *cleonioides* (Boiss.) P.H. Davis**	**naneruhu**	**Mediterrenian**	**x**		**VU**					**x**		**x**			**x**			
PLANTAGINACEAE	205	*Plantago lanceolata* L.	Bağa	Widespread									x				x			
	206	*Plantago scabra* Moench		Widespread									x				x			
PLUMBAGINACEAE	207	*Plumbago europaea* L.	Karakına	European-Siberia										x			x			
SANTALACEAE	208	*Osyris alba* L.	Süpürge çalısı	Mediterrenian								x					x			
EUPHORBIACEAE	209	*Euphorbia macroclada* Boiss.	Sütleğen	Irano-Turanian								x					x			
	210	*Euphorbia rigida* Bieb.	sütleğen	Mediterrenian								x					x			
MORACEAE	211	*Ficus carica* L. subsp. *carica*	incir	Widespread								x					x			
	212	*Morus alba* L.	dut	Cultivation											x			x		
ULMACEAE	213	*Ulmus minor* Miller subsp. *minor*	Karaağaç	Mediterrenian									x				x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		RDB	BERN	CITES			HABITAT				ABUNDANCE				
					R	W		Anx1	App1	App2	App3	1	2	3	4	1	2	3	4	5
FAGACEAE	214	*Quercus cerris* L. Var. *cerris*	Saçlımeşe	Widespread								x		x				x		
	215	*Quercus coccifera* L.	Kermesmeşesi	Mediterrenian								x							x	
	216	*Quercus infectoria* Olivier subsp. *boissieri* (Reuter) O. Schwarz	Mazımeşesi	Widespread								x						x		
RUBIACEAE	*217*	*Rubia tenuifolia* d'Urv. Subsp. *tenuifolia*		Mediterrenian									*x*				*x*			
	218	*Putoria calabrica* (L. fil.) DC.		Mediterrenian								*x*	*x*				*x*			
	219	*Cruciata taurica* (Pallas ex Willd.) Ehrend.	_	Irano-Turanian								x					x			
MONOCOTYLEDONES																				
ARACEAE	220	*Dracunculus vulgaris* Schott	Yılanyastığı	Mediterrenian								x					x			
LILIACEAE	221	*Allium scorodoprasum* L. subsp. *rotundum* (L.) Stearn	Yabani soğan	Mediterrenian								x				x				
	222	*Allium pseudoflavum* Vved.	Yabani soğan	Irano-Turanian										x			x			
	223	***Allium proponticum* Stearn & Özhatay var. *proponticum***	**Topkörmen**	**Mediterrenian**		**x**	**LC**					**x**		**x**			**x**			
	224	*Asparagus acutifolius* L.	kuşkonmaz	Mediterrenian								x		x			x			
	225	*Scilla autumnalis* L.	güzsümbülü	Mediterrenian									x	x			x			
	226	*Ornithogalum sphaerocarpum* Kerner	Akyıldız	Widespread									x				x			
	227	*Muscari comosum* (L.) Miller	morbaş	Mediterrenian										x			x			
	228	*Ruscus aculeatus* L. var. *angustifolius* Boiss.	tavşanmemesi	Widespread								x						x		
	229	*Smilax aspera* L.	gıcırdikeni	Widespread								x					x			
	230	*Asphodelus aestivus* Brot.	çiriş	Mediterrenian								x					x			
DIOSCOREACEAE	231	*Tamus communis* L. subsp. *communis*		Widespread								x					x			
POACEAE	232	*Poa bulbosa* L.	–	Widespread								x					x			
	233	*Bromus japonicus* Thunb. subsp. *japonicus*	–	Widespread									x				x			
	234	*Bromus intermedius* Guss.	–	Widespread								x	x				x			
	235	*Brachypodium sylvaticum* (Hudson) P. Beauv.	–	European-Siberia								x		x			x			
	236	*Stipa lessingiana* Trin. & Rupr.	–	Widespread								x					x			
	237	*Stipa bromoides* (L.) Dörfler	–	Mediterrenian								x	x					x		
	238	*Echinaria capitata* (L.) Desf.	–	Widespread									x	x			x			
	239	*Avena sterilis* L. subsp. *sterilis*	–	Widespread									x	x			x			
	240	*Aegilops biuncialis* Vis.	–	Irano-Turanian									x	x			x			
	241	*Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman	Parmak otu	Mediterrenian									x	x			x			
	242	*Koeleria cristata* (L.) Pers.	–	Widespread									x				x			
	243	*Triticum aestivum* L.	Buğday	Cultivation											x					x
	244	*Secale cereale* L.	Çavdar	Cultivation											x		x			
	245	*Hordeum murinum* L. subsp. *glaucum* (Steudel) Tzvelev	Yabani arpa	Widespread									x	x			x			
	246	*Hordeum bulbosum* L.	Arpa	Widespread									x				x			
	247	*Crysopogon gryllus* (L.) Trin. Subsp. *gryllus*		Widespread								x		x				x		
	248	*Piptatherum miliaceum* (L.) Cosson subsp. *thomasii* (Duby) Freitag	_	Widespread								x		x			x			
	249	*Piptatherum coerulescens* (Desf.) P. Beauv.		Widespread									x				x			
	250	*Calamagrostis pseudophragmites* (Haller fil.) Koeler	–	European-Siberia									x					x		
	251	*Cynodon dactylon* (L.) Pers. var. *dactylon*	Domuz ayrığı	Widespread									x						x	
	252	*Paspalum paspalodes* (Michx.) Scribner		Widespread									x					x		
	253	*Polypogon maritimus* Willd. subsp. *maritimus*		European-Siberia									xx		x			x		
	254	*Lagurus ovatus* L.		Mediterrenian											x			x		
	255	*Melica minuta* L.		Mediterrenian								x						x		
	256	*Briza humilis* Bieb.		Widespread								x					x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		RDB	BERN	CITES			HABITAT				ABUNDANCE				
					R	W		Anx1	App1	App2	App3	1	2	3	4	1	2	3	4	5
	257	*Elymus hispidus* (Opiz) Melderis subsp. *barbulatus* (Schur) Melderis	–	Widespread									x		x			x		
	258	*Taeniatherum caput-medusae* (L.) Nevski subsp. *crinitum* (Schreber) Melderis	–	Irano-Turanian									x				x			
	259	*Agrostis stolonifera* L.	–	European-Siberia									x				x			
	260	*Alopecurus myosuroides* Hudson var. *myosuroides*	–	European-Siberia									x				x			
	261	*Alopecurus arundinaceus Poiret*	–	European-Siberia									x				x			

Table 7.2 Amphibian-Reptilian-Mammalian Species List of the Project Area

SCIENTIFIC NAME	TURKISH NAME	ENGLISH NAME	IUCN	TRDB	BERN	CITES	EU HABITAT DİRECTIVE	DATA SOURCE
AMPHIBIAN								
ANURA								
Bufonidae								
Bufotes variabilis	Gece kurbağası	Green Toad	DD	LC	Ann-II	-	Ann- IV	O
REPTILIAN								
CHELONIA	Kaplumbağalar							
Testudinidae								
Testudo graeca	Tosbağa	Common Tortoise	VU		Ann-II	Ek-II	Ann-II, III, IV	O
LACERTILIA	Kertenkeleler							
Gekkonidae								
Cyrtopodion kotschyi	İnce Parmaklı Keler	Kotschy's Gecko	LC		Ann-II	-	Ann-III, IV	O
Lacertidae								
Ophisops elegans	Tarla Kertenkelesi	Snake-eyed Lizard	LC		Ann-II	-	Ann-III, IV	O
Scincidae								
Heremites vittatus	Şeritli Kertenkele	Bridled Mabuya	LC		Ann-III	-	-	O
OPHIDIA	Yılanlar							
Colubridae							-	
Dolichophis jugularis	Kara Yılan	Large Whip Snake	LC		Ann-II	-	Ann-III	O
Platyceps najadum	İnce Yılan	Dahl's Whip Snake	LC		Ann-II	-	Ann-III, IV	L
Malpolon insignitus	Çukurbaşlı Yılan	Eastern Montpellier Snake	LC		Ann-III	-	-	L
Telescopus fallax	Kedi Gözlü Yılan	Soosan Snake	LC		Ann-II	-	Ann-III	L
Typhlopidae								
Typhlops vermicularis	Kör Yılan	Worm Snake	LC		Ann-III	-	-	O
Viperidae							-	
Montivipera xanthina	Şeritli Engerek	Ottoman Viper	LC		Ann-II	-	-	L
MAMMALIAN								
EULIPOTYPHLA								
Erinaceidae								
Erinaceus concolor	Kirpi	White-breasted hedgehog	LC	LC				O
Soricidae								
Crocidura leucodon	Kır sivri faresi	Bicolored shrew	LC	LC				H
CHIROPTERA								
Rhinolophidae								
Rhinolophus ferrumequinum	Büyük Nalburunlu Yarasa	Greater Horseshoe Bat	LC	LC	Ann-II			H
Rhinolophus euryale	Küçük Nalburunlu yarasa	Lesser Horseshoe Bat	NT	NT	Ann-II			H
Vespertilionidae								
Pipistrellus kuhlii	Beyazşeritli Yarasa	Kuhl's Pipistrelle	LC	LC	Ann-II			H
Myotis blythii	Farekulaklı Küçük Yarasa	Lesser Mouse-eared Myotis	LC	LC	Ann-II			H, L
LAGORMOPHA								
Leporidae								
Lepus europaeus	Yabani Tavşan	European hare	LC	LC				O
RODENTIA								
Sciuridae								
Sciurus anomalus	Sincap	Caucasian Squirrel	LC	LC	Ann-II			O

SCIENTIFIC NAME	TURKISH NAME	ENGLISH NAME	IUCN	TRDB	BERN	CITES	EU HABITAT DİRECTIVE	DATA SOURCE
AMPHIBIAN								
Hystricomorpha								
Hystrix indica	Oklu kirpi	Indian porcupine	LC	NT	Ann-II			O
Muridae								
Apodemus flavicollis	Sarıboyunlu Ormanfaresi	Yellow-necked Mouse	LC	LC				H
Apodemus mystacinus	Kaya Faresi	Broad-toothed field mouse	LC	LC				H
Mus macedonicus	Sarı ev faresi	Macedonian mouse	LC	LC				H
Rattus norvegicus	Göçmen Sıçan	Brown rat	LC	LC				H
Hystrix indica	Oklu Kirpi	Indian Crested Porcupine	LC	NT				O
Spalacidae								
Nannospalax xanthodon	Anadolu körfaresi	Anatolian Mole Rat	DD	DD				O
CARNIVORA								
Canidae								
Canis aureus	Çakal	Golden jackal	LC	NT		Ann-III	Ann-V	A
Vulpes vulpes	Kızıl Tilki	Red fox	LC	LC		Ann-III		O
Mustelidae								
Martes foina	Kaya sansarı	Beech marten	LC	LC	Ann-III	Ann-III		O
Mustela nivalis	Gelincik	Least weasel	LC	LC	Ann-III			A
CETARTIODACTYLA								
Suidae								
Sus scrofa	Yaban domuzu	Wild boar	LC	LC	Ann-III	-		O

Table 7.3 Bird Species List of the Project Area

ORDO	FAMILIA	SPECIES	TURKISH NAME	ENGLISH NAME	IUCN/TRDB	BERN	CITES	EU BIRD DİRECTİVE	STATUS	DATA
										SOURCE
Ciconiiformes	Ciconiidae	*Ciconia nigra*	Kara Leylek	Black Stork	LC	Annex-II	Annex-II	Annex-I	M	O
Ciconiiformes	Ciconiidae	*Ciconia ciconia*	Leylek	White Stork	LC	Annex-II		Annex-I	M	O
Accipitriformes	Accipitridae	*Pernis apivorus*	Arı Şahini	Honey Buzzard	LC	Annex-II		Annex-I	M	O
Accipitriformes	Accipitridae	*Milvus migrans*	Kara Çaylak	Black Kite	LC	Annex-II		Annex-I	M	O
Accipitriformes	Accipitridae	*Circaetus gallicus*	Yılan Kartalı	Short-Toed Eagle	LC	Annex-II		Annex-I	M	O
Accipitriformes	Accipitridae	*Falco eleonorae*	Ada Doğanı	Eleonora's Falcon	LC	Annex-II		Annex-I	V	O
Accipitriformes	Accipitridae	*Falco vespertinus*	Ala Doğan	Red-footed Falcon	VU	Annex-II		Annex-I	T	L
Accipitriformes	Accipitridae	*Accipiter nisus*	Atmaca	Sparrowhawk	LC	Annex-II		Annex-I	R	O
Accipitriformes	Accipitridae	*Buteo buteo*	Şahin	Buzzard	LC	Annex-II			R	O
Accipitriformes	Accipitridae	*Buteo rufinus*	Kızıl Şahin	Long-Legged Buzzard	LC	Annex-II		Annex-I	R	O
Accipitriformes	Accipitridae	*Hieraaetus pennatus*	Küçük Kartal	Booted Eagle	LC	Annex-II		Annex-I	M	L
Falconiformes	Falconidae	*Falco tinnunculus*	Kerkenez	Kestrel	LC	Annex-II			R	O
Falconiformes	Falconidae	*Falco subbuteo*	Delice Doğan	Hobby	LC	Annex-II			M	L
Falconiformes	Falconidae	*Falco peregrinus*	Gök Doğan	Peregrine	LC	Annex-II	Annex-I	Annex-I	R	L
Galliformes	Phasianidae	*Alectoris chukar*	Kınalı Keklik	Chukar	LC	Annex-III		Annex-II-B	R	L
Columbiformes	Columbidae	*Columba livia*	Kaya Güvercini	Rock Dove	LC	Annex-III		Annex-II-A	R	O
Columbiformes	Columbidae	*Streptopelia decaocto*	Kumru	Collared Dove	LC	Annex-III		Annex-II-B	R	O
Columbiformes	Columbidae	*Streptopelia turtur*	Üveyik	Turtle Dove	VU	Annex-III		Annex-II-B	M	O
Cuculiformes	Cuculidae	*Cuculus canorus*	Guguk	Cuckoo	LC	Annex-III			M	O
Strigiformes	Tytonidae	*Tyto alba*	Peçeli Baykuş	Barn Owl	LC	Annex-II			R	L
Strigiformes	Strigidae	*Otus scops*	İshakkuşu	Scops Owl	LC	Annex-II			M	L
Strigiformes	Strigidae	*Athene noctua*	Kukumav	Little Owl	LC	Annex-II			R	L
Caprimulgiformes	Apodidae	*Apus apus*	Ebabil	Swift	LC	Annex-III			M	O
Caprimulgiformes	Apodidae	*Tachymarptis melba*	Ak Karınlı Ebabil	Alpine Swift	LC	Annex-II			M	O
Coraciiformes	Meropidae	*Merops apiaster*	Arıkuşu	Bee-Eater	LC	Annex-II			M	O
Bucerotiformes	Upupidae	*Upupa epops*	İbibik	Eurasian Hoopoe	LC	Annex-II			M	O
Piciformes	Picidae	*Dendrocopos syriacus*	Alaca Ağaçkakan	Syrian Woodpecker	LC	Annex-II		Annex-I	R	L
Passeriformes	Alaudidae	*Galerida cristata*	Tepeli Toygar	Crested Lark	LC	Annex-III			R	O
Passeriformes	Alaudidae	*Lullula arborea*	Orman Toygarı	Woodlark	LC	Annex-III		Annex-I	R	O
Passeriformes	Hirundinidae	*Hirundo rupestris*	Kaya Kırlangıcı	Crag Martin	LC	Annex-II			M	O
Passeriformes	Hirundinidae	*Hirundo rustica*	Kır Kırlangıcı	Swallow	LC	Annex-II			M	O
Passeriformes	Hirundinidae	*Hirundo daurica*	Kızıl Kırlangıç	Red-Rumped Swallow	LC	Annex-II			M	O
Passeriformes	Hirundinidae	*Delichon urbicum*	Ev Kırlangıcı	House Martin	LC	Annex-II			M	O
Passeriformes	Motacillidae	*Anthus campestris*	Kır İncirkuşu	Tawny Pipit	LC	Annex-II		Annex-I	W	O
Passeriformes	Motacillidae	*Motacilla alba*	Ak Kuyruksallayan	Pied Wagtail	LC	Annex-II			R	O
Passeriformes	Pycnonotidae	*Pycnonotus xanthopygos*	Arap Bülbülü	Yellow-Vented Bulbul	LC	Annex-III			R	O
Passeriformes	Troglodytidae	*Troglodytes troglodytes*	Çıtkuşu	Wren, Winter Wren	LC	Annex-II		Annex-I	W	L
Passeriformes	Muscicapidae	*Erithacus rubecula*	Kızılgerdan	Robin	LC	Annex-II			W	L
Passeriformes	Muscicapidae	*Luscinia megarhynchos*	Bülbül	Nightingale	LC	Annex-II			M	O
Passeriformes	Muscicapidae	*Phoenicurus ochruros*	Kara Kızılkuyruk	Black Redstart	LC	Annex-II			W	L
Passeriformes	Muscicapidae	*Oenanthe oenanthe*	Kuyrukkakan	Northern Wheatear	LC	Annex-II			M	O
Passeriformes	Muscicapidae	*Oenanthe hispanica*	Kara Kulaklı Kuyrukkakan	Black-Eared Wheatear	LC	Annex-II			M	O

ORDO	FAMILIA	SPECIES	TURKISH NAME	ENGLISH NAME	IUCN/TRDB	BERN	CITES	EU BIRD DİRECTİVE	STATUS	DATA
										SOURCE
Passeriformes	Turdidae	*Turdus merula*	Karatavuk	Blackbird	LC	Annex-III		Annex-II-B	R	O
Passeriformes	Sylviidae	*Hippolais pallida*	Ak Mukallit	Olivaceous Warbler	LC	Annex-III			M	O
Passeriformes	Sylviidae	*Sylvia melanocephala*	Maskeli Ötleğen	Sardinian Warbler	LC	Annex-II			R	O
Passeriformes	Sylviidae	*Sylvia communis*	Ak Gerdanlı Ötleğen	Whitethroat	LC	Annex-II			M	O
Passeriformes	Sylviidae	*Phylloscopus collybita*	Çıvgın	Chiffchaff	LC	Annex-II			R	L
Passeriformes	Sylviidae	*Phylloscopus trochilus*	Söğütbülbülü	Willow Warbler	LC	Annex-II			W	L
Passeriformes	Muscicapidae	*Muscicapa striata*	Benekli Sinekkapan	Spotted flycatcher	LC	Annex-II			M	O
Passeriformes	Aegithalidae	*Aegithalos caudatus*	Uzun Kuyruklu Baştankara	Long-Tailed Tit	LC	Annex-III			R	O
Passeriformes	Paridae	*Parus ater*	Çam baştankarası	Coal Tit	LC	Annex-II		Annex-I	R	O
Passeriformes	Paridae	*Parus caeruleus*	Mavi Baştankara	Blue Tit	LC	Annex-II			R	L
Passeriformes	Paridae	*Parus major*	Büyük Baştankara	Great Tit	LC	Annex-II			R	O
Passeriformes	Sittidae	*Sitta neumayer*	Kaya Sıvacısı	Rock Nuthatch	LC	Annex-II			R	O
Passeriformes	Laniidae	*Lanius collurio*	Kızıl Sırtlı Örümcekkuşu	Red-Backed Shrike	LC	Annex-II			M	O
Passeriformes	Laniidae	*Lanius senator*	Kızıl Başlı Örümcekkuşu	Woodchat Shrike	NT	Annex-II			M	O
Passeriformes	Corvidae	*Garrulus glandarius*	Alakarga	Jay, Eurasian Jay	LC	–			R	O
Passeriformes	Corvidae	*Corvus monedula*	Küçük Karga	Jackdaw, Eurasian Jackdaw	LC	-			R	O
Passeriformes	Corvidae	*Corvus cornix*	Leş Kargası	Hooded Crow	LC	-			R	O
Passeriformes	Corvidae	*Corvus corax*	Kuzgun	Raven	LC	Annex-III			R	O
Passeriformes	Sturnidae	*Sturnus vulgaris*	Sığırcık	Starling	LC	-			R	O
Passeriformes	Passeridae	*Passer domesticus*	Serçe	House Sparrow	LC	-			R	O
Passeriformes	Fringillidae	*Fringilla coelebs*	İspinoz	Chaffinch	LC	Annex-III			W	O
Passeriformes	Fringillidae	*Carduelis chloris*	Florya	Greenfinch	LC	Annex-II			R	O
Passeriformes	Fringillidae	*Carduelis carduelis*	Saka	Goldfinch	LC	Annex-II			R	O
Passeriformes	Fringillidae	*Carduelis cannabina*	Ketenkuşu	Linnet	LC	Annex-II			W	O
Passeriformes	Emberizidae	*Emberiza cirlus*	Bahçe Kirazkuşu	Cirl Bunting	LC	Annex-II			M	O
Passeriformes	Emberizidae	*Miliaria calandra*	Tarla Kirazkuşu	Corn Bunting	LC	Annex-III			M	O

Table 7.4 Fish species sampled in AQ3 station

Latin Name	Family	Common Name	Introduced	Native	Endemic	Source	BERN	ERL	CITES
Carassius gibelio	Cyprinidae	Prussian carp	X			Obs.			
Gambusia holbrooki	Poeciliidae	Eastern Mosquitofish	X			Obs.		LC	

Table 7.5 Freshwater Algae of the ADMP Sampling Stations

Bacillariophyta
Planothidium sp.
Planothidium lanceolata
Planothidium looseri
Achnanthidium minutissimum
Achnanthes longipes
Achnanthes brevipes var. intermedia
Eucocconeis flexella
Cocconeis pediculus
Cocconeis placentula
Cocconeis scutellum
Bacillaria paradoxa
Denticula elegans
Denticula kuetzingii
Hantzschia amphioxys
Nitzschia sp.
Nitzschia acuta
Nitzschia acicularis
Nitzschia amphibia
Nitzschia clausii
Nitzschia dissipata
Nitzschia linearis
Nitzschia intermedia
Nitzschia obtusa
Nitzschia palea
Nitzschia rostella
Nitzschia recta
Nitzschia sigmoidae
Nitzschia sinuata
Nitzschia tryblionella
Tryblionella hungarica
Tryblionella gracilis var. subsalina
Tryblionella kuetzingii
Grunowia tabellaria
Anomoeoneis sphaerophora
Cymbella affinis
Cymbella excisa
Cymbella lanceolata
Cymbella neocistula
Encyonema caespitosum
Encyonema helvetica
Encyonema prostratum
Encyonema silesiacum
Encyonema tumida

Encyonema ventricosa
Cymbopleura naviculiformis
Cymbopleura amphicephala
Reimeria sinuata
Placoneis exigua
Didymosphenia geminata
Gomphonema olivaceum
Gomphonema acuminatum
Gomphonema affine
Gomphonema angustum
Gomphonema angustatum
Gomphonema augur
Gomphonema augur var. turris
Gomphonema clavatum
Gomphonema intricatum
Gomphonema pseudoaugur
Gomphonema gracile
Gomphonema parvalum
Gomphonema truncatum
Gomphosphenia grovei
Rhoicosphenia abbreviata
Eunotia arcus
Mastogloia recta
Diploneis elliptica
Diploneis modica
Diploneis oblonga
Caloneis alpestris
Caloneis amphisbaena
Caloneis bacillum
Caloneis budensis
Caloneis molaris
Caloneis silicula
Caloneis permagna
Caloneis ventricosa
Navicula tripunctata
Navicula arenaria
Navicula caterva
Navicula capitatoradiata
Navicula cryptotenella
Navicula cari
Navicula cryptocephala
Navicula decussis
Navicula expecta
Navicula gregari
Navicula menisculus
Navicula mutica var. mutica

Navicula oblonga
Navicula rhynchocephala
Navicula pseudoanglica
Navicula radiosa
Navicula trivialis
Navicula viridula
Craticula cuspidata
Craticula halophila
Luticola ventricosa
Luticola goeppertiana
Luticola cohnii
Geissleria decussis
Geissleria similis
Hippodonta capitata
Neidium ampliatum
Neidium affine
Neidium binodis
Neidium dubium
Pinnularia biceps
Pinnularia gibba
Pinnularia lundii
Pinnularia microstauron
Pinnularia mesolepta
Pinnularia viridis
Gyrosigma attenuatum
Gyrosigma acuminatum
Pleurosigma angulatum
Sellaphora pupula
Sellaphora bacillum
Sellaphora laevissima
Stauroneis anceps
Stauroneis phenicenteron
Stauroneis obtusa
Stauroneis smithii
Frustulia rhomboides
Frustulia vulgaris
Frustulia spicula
Epithemia sorex
Epithemia adnata
Epithemia argus
Epithemia turgida
Rhoipalodia gibberula
Rhoipalodia gibba
Cymatopleura elliptica
Cymatopleura solea
Surirella angusta

Surirella biseriata
Surirella linearis var. helvetica
Surirella minuta
Surirella ovalis
Surirella ovata
Surirella ovata var. apiculata
Surirella robusta
Campylodiscus clypeus
Campylodiscus hibernicus
Amphora ovalis
Amphora veneta
Amphora commutata
Amphora pediculus
Amphora coffeaeformis
Aulacoseria granulata
Aulacoseria distans
Melosira varians
Cyclotella sp.
Cyclotella meneghiniana
Cyclotella comta
Cyclotella ocellata
Asterionella formosa
Diatoma elongatum
Diatoma mesodon
Diatoma vulgaris
Diatoma tenius
Fragilaria acus
Fragilaria crotonensis
Fragilaria capucina
Fragilaria capucina var. vauchaeria
Fragilaria capucina var. mesolepta
Fragilaria dilatata
Fragilaria construens
Pseudostaurosira parasitica
Ulnaria ulna
Staurosirella leptostauron
Staurosirella pinnata
Meridion circulare
Meridion circulare var. constrictum
Chlorophyta
Chloroidium ellipsoideum
Hariotina reticulata
Crucigenia quadrata
Pseudopediastrum boryanum
Pseudopediastrum integrum
Neglectella solitaria

Oocyctis elliptica
Comasiella arcuata
Tetradesmus obliquus
Scenedesmus ecornis
Scenedesmus obtusus
Tetradesmus incrassatulus
Desmodesmus intermedius
Desmodesmus spinosus
Ulothrix aequalis
Ulothrix cylindricum
Ulothrix tenuissima
Charophyta
Spirogyra weberi var. grevilleana
Spirogyra singularis
Spirogyra varians
Spirogyra weberi
Zygnema pectinatum
Klebsormidium subtile
Cosmarium laeve
Cosmarium margaritiferum
Cosmarium nitidulum
Cosmarium ostusatum
Cyanobacteria
Aphanothece sp.
Aphanothece saxicola
Chroococcus dispersus
Chroococcus giganteus
Limnococcus limneticus
Chroococcus minimus
Chroococcus minor
Chroococcus turgidus
Merismopedia glauca
Merismopedia tenuissima
Microcystis aeruginosa
Cyanothece aeruginosa
Johanseninema constrictum
Lyngbya lagerheimii
Nostoc commune
Kamptonema formosum
Pseudanabaena limnetica
Oscillatoria limosa
Oscillatoria princeps
Phormidium ambiguum
Phormidium articulatum
Phormidium tergestinum
Leptolyngbya tenuis

Glaucospira laxissima
Spirulina major
Spirulina nodstedtii
Spirulina subsalsa
Euglenozoa
Lepocinclis acus
Euglena elongata
Euglenaformis proxima
Phacus circulatus

Table 7.6 Zooplanktonic Organisms of the ADMP Sampling Stations

Rotifera
Asplanchna girodi
Asplanchna priodonta
Brachionus calyciflorus
Brachionus diversicornis
Brachionus quadridentatus
Conochilus dossuarius
Conochilus unicornis
Euchlanis dilatata lucksiana
Euchlanis lyra
Filinia terminalis
Keratella cochlearis
Keratella quadrata
Keratella tecta
Keratella tropica
Lecane lunaris
Lecane closterocerca
Lecane luna
Notholca acuminata
Notholca squamula
Polyarthra dolichoptera
Polyarthra vulgaris
Pompholyx sulcata
Synchaeta oblonga
Synchaeta pectinata
Trichocerca cylindrica
Cladocera
Ceriodaphnia pulchella
Bosmina longirostris
Alona rectangula
Chydorus sphaericus
Copepoda
Eucyclops serrulatus
Cyclops vicinus
Metacyclops gracilis

Table 7.7 Benthic Invertebrates of the ADMP Sampling Stations

PLATYHELMINTHES
Ordo: Tricladida
Family: Planariidae
Planaria sp.
Ordo: Tubificida
Family: Naididae
Pristinella rosea
MOLLUSCA
Ordo: Neritopsina
Family: Neritidae
Theodoxus fluviatilis
Ordo: Basommatophora
Family: Lymnaeidae
Lymnea glabra
Lymnea peregra
Lymnea sp.
Family: Physidae
Physa sp.
Family: Planorbidae
Planorbis sp.
Ordo: Littorinimorpha
Family: Bythinellidae
Bythinella sp.
Family: Hydrobiidae
Potamopyrgus sp.
Ordo: Sphaerioidea
Family: Pisidiidae
Pisidium sp.
Sphaerium simile
Sphaerium sp.
ANNELIDA
Ordo: Haplotaxida
Family: Naididae
Stylaria lacustris
Family: Tubificidae
Limnodrilus sp.
Family: Tubificidae
Tubifex tubifex
Ordo: Rhynchobdellida
Family: Glossiphoniidae
Helobdella stagnalis
Theromyzon sp.
ARTHROPODA
Class: MALACOSTROCA

Ordo: Isopoda
Family: Asellidae
Asellus aquaticus
Ordo: Amphipoda
Family: Corophiidae
Corophium sp.
Family: Gammaridae
Gammarus pulex
Ordo: Decapoda
Family: Palaemonidae
Palaemon sp.
Class: INSECTA
Ordo: Coleoptera
Family: Dytiscidae
Agabus sp.
Colymbetes sp.
Laccophilus sp.
Family: Gyrinidae
Gyrinus sp.
Family: Hydrophilidae
Hydrobius sp.
Tropistemus sp.
Ordo: Diptera
Family: Ceratopogonidae
Bezzia sp.
Family: Chaoboridae
Chaoborus sp.
Family: Chironomidae
Chironomus riparius
Chironomus sp.
Cladotanytarsus mancus
Cricotopus spp.
Cryptochironomus sp.
Dicrotendipes sp.
Eukiefferiella sp.
Harnischia sp.
Macropelopia sp.
Micropsectra sp.
Nanocladius sp.
Orthocladius sp.
Paracladius sp.
Paracladopelma sp.
Paratanytarsus penicillatus
Paratrichocladius sp.
Polypedilum sp.
Procladius sp.

Rheocricotopus sp.
Stictochironomus sp.
Tanypus sp.
Thienemanniella sp.
Family: Simuliidae
Simulium sp.
Simulium vittatum
Family: Tabanidae
Silvius sp.
Family: Tipulidae
Tipula sp.
Ordo: Ephemeroptera
Family: Baetidae
Baetis laevis
Baetis rhodani
Baetis vernus
Centroptilum sp.
Cloeon sp.
Family: Caenidae
Caenis sp.
Family: Ephemerellidae
Ephemerella ignita
Family: Heptageniidae
Ecdyonurus sp.
Heptagenia sp.
Family: Potamanthidae
Potamanthus sp.
Family: Siphlonuridae
Ameletus sp.
Ordo: Hemiptera
Family: Corixidae
Callicorixa sp.
Sigara sp.
Family: Gerridae
Gerris gibbifer
Family: Naucoridae
Ilyocoris sp.
Family: Notonectidae
Notonecta sp.
Ordo: Odonata
Family: Aeshnidae
Anax imperator
Brachytron pratense
Family: Calopterygidae
Calopteryx splendens
Calopteryx virgo

Family: Coenagrionidae
Coenagrion sp.
Enallagma sp.
Ischnura sp.
Family: Euphaeidae
Epallage fatime
Family: Gomhpidae
Onychogomphus forcipatus
Ophiogomphus sp.
Family: Lestidae
Sympecmen sp.
Family: Libellulidae
Libellula sp.
Ordo: Plecoptera
Family: Perlodidae
Isoperla sp
Ordo: Trichoptera
Family: Hydropsychidae
Hydropsyche sp.
Hydropsyche instabilis
Hydropsyche pellucidula
Family: Hydroptilidae
Hydroptila sp.
Family: Psychomyiidae
Psychomyia pusilla

➢ **Annex-7/B Photographs of Terrestrial-Aquatic Habitats and Species**

- **Photographs of Terrestrial Flora and Flora Sampling Points**
- **Photographs of Fish Species**

Photographs of Terrestrial Flora and Flora Sampling Points

FF 1 (Olive Garden)

FF 2 (Maquis)

Photographs of Terrestrial Flora and Flora Sampling Points

FF 2 (*Pinus brutia* plantation)

FF 2 (Olive Garden)

Photographs of Terrestrial Flora and Flora Sampling Points

FF 3 (Maquis)

FF 4 (Maquis)

Photographs of Terrestrial Flora and Flora Sampling Points

FF 4 (Olive Garden)

FF 5 (Olive Garden)

Photographs of Terrestrial Flora and Flora Sampling Points

FF 6 (Olive Garden)

FF 7 (Olive Garden)

Photographs of Terrestrial Flora and Flora Sampling Points

FF 7 (Maquis)

FF 8 (Dalama quarry, *Pinus brutia* plantation)

Photographs of Terrestrial Flora and Flora Sampling Points

FF 8 (Dalama Quarry, *Pinus pinea* Plantation)

FF 9 (Akçaköy Quarry, Olive plantation)

Photographs of Terrestrial Flora and Flora Sampling Points

FF 9 (Akçaköy Quarry, Maquis)

FF1

Photographs of Terrestrial Flora and Flora Sampling Points

FF2

FF3

Photographs of Terrestrial Flora and Flora Sampling Points




FF4

FF5

Photographs of Terrestrial Flora and Flora Sampling Points

FF6

FF7

Photographs of Terrestrial Flora and Flora Sampling Points

FF8 Dalama Quarry

FF9 Akçaköy Quarry

Photographs of Fish Species

Carassius gibelio

Photographs of Fish Species

Gambusia holbrooki

ANNEX–8

NOISE MODELING

AND

ASSESSMENT REPORT

Noise Assessment for
Aydın Denizli Motorway South Alternative:
Between 15+856-34+630 KM

October 2023

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1 NOISE ASSESSMENT FOR AYDIN DENİZLİ MOTORWAY SOUTH ALTERNATIVE: BETWEEN 15+856-34+630 KM

1.1 Preamble

Sound is material ambient vibrations that the ear can perceive. Sound has three components, namely, pitch-depth, level of presence and timbre. On the other hand, noise is defined as a physically irregular, physiologically unpleasant, disturbing sound. Noise pollution is caused by various noise sources such as construction equipment, road vehicles, work machines, etc.

Even though noise is a subjective type of pollution, it has been proven that short or long-term exposure above a certain level has many negative impacts on human health. These impacts can be classified as physiological impacts, psychological impacts, or illness/discomfort. Depending on the level and duration of exposure, noise exposure causes temporary or permanent impacts on human health and diseases. Reducing the noise level reaching the receiver is of great importance in order to prevent such problems. The increase in exposure to noise or the constant presence of noise may create great losses in the quality of life and human health.

The concept of 'environmental noise' is defined in the international literature as the total noise of sources generally located in the external environment of the buildings, which do not cause hearing loss unless they have a long exposure time and level, but create various health problems in the medium and long term. Traffic of motor transport vehicles is the most common of the environmental noises and the most disturbing noise source.

Within the scope of this report, the studies on the determination of the impacts of possible noise that may arise from the construction site, construction activities and operation of the planned "South Alternative" and the action plans performed as per the regulation on the routes where the limit values specified in the RENC are exceeded are explained.

Issues related to noise pollution and its control and prevention are regulated with "**Environmental Noise Directive** Directive 2002/49/EC relating to the assessment and management of environmental noise (the Environmental Noise Directive – **END**)" in the European Union and "Regulation on Environmental Noise Control (**RENC**) published in the Official Gazette numbered 32029 dated November 30, 2022 under the Environmental Law" in Turkey. The RENC regulation is in compliance with the END regulation. Limit values within the scope of this report are from RENC.

Within the scope of the project, the current assessment of noise levels and noise modeling studies were conducted by Hidrotek Mimarlık Mühendislik Tic. Ltd. Şti.

1.2 The Purpose of the Project

Within the scope of this study, noise maps were created in order to determine the potential noise impacts that may occur in the construction sites, motorway construction and opening of the motorway to traffic regarding the route of South Alternative The results obtained by modeling were assessed according to " Regulation on Environmental Noise Control (RENC)".

Noise assessments arising from the construction and operation of the South Alternative project are discussed in this section.

A study area has been created for all project sites to anticipate a wider and more comprehensive scenario (see Figure 3.1 and Figure 3.2). Measures to mitigate the impact of the transportation-related noises that will arise from the South Alternative project have been analyzed based on the anticipated operating conditions. Noise impacts have been assessed in accordance with RENC.

The noise modeling analysis made makes it possible to anticipate possible future impacts for the motorway and its surroundings in the project area.

The purpose of this study is to estimate and model the noise that will be caused by the construction site, during the construction and motorway operation, along with the following specific objectives:

- Creation of action plans to reduce the noise levels in the designated area to acceptable levels,
- Noise modeling of the noise levels caused by vehicles during the operation period of the motorway and creation of noise maps,
- Assessment of whether or not the noise levels in any area exceed the criteria specified in the relevant noise regulations and guidelines,
- Determination of the locations, lengths and heights of the noise barriers that will be required in order to reduce the environmental noise to the desired levels,

2 REGULATIONS ON NOISE

2.1 National Regulations on Noise

The assessment of environmental noise occurring during the construction site and operation phase of the project according to the national noise regulation is discussed in this section.

Environmental noise pollution in Turkey and the issues related to the control and prevention of this pollution are regulated by the Regulation on Environmental Noise Control (**RENC**) published in the Official Gazette under the Environmental Law dated 30 November 2022 and numbered 32029.

RENC is about providing the body and soul of people exposed to environmental noise, determination of environmental noise exposure levels by means of noise maps to be prepared, acoustic report and environmental noise level assessment report, by using assessment methods to be put into practice gradually, informing the public about environmental noise and its impacts, preparation of action plans to prevent and reduce noise, based on the results of noise maps, acoustic report and environmental noise level assessment report, especially where environmental noise exposure levels may cause harmful impacts on human health and it is necessary to protect the environmental noise quality, and determining the procedures and principles regarding the implementation of these plans.

Noise models have been developed using commercial modeling software SoundPLAN V 9.0 (64 Bit). Calculations for the motorway have been made using emission values given in the guideline

“Guide du bruit des transports terrestres, fascicule prevision des niveaux sonores CETUR 1980” (Noise guideline for and sound levels estimation road transport CETUR 1980) referred to in the French Standard **NMPB Road 96** - XPS31-133 for roads, which is also recommended by RENC and the European Commission Directive for the assessment of environmental noise caused by sources such as motorways, viaducts and tunnels and

TS ISO 9613–2: Acoustics - Reduction of Sound When Propagated Outside-Section 2: General Calculation Method for the construction site and construction phase.

All Sources Noise Criteria

Limit values valid in RENC for traffic noise caused by motorways are given in Annex II – Table 1 of the said regulation. The noise levels given in Table 2.1.1 should be obtained at the location of the nearest off-site receiver by using noise reduction measures.

Table 2.1.1 Environmental Noise Limit Values for Motorways, Turkey (L_{eq} dB(A))

Table 1. Environmental Noise Limit Values for Motorways

Noise Source	Measured Parameter	Environmental Noise Level		
		Day	Evening	Night
Industrial facilities, transport	LAeq, 5 dk.	65 dB(A)	60 dB(A)	55 dB(A)
Businesses broadcasting music (1)	LAeq 63-250 Hz	60 dB(A)	55 dB(A)	50 dB(A)
Workplaces (2)	LAeq, 5 dk.	Background + 5 dB(A)		Background + 3 dB(A)
In case of multiple workplaces (3)	LAeq, 5 dk.	Background + 7 dB(A)		Background + 5dB(A)
All sources	LCmax	l00 dB(C)		

Noise criteria for the construction site

In the calculations for the construction site noise "TS ISO 9613–2: Acoustics - Reduction of Sound When Propagated Outside-Section 2: General Calculation Method" was used. Working hours for the construction site are given in Table 2.1.2.

Table 2.1.2 Working hours for construction site

Table 2. Permitted time frame for outdoor activities in residential areas

Activity Name	Activity Hours
Construction site activities	10.00-22.00
Outdoor activities that cause environmental noise (1)	10.00-01.00
Use of fireworks	20.00-22.00
Explosion activities in mines, quarries and other areas	10.00-20.00

For the areas other than this, it is not allowed to increase the background noise more than 5 dB(A).

2.2 Interational Regulations on Noise

Assessment of IFC (International Finance Corporation)

IFC noise criteria are defined in document named General Environmental Health and Safety (EHS) Guidance – Noise. These limit values have been determined on the basis of the Guidelines of the World Health Organization and are given in Table 2.2.1.

Table 2.2.1 IFC Noise Limit Values

Receiving Environment	Hourly L_{Aeq} (dBA)	
	Day 07:00 — 22:00	Night 22:00 — 07:00
Residential, institutional and educational areas	55	45
Industrial, commercial areas	70	70

According to the requirements of IFC, noise levels should not exceed the values given in Table 2.2.1 or cause an increase of more than 3 dB on the background noise levels of the nearest off-site receiving environment. IFC's EHS Guidelines also describe measures to reduce noise levels to avoid exceeding limit values, as well as recommendations for monitoring to detect noise levels. IFC's noise level guideline treats the receiving environment as two categories and does not distinguish between noise sources. Therefore, in the said guideline, the limit values to be complied with for motorway projects are not clearly stated. Recommendations to prevent, reduce and control noise are presented in this guideline, but no limit values are specified. When the European Union Directives are examined, Member States are required to appoint competent authorities and have noise maps drawn in order to draw strategic noise maps for main roads, main airports, railways and assembly places using harmonized noise markers according to the Environmental Noise Directive 2002/49/EC. In the EU Environmental Noise Directive, limit values are not specified, and it is recommended that member countries determine these standards on a national basis.

Member States are expected to use L_{den} and L_{night} noise indicators according to this directive for the assessment of environmental noise.

Significance Level Criteria

The significance level of the impacts on noise is determined as high, medium and low depending on the sensitivity of the receptors and the level of the impact. The magnitude of the impacts on noise is determined by the criteria described in Chapter 4 ("ESIA Methodology"), and the sensitivity criteria within the scope of impact assessment are given in Table 4.4.

Table 2.2.2 Sensitivity Criteria of Receivers

Ecosystem Component	**Sensitivity Level**		
	High(3)	**Moderate (2)**	**Low (1)**
Humans	Education, culture and health areas as well as summer, camping areas and residential areas.	Areas where commercial buildings and workplaces are densely located and where residences are not concentrated	Industrial areas

The magnitude of the impacts was determined on the basis of the increase in the noise levels of the motorway, the construction site and the nearby settlements during the construction period due to the realization of the project. The magnitudes of the impacts are defined as low, medium and high for increases in baseline noise levels of 3-6 dB (A), 6-9 dB (A) and more than 9 dB (A), respectively (Table 2.2.3).

Additionally, regardless of the baseline levels, the impact level was considered high when the results of the model study exceeded the limit value in the relevant legislation.
According to IFC requirements, the noise levels should not exceed the limit values or cause an increase in the background noise levels of the nearest off-site receiving environment by more than 3-6 dB (A). Therefore, an increase of 3-6 dB (A) in the noise level was considered acceptable and its impact was defined as negligible.

Table 2.2.3 Impact Level Criteria

Impact Level	**Increase in the Noise Levels of the Current Situation (L_{den} dB(A))**
Low	3-6 dB(A)
Moderate	6-9 dB(A)
High	>9 dB(A) or exceeding the limit values according to the model result

3 STUDY AREA

The study area according to the changes made between km 15+856-34+630 of the project is shown in Figure 3.1. The former route is shown in Figure 3.2.

The construction sites in the study area of the project are shown in Figure 3.2. Construction sites in the region are as follows

- Alanlı-2
- Dalama-2
- Dereköy
- Dereköy (Center)
- Yenipazar

During the noise assessment phase, a calculation area of approximately 2 km wide (1 km from the right and left of the Motorway) and virtual receivers for the points where noise measurements were made were defined on the project route.

In order to facilitate the design, planning and assessment of the noise calculation area, the construction sites, the construction phase and the noise levels that will occur after the opening of the motorway have been examined separately between 15+856-34+630 km.

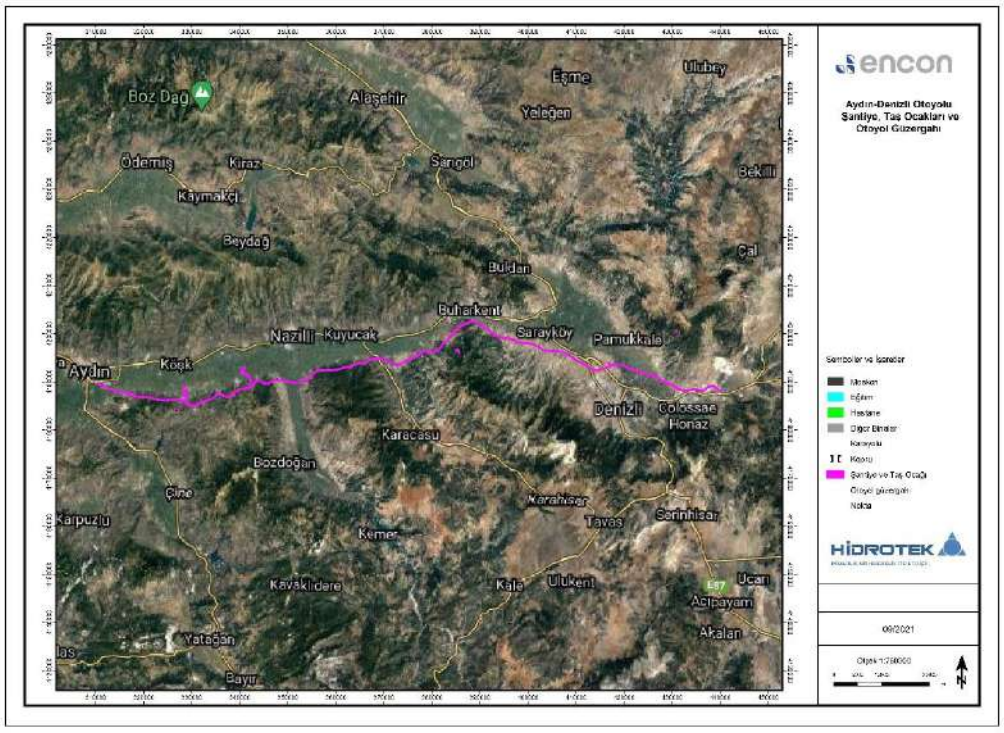


Figure 3.1 ADM new route

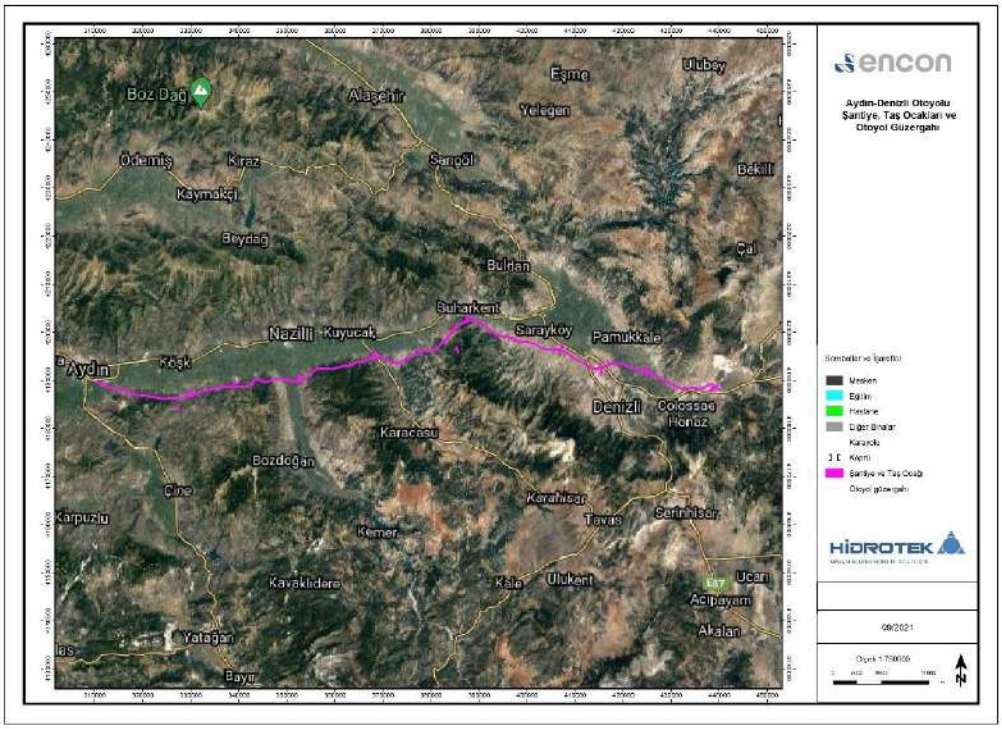


Figure 3.2 ADM former route

The number of vehicles specified in Table 3.1 and Table 3.2 are estimated traffic data for 2034 and modeling was performed according to these data.

Table 3.1 ADM's estimated light vehicle traffic data for 2034

Light vehicle (<3.5 tons) (Daily)				
Section	**Description**	**day**	**evening**	**night**
Section 1	Aydın-Kuyucak	7.260	2.220	1.244
Section 2	Kuyucak-Denizli	4.767	1.457	817

Light vehicle (<3.5 tons) (Hourly)				
Section	**Description**	**day**	**evening**	**night**
Section 1	Aydın-Kuyucak	605	555	155
Section 2	Kuyucak-Denizli	397	364	102

NOT: Day: 07.00-19.00 Evening: 19.00-23.00 Night : 23.00-07.00

Table 3.2 ADM's estimated heavy vehicle traffic data for 2034

Heavy vehicle (>3.5 tons)(Daily)				
Section	**Description**	**day**	**evening**	**night**
Section 1	Aydın-Kuyucak	2.083	824	754
Section 2	Kuyucak-Denizli	1.813	717	656

Heavy vehicle (>3.5 tons)(Hourly)				
Section	**Description**	**day**	**evening**	**night**
Section 1	Aydın-Kuyucak	174	206	94
Section 2	Kuyucak-Denizli	151	179	82

The list of machinery equipment to be used in construction sites and road construction during the motorway construction is shown in Table 3.3. It is assumed that these machinery equipment will run during the daytime and at 50% capacity.

Table 3.3 Machine Park

Machine Park	Quantity	Sound Power dB (A)
Excavator	74	110
Grader	11	117
Crusher-Grinder	2	125
Dozer	25	119
Loader	19	110
Cylinder	40	101
Dump Truck	231	104
Rock Crusher	2	120
TOTAL	**404**	136

NOTE: Sound power levels are from the SoundPLAN library. Source :Bearbeitung: RWTÜV Anlagentechnik GmbH, Essen im Auftrag des Landesumweltamtes NRW, Essen 2000

Building heights within the study area vary as the project route passes through different regions. The buildings in the project area are mostly 1 to 2 floors high, but they can be up to 5 floors high in the mass housing areas within the project area. The terrain models of the region are shown in Figure 3.3 and Figure 3.4.

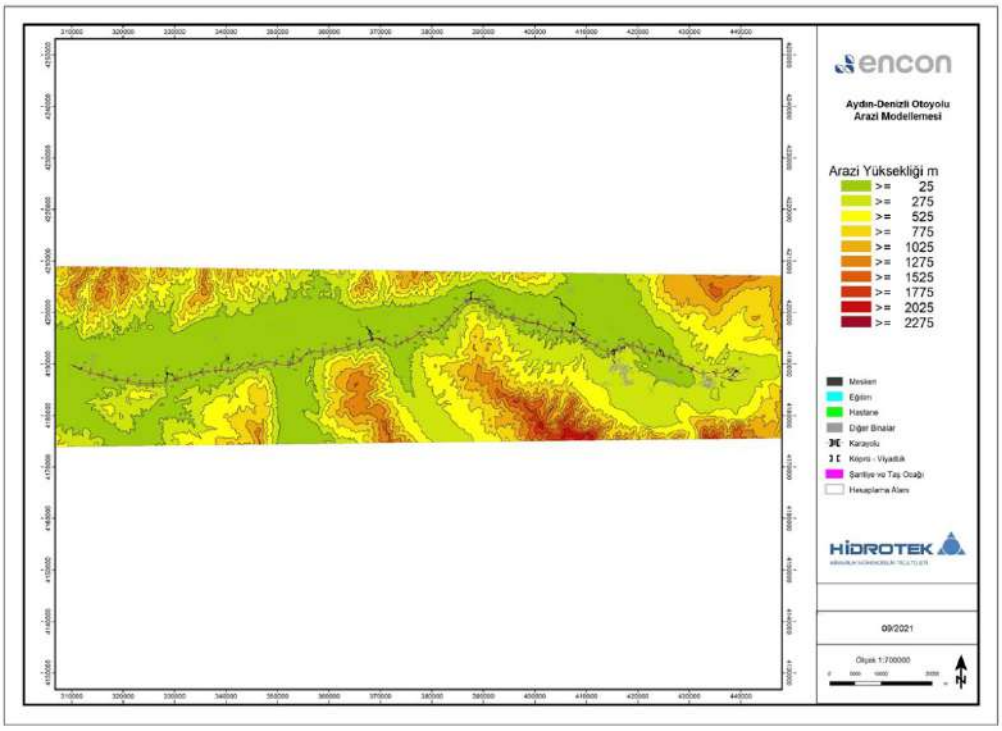


Figure 3.3 Terrain model of ADM

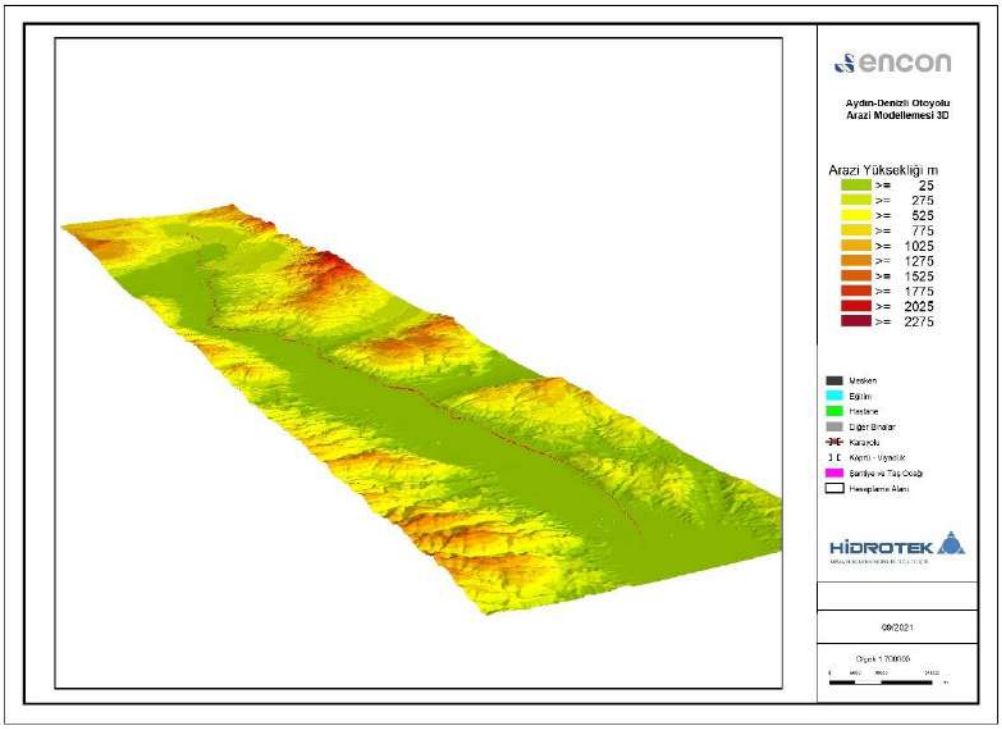


Figure 3.4 Terrain model of ADM in 3D

4 NOISE ASSESSMENT AND METHODOLOGIES

Traffic noise is the main source of noise pollution in urban areas. The most basic causes of noise pollution are the sounds made by the engines, aerodynamic structure and exhaust systems of cars, trucks, buses and motorcycles.

In order to preserve the peace of the environment and the mental and physical health of people, it is important to comply with the regulation criteria regarding noise. The main purpose of this study is stated in the first article of the regulation, which is taken as a basis within the scope of the study: "The purpose of this regulation is to ensure that the necessary measures are taken to ensure that the peace and tranquility of the society, physical and mental health are not deteriorated due to exposure to environmental noise. This regulation is also about informing the public about the negative impacts of environmental noise, preparing an action plan for the prevention and reduction of high-level noises, and determining environmental noise exposure levels according to reports and noise maps.". By comparing with the road traffic noise limit values in Table 4.14.1.1 and the construction site noise limit values in Table 2.2, noise levels are classified in terms of suitability.

4.1 Traffic Noise Assessment

Traffic noise modeling was performed considering the noise regulations in Turkey and the European Union. Noise map calculations were made according to the Noise Map Preparation Guideline published by the Ministry of Environment and Urbanization of the Republic of Turkey. Calculations were made according to NMPB Road 96 (Road noise mapping method) and ISO 9613-2 (Industry noise mapping method) with 10 meters x 10 meters grid sizes at 4 meters above ground level. Noise measurements were made at some points in the field in order to detect background noise. Virtual measurement points were created for these measurement points and the noise levels coming to these points were calculated by modeling. The difference between the measured noise level and the calculated noise level is shown in Table 5.4.3.

Traffic noise modeling is based on NMPB Road 96 Standard, using SoundPLAN V 9.0 (64 Bit) noise modeling software. The limit values in the modeling studies were compared with the limit values of RENC (Table 4.1.1).

Table 4.1.1 Environmental Noise Limit Values for Motorways, Turkey (L_{eq} dB(A))

Type of Land Use	**Limit Value dB(A)**		
	L_{day} (07:00-19:00)	$L_{evening}$ (19:00-23:00)	L_{night} (23:00-07:00)
Industrial facilities and transport	65	60	55

Regarding the annual average speed values, the highest limit values given in the relevant title in the Turkish Traffic Legislation have been taken into consideration. Light vehicle speeds 120 km/h, heavy vehicles speed 100 km/h.

Land heights, city plan and road layout were processed into the modeling system.

Limit values for new roads in RENC are given in ANNEX-II, Table - 1 and are determined separately for different times of the day: whole day (L_{den}) (00:00-24.00) day (L_{day}) (07:00-19:00), evening ($L_{evening}$) (19:00-23:00) and night (L_{night}) (23:00-07:00). Therefore, the calculation results are shown as L_{day}, $L_{evening}$ and L_{night}. Additionally, calculations were made within the time periods LD (07:00-22:00) for daytime and LN (22:00-07:00) for nighttime available in EU regulations. Therefore, the calculation results are shown in tables as L_{day}, $L_{evening}$, L_{night}, LD and LN.

Calculations and noise maps for each of the time intervals are shown in the report.

The road traffic methodology requires hourly light and heavy vehicle traffic data, the type of road surface pavement, and the average speed of the vehicles.

In the modeling, the ground absorption coefficient (G) factor was taken as 0.6 and all shielding, topography, distance propagation factors were assessed.

The road surface was assessed as flat-mastic asphalt. The topographic structure of the project site is shown in Figure 3.3 and Figure 3.4.

Traffic flow data are shown in Table 3.1

Table 3.1 and Table 3.2. Cars represent light vehicles, buses, trucks, trailers, tractors and semi-trailers represent heavy vehicles in this table. The total values of the traffic flow data used in the noise modelling programme were divided into daily, day, evening and night time periods by using Table 3.2 and converted into vehicles/hour. In the calculations, modeling was made for the worst case based on the year 2034.

4.2 Assessment of Noise Levels of Construction Sites and Construction Activities

Construction site noise assessments were carried out taking into account the noise regulations in Turkey and the European Union. Noise map calculations were made according to the Noise Map Preparation Guide published by the Ministry of Environment, Urbanisation and Climate Change of the Republic of Turkey. It was made according to ISO 9613-2 (Industrial noise mapping method) with grid sizes of 10 meters x 10 meters at a height of 4 meters from the ground. Noise measurements were made at some points in the field in order to detect background noise. Virtual measurement points were created for these measurement points and the noise levels coming to these points were calculated by modeling. The measured noise level, the calculated noise level and the comparison between these two levels are shown in Table 5.4.1 Construction site noise modeling results and comparison table and Table 5.4.2 Construction site and motorway construction noise modeling results and comparison table.

Site and construction activity noise modeling was done based on ISO 9613-2 Standard, using SoundPLAN V 9.0 (64 Bit) noise modeling software. In the modeling studies, the limit values were compared with the limit values of RENC and background noise.

The noise levels of the vehicles in the machinery park in Table 3.3. are calculated with the assumption that the construction site and construction activities will be carried out between 7.00 and 19.00 and will operate at 50% capacity. Noise maps showing the noise levels caused by the operation and construction of the project are shown within the scope of the report.

Land heights, city plan and road layout were processed into the modeling system.

Limit values for new roads in RENC are given in Annex-II, Table - 1 and are determined separately for different times of the day: whole day (L_{den}) (00:00-24.00) day (L_{day}) (07:00-19:00), evening ($L_{evening}$) (19:00-23:00) and night (L_{night}) (23:00-07:00). Additionally, calculations were made within the time periods LD (07:00-22:00) for daytime and LN (22:00-07:00) for nighttime available in EU regulations. Therefore, the calculation results are shown in tables as L_{day}, $L_{evening}$, L_{night}, LD and LN.

Calculations and noise maps for each of the time intervals are shown in the report.

In the modeling, the ground absorption coefficient (G) factor was taken as 0.6 and all shielding, topography, distance propagation factors were assessed.

4.3 Assessment of IFC (International Finance Corporation)

IFC noise criteria are defined in document named General Environmental Health and Safety (EHS) Guidance – Noise. These limit values have been determined on the basis of the Guidelines of the World Health Organization and are given in Table 4.3.1.

Table 4.3.1 IFC Noise Limit Values

Receiving Environment	Hourly L_{Aeq} (dBA)	
	Day 07:00 — 22:00	Night 22:00 — 07:00
Residential, institutional and educational areas	55	45
Industrial, commercial areas	70	70

In the EU Environmental Noise Directive, limit values are not specified, and it is recommended that member countries determine these standards on a national basis. Member States are expected to use L_{den} and L_{night} noise indicators according to this directive for the assessment of environmental noise.

Significance Level Criteria

The significance level of the impacts on noise is determined as high, medium and low depending on the sensitivity of the receptors and the level of the impact. The magnitude of the impacts on noise is determined by the criteria described in Chapter 4 ("ESIA Methodology"), and the sensitivity criteria within the scope of impact assessment are given in Table 3.2.

Table 4.3.2. Sensitivity Criteria of Receivers

Ecosystem Component	Sensitivity Level		
	High(3)	Moderate (2)	Low (1)
Humans	Education, culture and health areas as well as summer, camping areas and residential areas.	Areas where commercial buildings and workplaces are densely located and where residences are not concentrated	Industrial areas

The magnitude of the impacts was determined on the basis of the increase in the noise levels of the motorway, the construction site and the nearby settlements during the construction period due to the realization of the project. The magnitudes of the impacts are

defined as low, medium and high for increases in baseline noise levels of 3-6 dB (A), 6-9 dB (A) and more than 9 dB (A), respectively (Table 4.3.3).

Additionally, regardless of the baseline levels, the impact level was considered high when the results of the model study exceeded the limit value in the relevant legislation.
According to IFC requirements, the noise levels should not exceed the limit values or cause an increase in the background noise levels of the nearest off-site receiving environment by more than 3-6 dB (A). Therefore, an increase of 3 - 6 dB (A) in the noise level was considered acceptable and its impact was defined as negligible.

Table 4.4.3 Impact Level Criteria

Impact Level	Increase in the Noise Levels of the Current Situation (L_{den} dBA)
Low	3-6 dB(A)
Moderate	6-9 dB(A)
High	>9 dB(A) or exceeding the limit values according to the model result

4.4 Impact Assessment

Calculated day, evening and night traffic noise levels were compared with RENC limit values (Tables 4.1) and international standards (Table 4.3.3) according to building usage type during the assessment of possible noise impacts. Additionally, the calculated construction site noise levels were compared with the limit values for construction site noises given in the regulation.

The calculated noise levels were compared with the existing background noise levels in order to decide on the necessary mitigation measures to reduce the noise levels.

5 RESULTS OF MODELING

5.1 Situation Assessment for Construction Sites:

Residential areas and sensitive usage areas were taken into account in the noise modeling and it was declared that the construction site activities would be in the daytime period (07.00 in the morning and 19.00 in the evening) and the calculations were made according to this time period. The modeling results were compared with the limit values determined in RENC and the impact level was determined in this way. The site plans of the locations where the construction site activities take place are shown in Figure 5.1.1 - Figure 5.1.5 on Google Earth. Operational noise distribution maps during construction site activities are shown in Figure 5.1.6 - Figure 5.1.17 for L_{den} (00:00-24:00) and L_{day} (07:00 to 19:00).

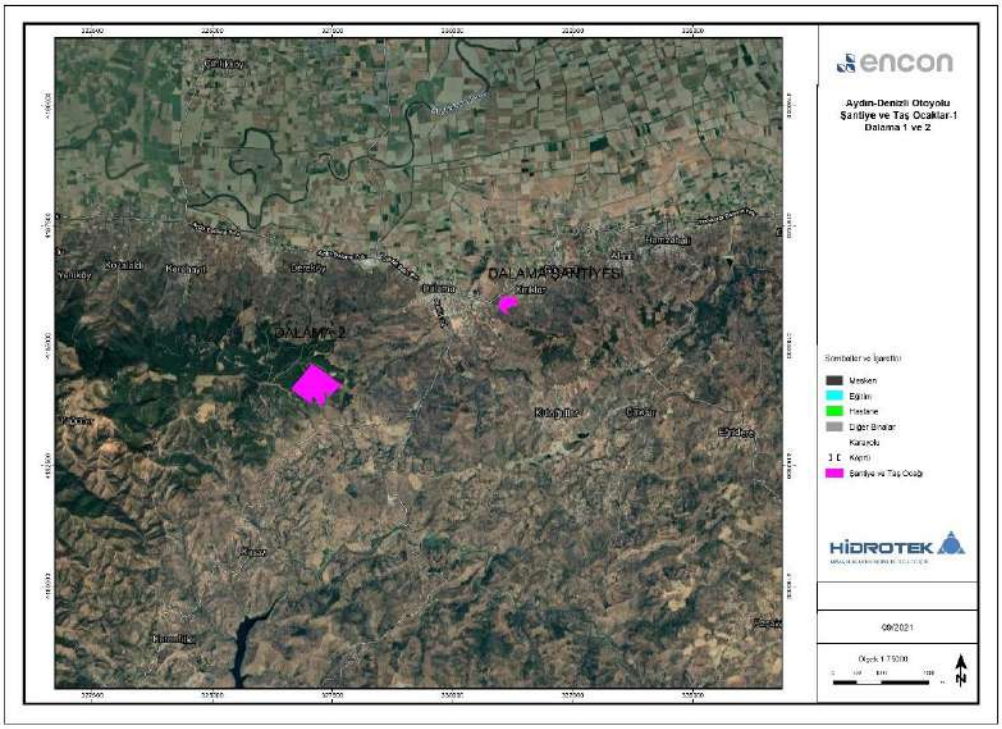


Figure 5.1.1 Dalama Quarries 2-3 and Dalama Construction Site

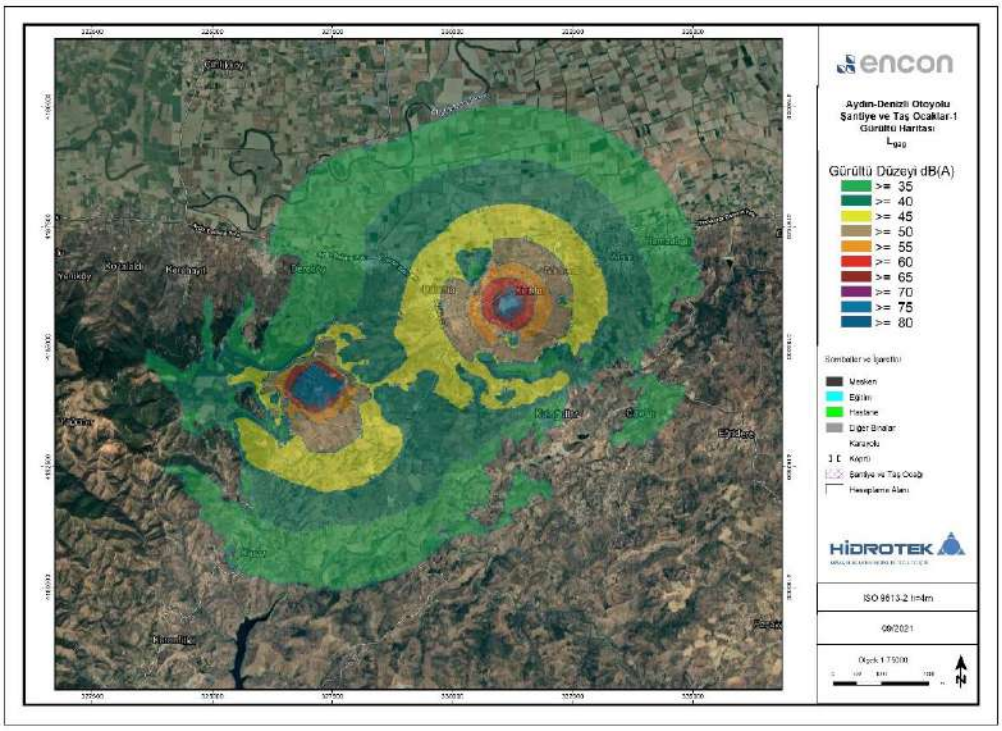


Figure 5.1.6 Dalama Quarries 2-3 and Dalama Construction Site L_{den} noise map

5.2 Situation Assessment for Construction Sites and the Construction Route of the Motorway:

Residential areas and sensitive usage areas were taken into account in the noise modeling and it was declared that the construction site activities would be in the daytime period (07.00 in the morning and 19.00 in the evening) and the calculations were made according to this time period. The modeling results were compared with the limit values determined in RENC and the impact level was determined in this way. The site plans of the construction sites and motorway construction activities are shown in Figure 5.2.1 on Google Earth. Operational noise distribution maps during construction site activities are shown in Figure 5.2.2 - Figure 5.2.3 for L_{den} (24 hour exposure) and L_{day} (between 07:00 and 19:00).

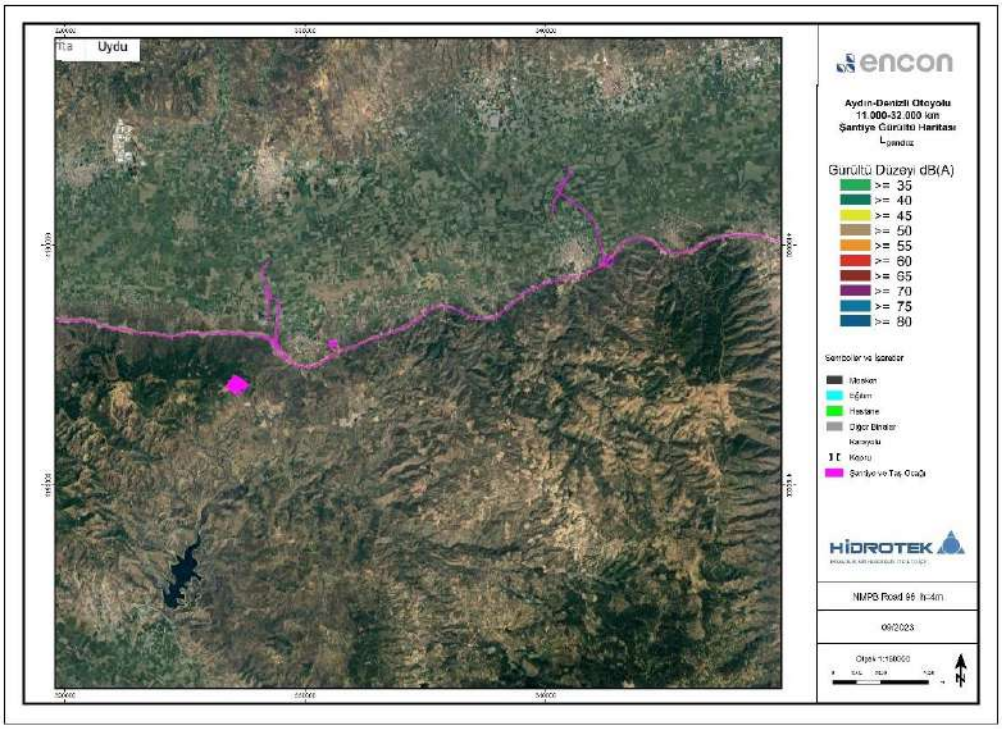


Figure 5.2.1 Construction Sites, Quarries and Motorway route

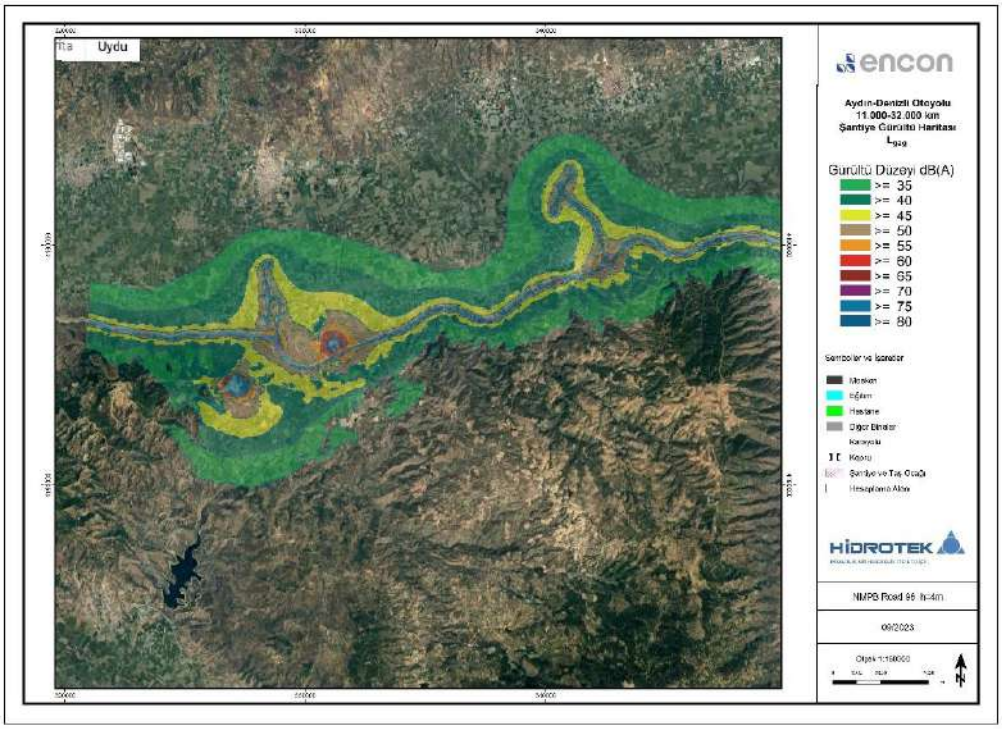


Figure 5.2.2 Construction Sites, Quarries and Motorway construction L_{den} noise map

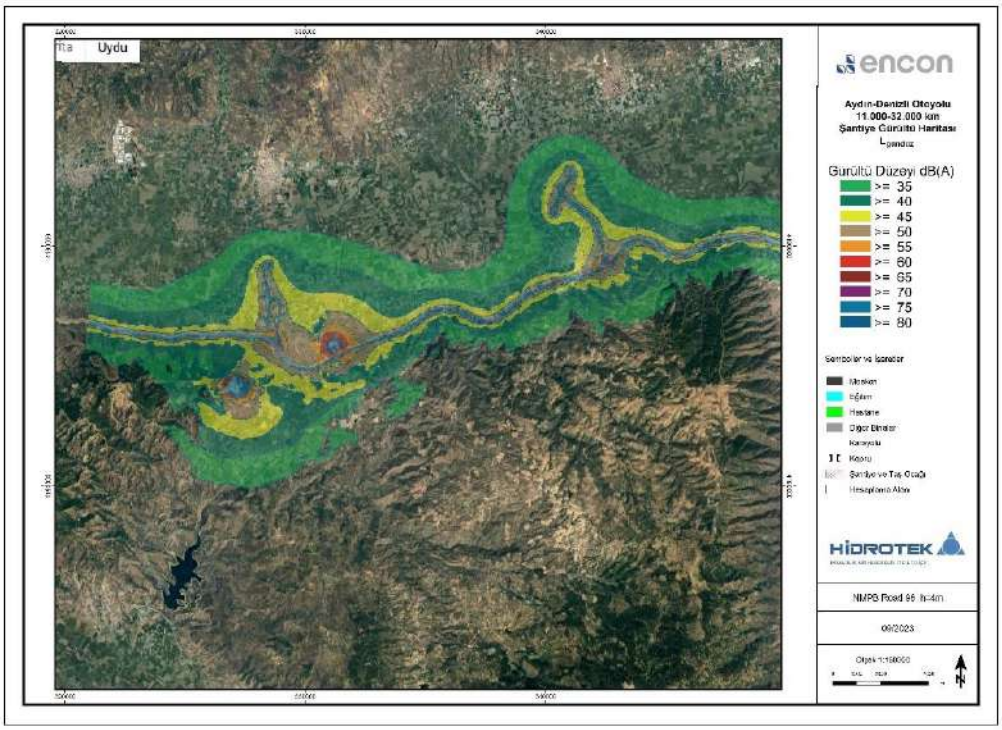


Figure 5.2.3 Construction Sites, Quarries and Motorway construction L_{day} noise map

5.3 Modeled Situation Assessment for Motorway:

In noise modeling, residential areas and sensitive usage areas are taken into account. During the modeling phase, the study area was divided into sections by making a square. Maps showing the grid sections are shown in Figure 5.3.1-Figure 5.3.4.

The modeling results were compared with the limit values determined in RENC and the impact level was determined in this way. Noise maps showing the analyzes created by modeling for the motorway are shown in Figure 5.3.7-Figure 5.3.14.

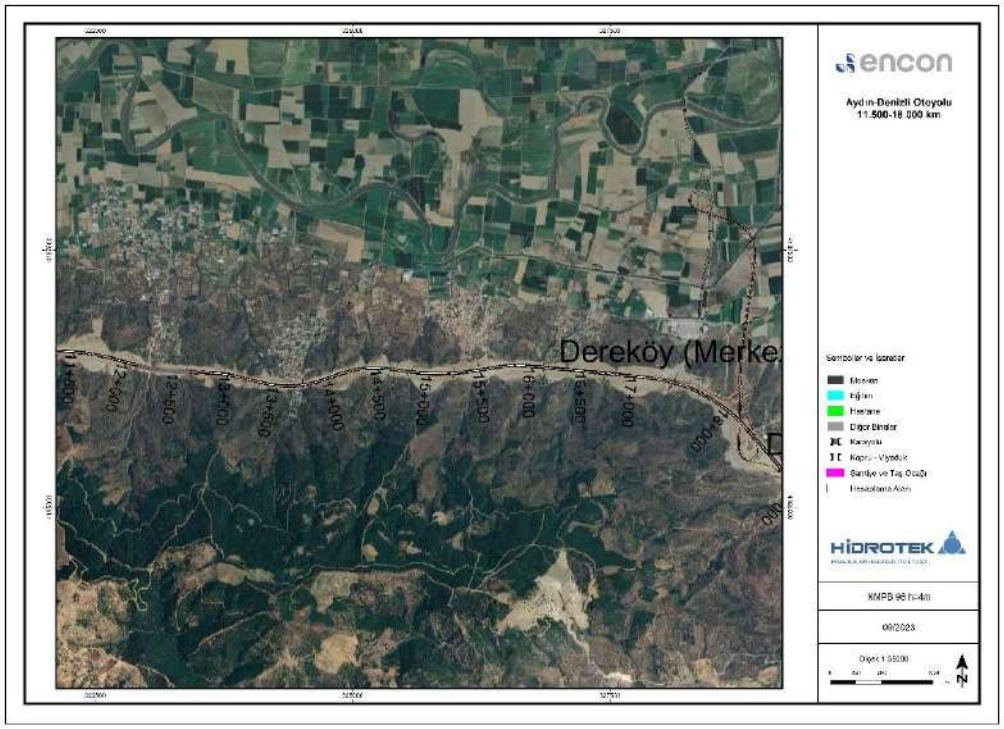


Figure 5.3.1 South Alternative noise map map section 11,5-18 km

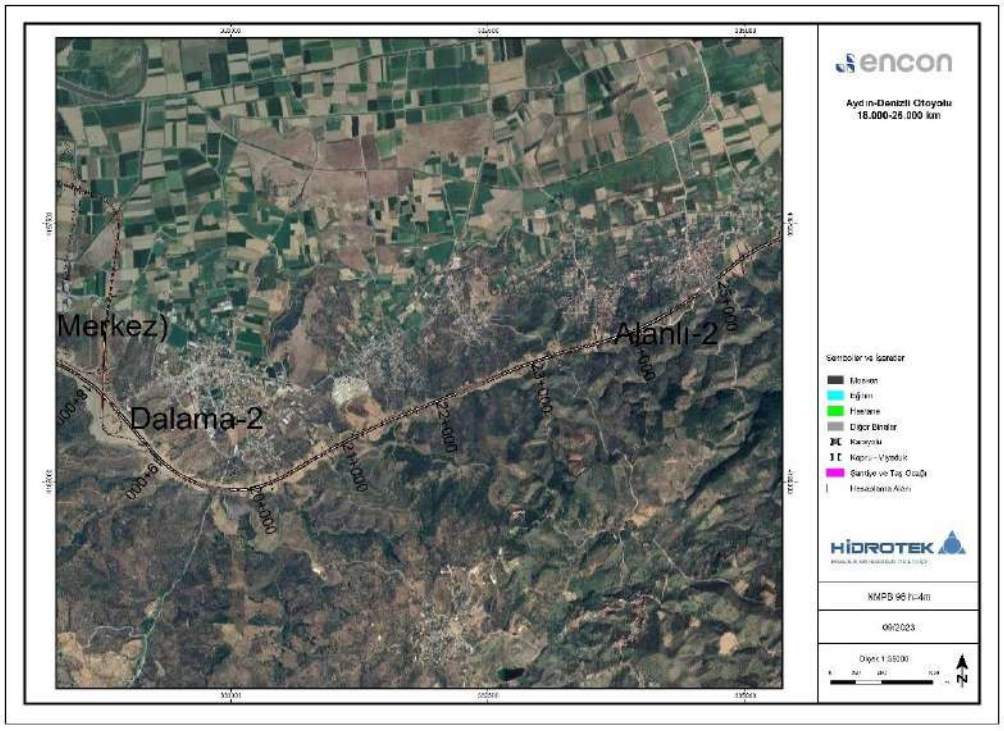


Figure 5.3.2 South Alternative noise map map section 18-25 km

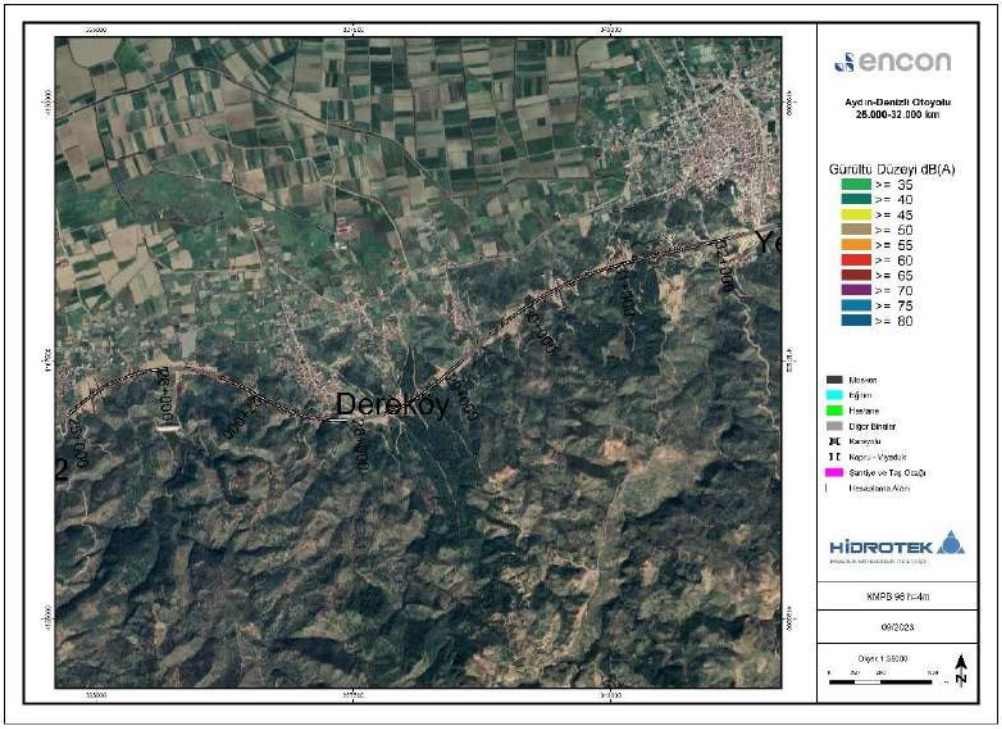


Figure 5.3.3 South Alternative noise map map section 25-32

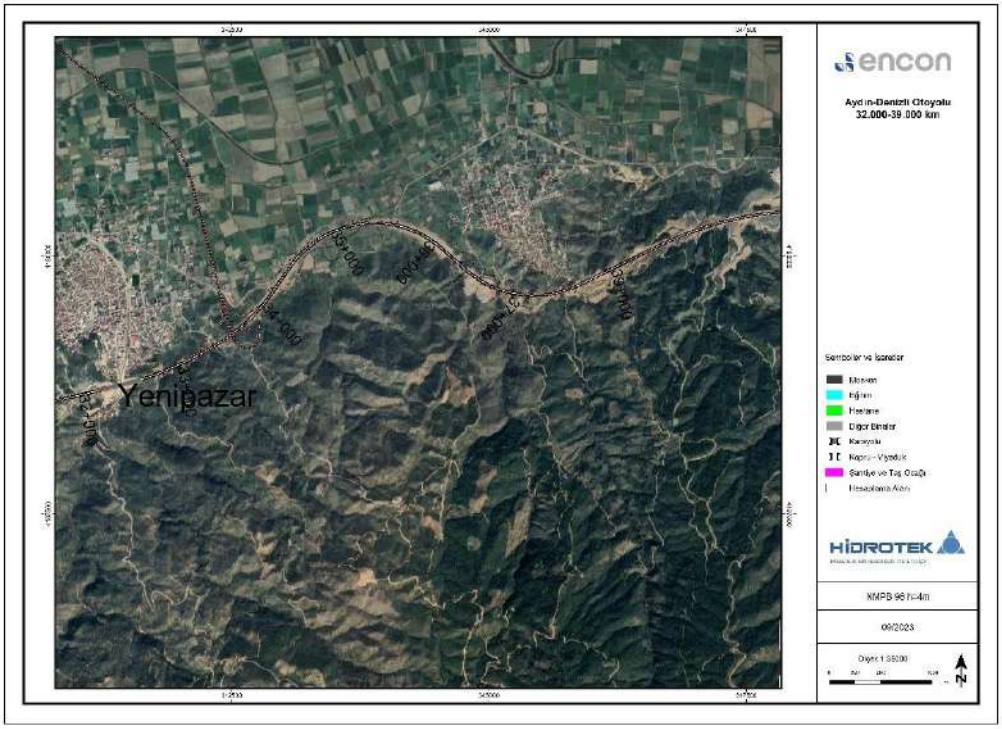


Figure 5.3.4 South Alternative noise map map section 32-39 km

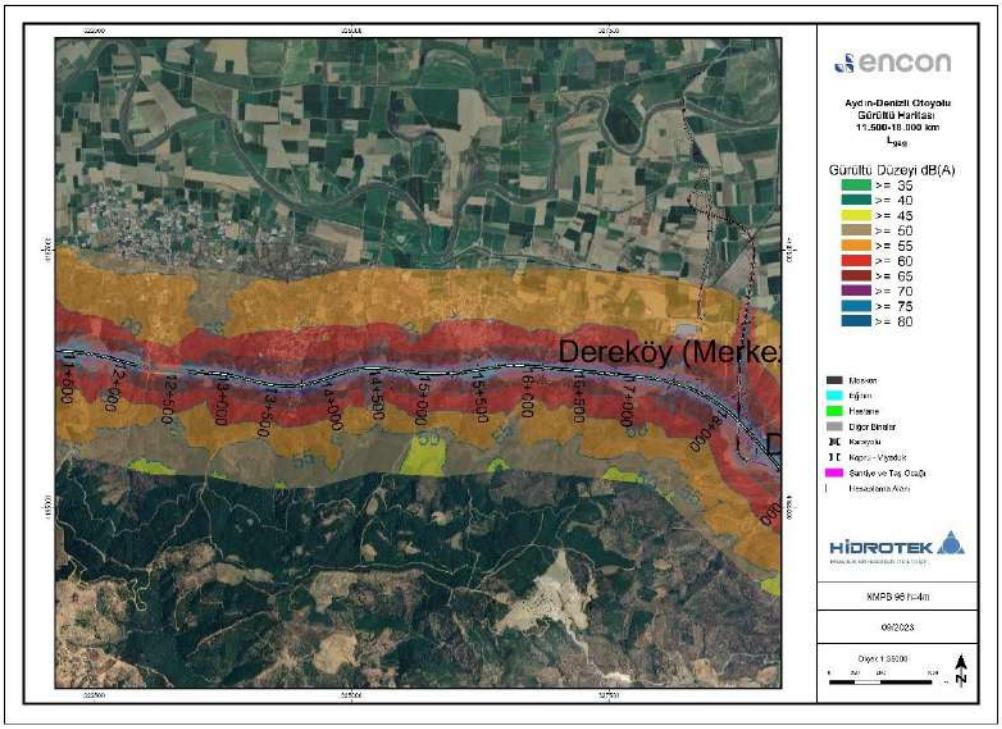


Figure 5.3.7 South Alternative noise map L_{den} map section 11-18 km

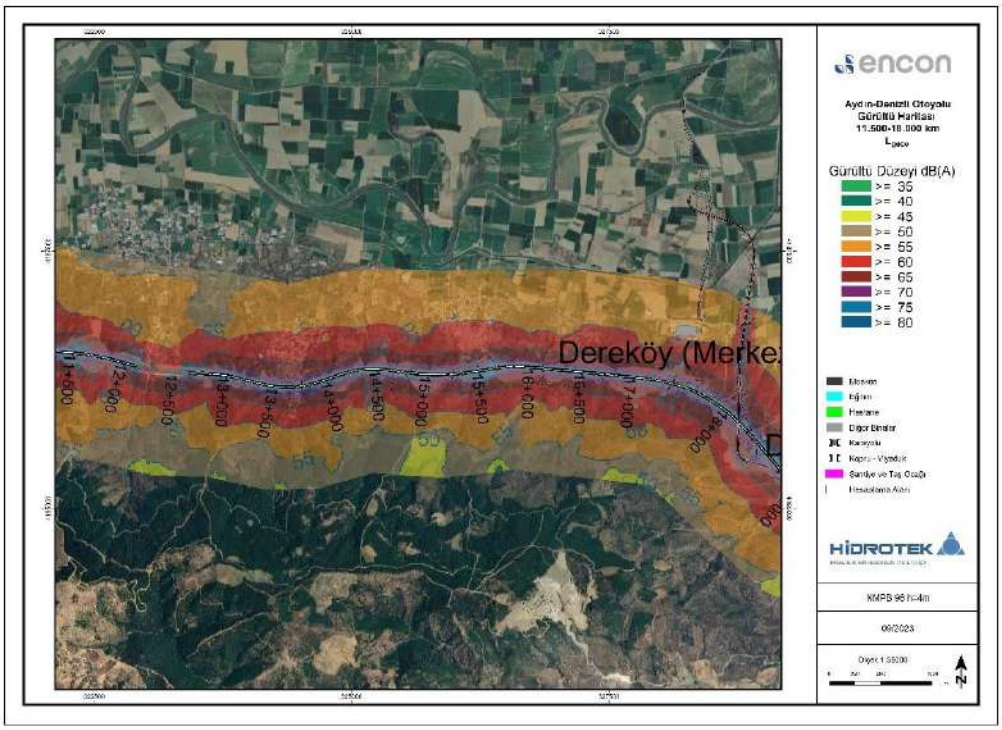


Figure 5.3.8 South Alternative noise map L_{night} map section 11-18 km

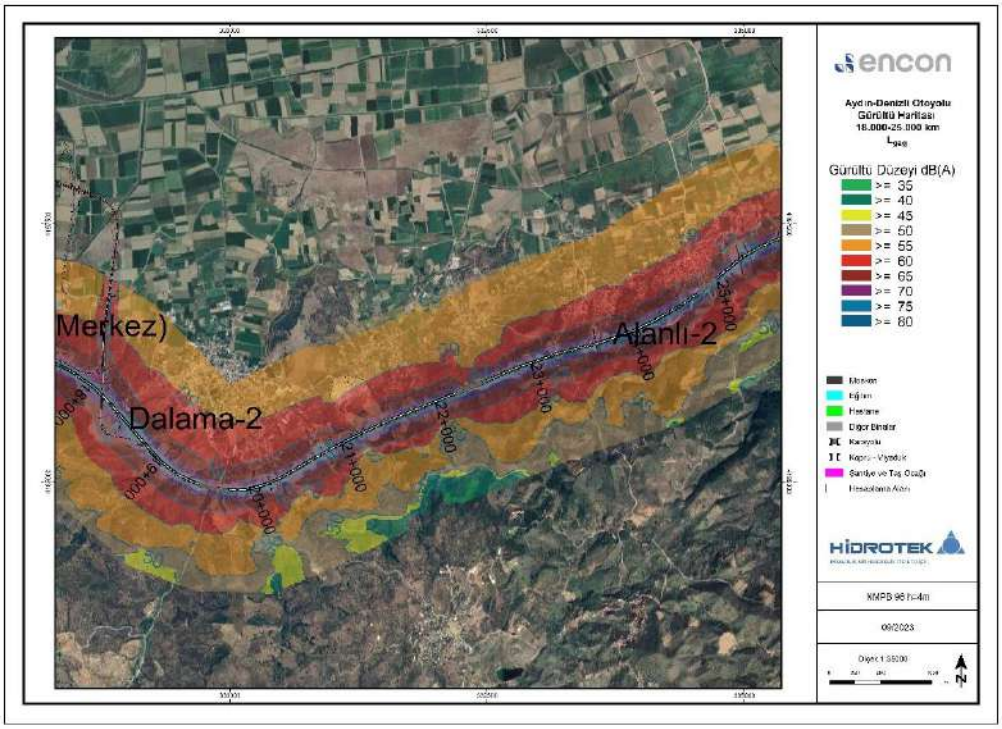


Figure 5.3.9 South Alternative noise map L_{den} map section 18-25 km

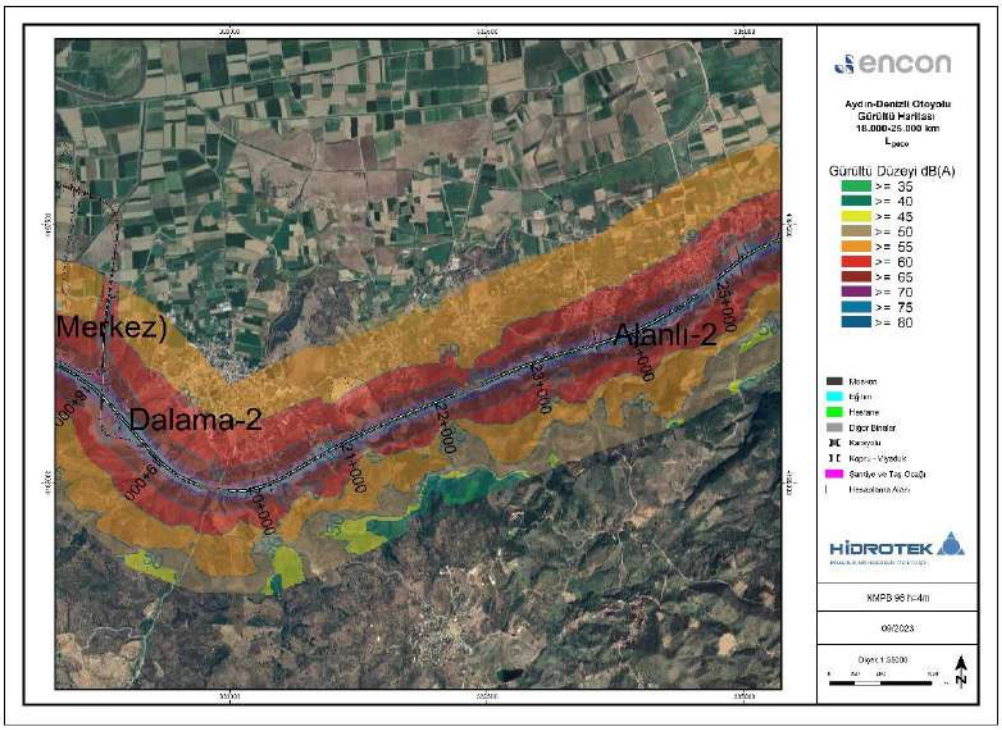


Figure 5.3.10 South Alternative noise map L_{night} map section 18-25

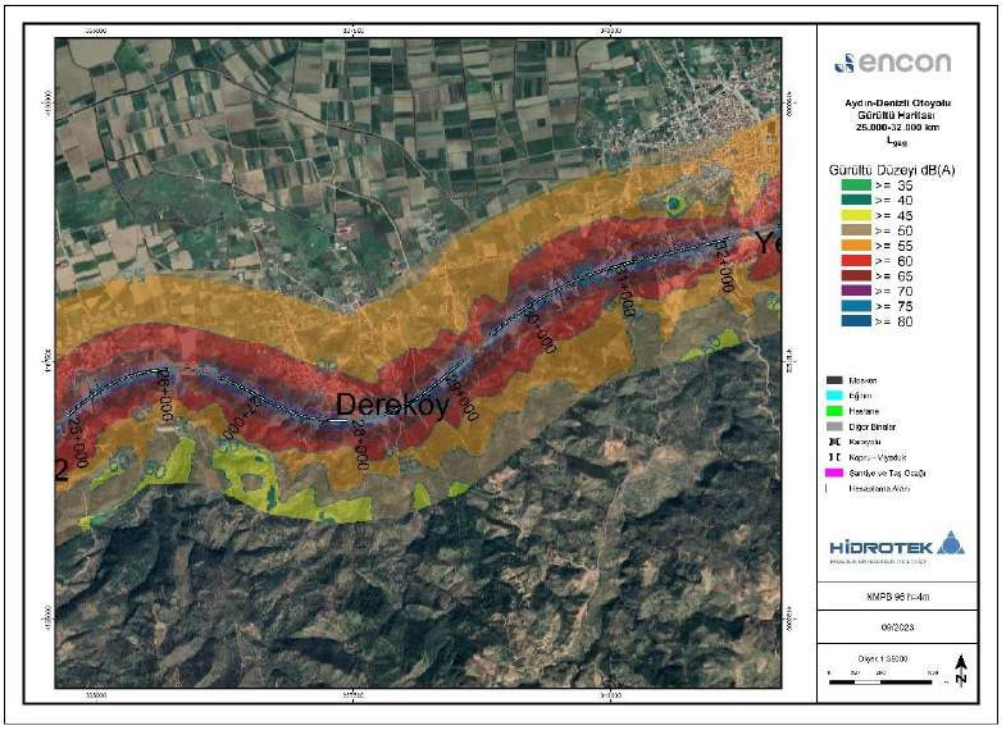


Figure 5.3.11 South Alternative noise map L_{den} map section 25-32

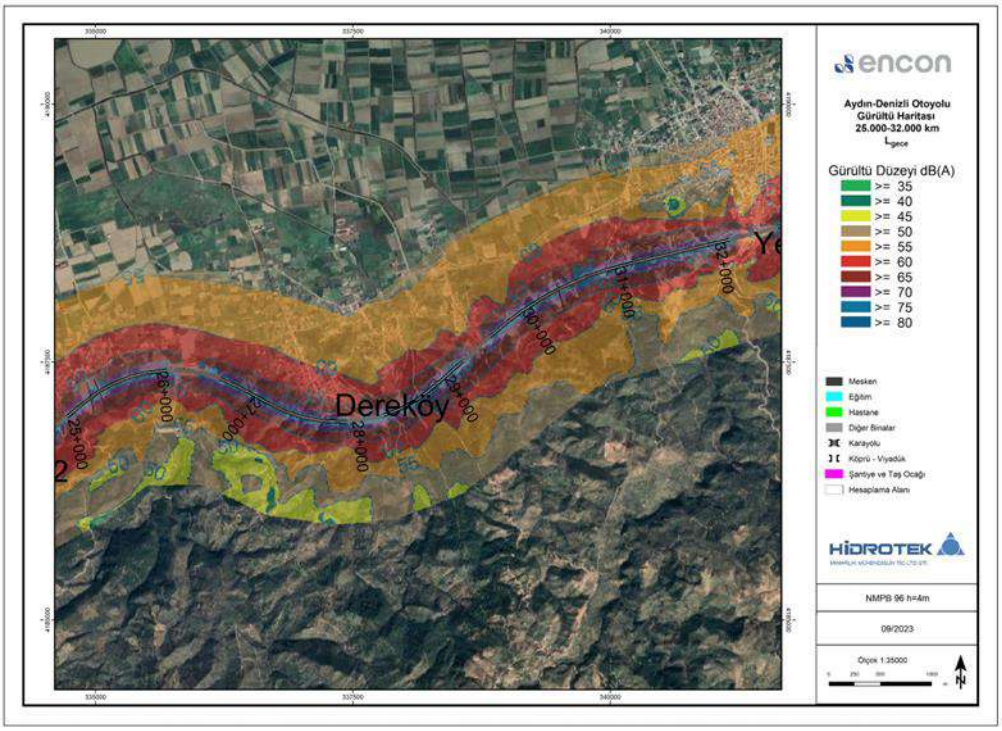


Figure 5.3.12 South Alternative noise map L_{night} map section 25-32 km

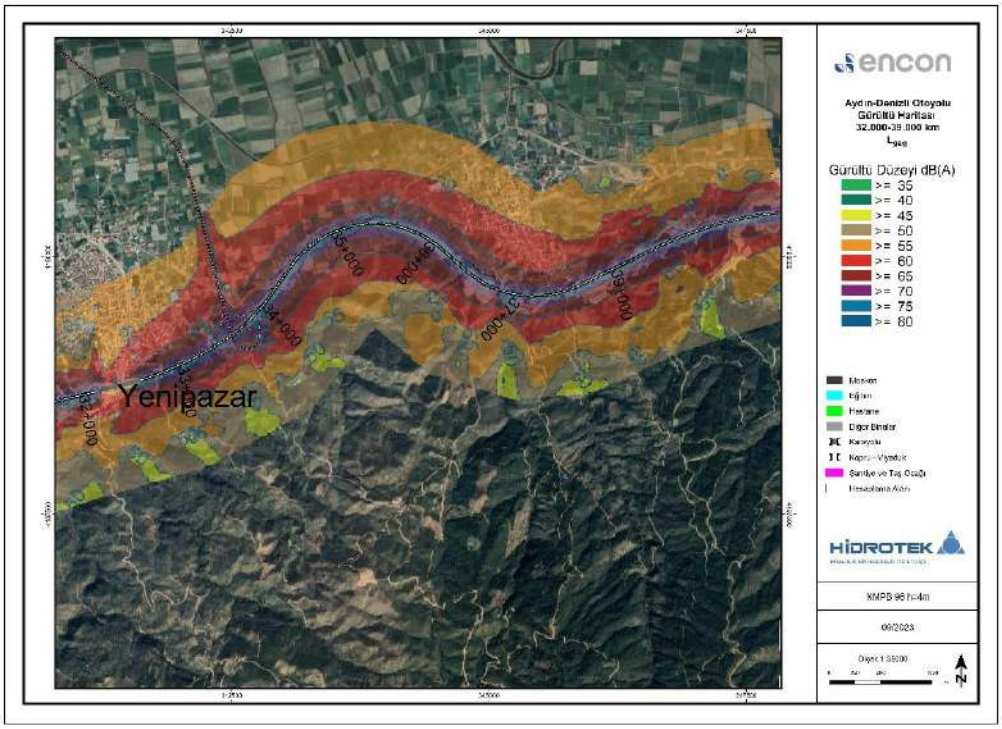


Figure 5.3.13 South Alternative noise map L_{den} 32-39 km

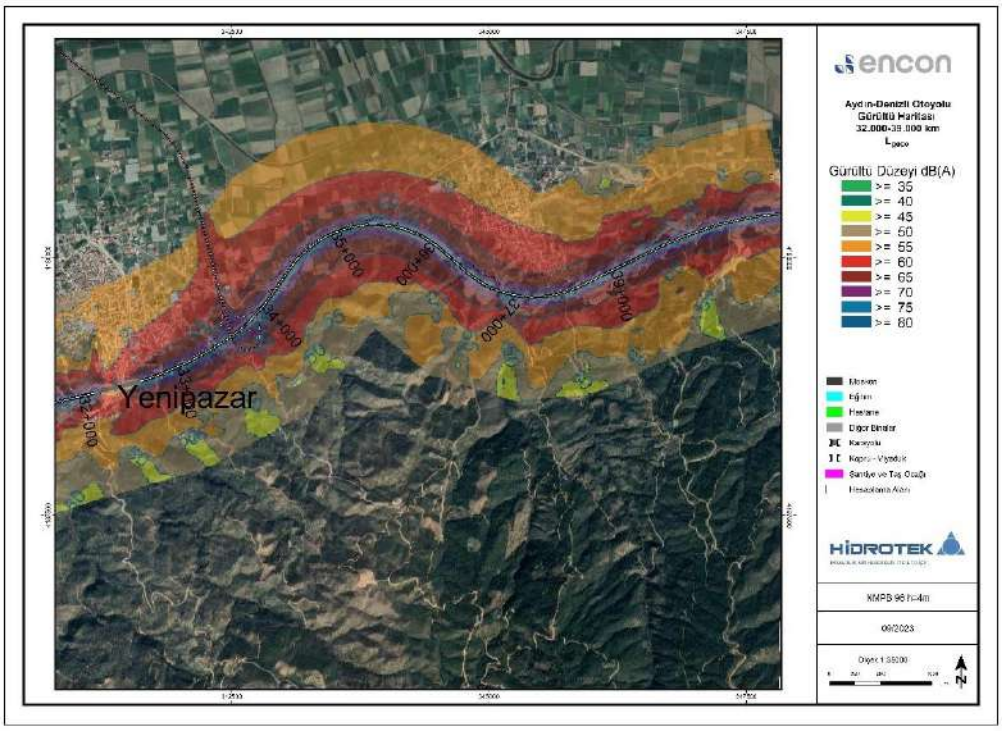


Figure 5.3.14 South Alternative noise map L_{night} map section 32-39 km

5.4 Situation Assessment

5.4.1 Construction Phase Noise Assessment

The limit values for construction site noise specified in Table 2.1 and whether or not there is a noise level that exceeds the measured background noise level by 5 dB (A) are compared in Table 5.4.1.

Table 5.4.1 Construction site noise modeling results and comparison table

	Calculated	Calculated	Measured			Measured		Difference	Difference
Location	Leq Day (07:00-19:00)	Leq Day (07:00-22:00)	Leq Day (07:00-19:00)	Leq Evening (19:00-23:00)	Leq Night (23:00-07:00)	Leq Day (07:00-22:00)	Leq Night (22:00-07:00)	Leq Day (07:00-19:00)	Leq Day (07:00-22:00)
Limit Value	65	55	65	60	55	55	45		
	dBA	dBA	dBA	dBA	dBA	dBA	dBA		
Yenipazar	59,8	58,8	50,7	50,1	44,4	50,8	44,2	9.1	8
Dereköy	50,1	49,1	46	45,3	40,4	46,1	40,1	4.1	3
Alanlı-2	52,4	51,4	51	50,3	44,7	51,1	44,6	1.4	0.3
Dalama-2	63,5	62,6	48,1	46,9	41,4	48,1	41,2	15.4	14.5
Dereköy (Centre)	49	48	51,3	50,3	44,9	51,3	44,7	-2.3	-3.3

When the table is examined, it is seen that for the measured points; the noise level does not exceed the limit value of 65 dB(A), which is the limit value defined in Table 5.4.1 in the daytime time period in the RENC and the limit value of 55 dB(A) defined in the IFC. It is understood from the difference calculations that Yenipazar and Dalama-2 are the regions where the background noise level is exceeded by 5 dB(A).

5.4.2 Operational Phase Noise Assessment

For the noise levels that will be emitted when the motorway starts operation, the limit values specified in Table 2.1.1 are compared with the measured background noise level exceeding 5 dB(A) in Table 5.4.2.

Table 5.4.2 South Alternative noise modeling results and comparison table

	Calculated			Calculated		Measured			Measured		Difference			Difference	
Location	Leq Day (07:00-19:00)	Leq Evening (19:00-23:00)	Leq Night (23:00-07:00)	Leq Day (07:00-22:00)	Leq Night (22:00-07:00)	Leq Day (07:00-19:00)	Leq Evening (19:00-23:00)	Leq Night (23:00-07:00)	Leq Day (07:00-22:00)	Leq Night (22:00-07:00)	Leq Day (07:00-19:00)	Leq Evening (19:00-23:00)	Leq Night (23:00-07:00)	Leq Day (07:00-22:00)	Leq Night (22:00-07:00)
Limit Value	65	60	55	55	45	65	60	55	55	45					
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA					
Yenipazar	53.6	55.0	51.8	53.9	52.3	50,7	50,1	44,4	50,8	44,2	2,9	4,9	7,4	3,1	8,1
Dereköy	57.4	57.9	54.1	57.5	54.7	46	45,3	40,4	46,1	40,1	11,4	12,6	13,7	11,4	14,6
Alanlı-2	59.9	61.3	58.2	60.2	58.7	51	50,3	44,7	51,1	44,6	8,9	11	13,5	9,1	14,1
Dalama-2	63.0	63.9	60.3	63.2	60.9	48,1	46,9	41,4	48,1	41,2	14,9	17	18,9	15,1	19,7
Dereköy (Centre)	54.6	55.9	52.7	54.9	53.2	51,3	50,3	44,9	51,3	44,7	3,3	5,6	7,8	3,6	8,5

When the table is examined, it is seen that the noise level of 65 dB(A),

It is seen that the noise level of 65 dB(A), which is the limit value defined in the daytime time period specified in the RENC, is not exceeded. It is understood from the difference calculations that the areas where the background noise level is exceeded by 5 dB(A) are Alanlı-2, Dalama-2 and Dereköy. It is seen that the noise level of 55 dB(A), which is the limit value specified in IFC, is exceeded in Dereköy, Alanlı-2 and Dalama-2 regions.

It is seen that the noise level of 60 dB(A), which is the limit value defined in the evening time period in the RENC, is exceeded in Alanlı-2 and Dalama-2. It is understood from the

difference calculations that the areas where the background noise level is exceeded by 5 dB(A) are Dereköy, Alanlı-2, Dalama-2 and Dereköy (Center).

It is seen that the noise level of 55 dB(A), which is the limit value defined in the night time period in the RENC, is exceeded in Dereköy, Alanlı-2 and Dalama-2. It is understood from the difference calculations that the regions where the background noise level is exceeded by 5 dB(A) are Yenipazar, Dereköy, Alanlı-2, Dalama-2 and Dereköy (Merkez). It is seen that the noise level of 45 dB(A), which is the limit value specified in IFC, is exceeded in all regions.

6 Noise Control Measures

Noise control measures accepted in the world and in our country, noise barrier or soil bench systems can be applied.

When the physical conditions are examined, it has been determined that there is no area where the bench system can be made on the motorway side. Therefore, aluminum noise barrier with high absorbency is preferred as a noise barrier (Figure 6.2.1).

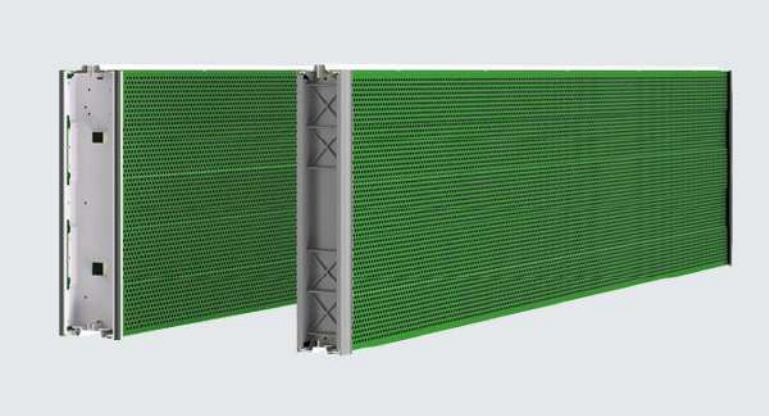


Figure 6.2.1 Absorber type aluminum noise barrier

Technical features of aluminum noise barrier;

ABSORBER TYPE NOISE BARRIER MINIMUM FEATURES:

According to EN 1793-1: Single number rating of sound absorption **$DL_\alpha \geq 19$ dB**
According to EN 1793-2: Insulation performance class **$DL_R \geq 22$ dB**

Standards for barriers to be used to reduce road-borne noise:

TS EN 14388: Traffic noise reduction devices - Technical specifications

TS EN 1793-1: Devices that reduce road traffic noise - Test method for determining acoustic performance - Section 1: Actual characteristics of sound absorption under diffuse sound field conditions

TS EN 1793-2: Traffic noise reduction systems on roads - Test method for determination of acoustic performance - Section 2: Basic properties of airborne sound insulation in uniformly distributed sound field conditions

TS EN 1793-3: Systems that reduce traffic noise on roads - Test method for determination of acoustic performance - Section 3: Normalized traffic noise spectrum

TS EN 1793-4: Traffic noise reduction systems on roads - Test method for determination of acoustic performance - Section 4: Basic properties - Values at the refraction point of sound

TS EN 1793-5: Traffic noise reduction systems on roads - Test method for determination of acoustic performance - Section 5: Basic properties - Sound reflection values in direct sound field conditions

TS EN 1793-6: Road traffic noise attenuating devices – Test methods for determining acoustic performance – Section 6: Basic properties – In situ values of airborne sound insulation directly under field conditions

TS EN 1794-1+AC: Devices that reduce road traffic noise - Non-acoustic performance - Section 1: Mechanical performance and stability requirements

TS EN 1794-2: Systems for reducing traffic noise on roads - External acoustic performance - Section 2: General safety and environmental requirements

TS EN 1794-3: Motorway traffic noise reducing devices - Non-acoustic performance - Section 3: Reaction to fire - Combustion behavior and classification of noise reducing devices

TS EN 14389-1 Traffic noise reduction systems on roads – Methods used to evaluate long-term performance Section 1: Acoustic properties

TS EN 14389-2 Traffic noise reduction systems on roads – Methods used to evaluate long-term performance Section 2: Non-acoustic properties

6.1 Noise control measures in Dalama-2 region

For this region; 1700 metres in Aydın direction, 4 metres high, highly absorbing noise barrier with technical specifications and standards specified above has been constructed. Noise barrier layout is given in Figure 6.2.2.

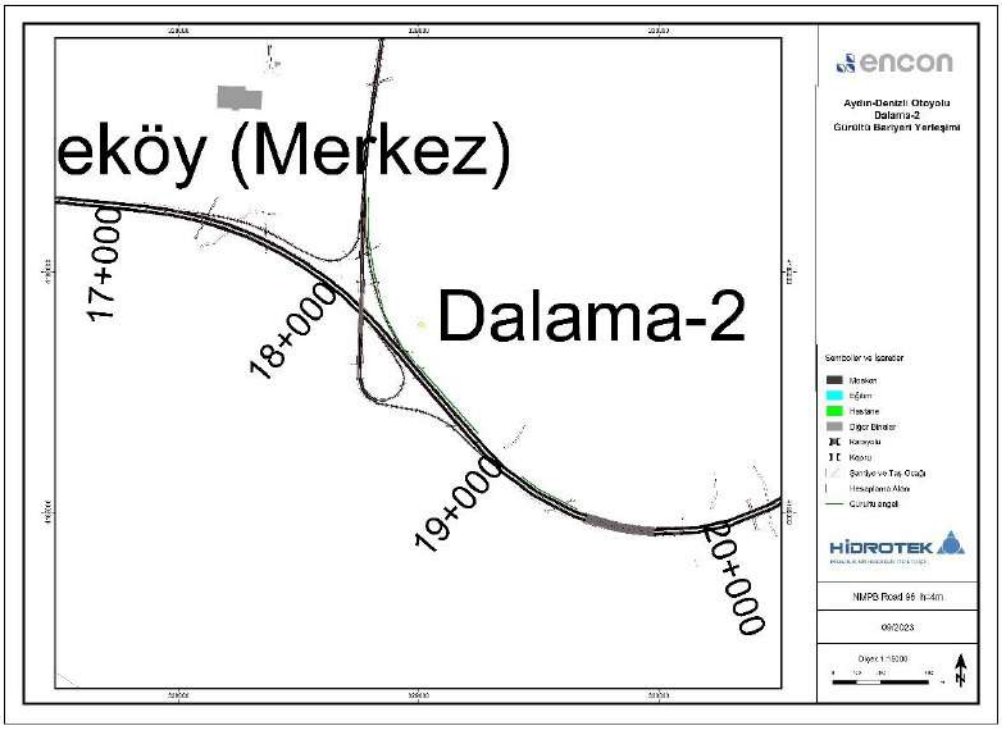


Figure 6.1.1 Dalama-2 region noise barrier layout

The noise map for the whole day time (L_{den}) period before the noise barrier application is shown in Figure 6.2.2, the night time period (L_{night}) is shown in Figure 6.2.3, and the night time interval is shown in Figure 6.2.5.

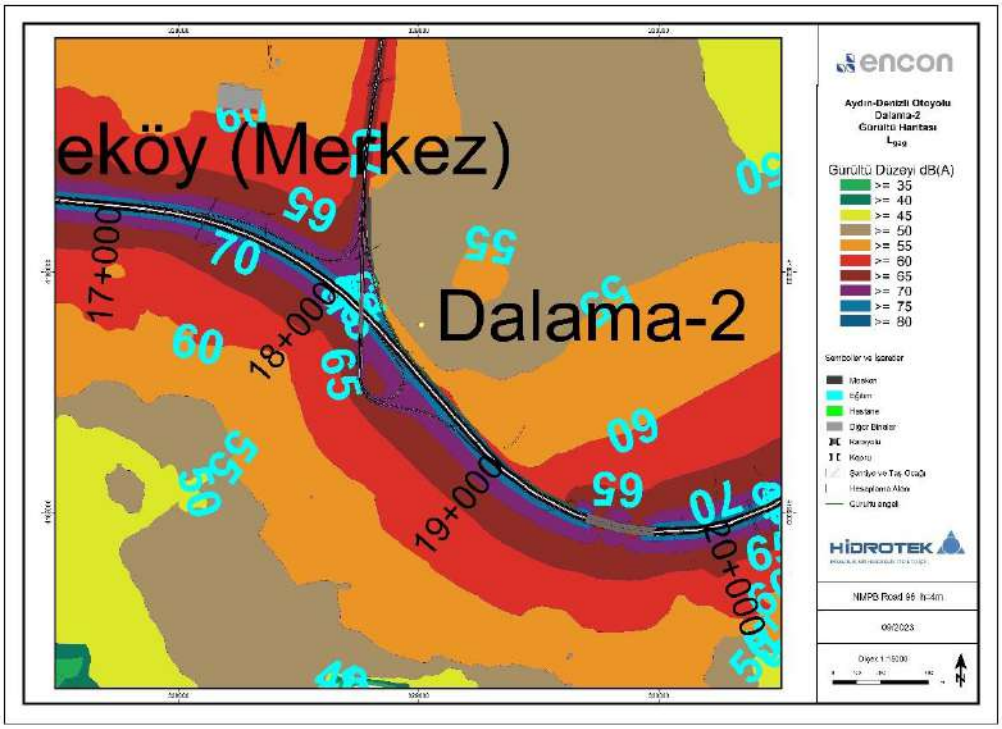


Figure 6.2.2 Dalama-2 region noise map L_{den}

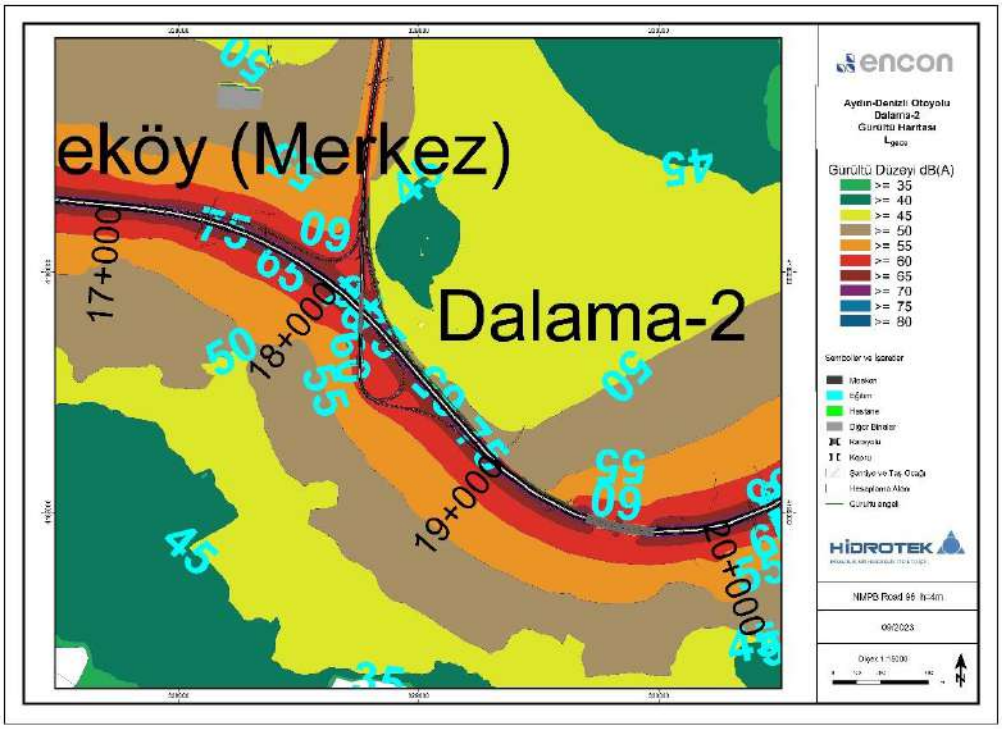


Figure 6.2.3 Dalama-2 region noise map L_{night}

It is estimated that there will be a noise level difference of 10 dB(A) for this region when a high absorption noise barrier of 1700 metres and 4 metres in height is applied in Aydın direction.

6.2 Noise control measures in Alanlı-2 region

For this region; 800 metres in Aydın direction, 4 metres high, highly absorbing noise barrier with technical specifications and standards specified above has been constructed. Noise barrier layout is given in Figure 6.2.1.

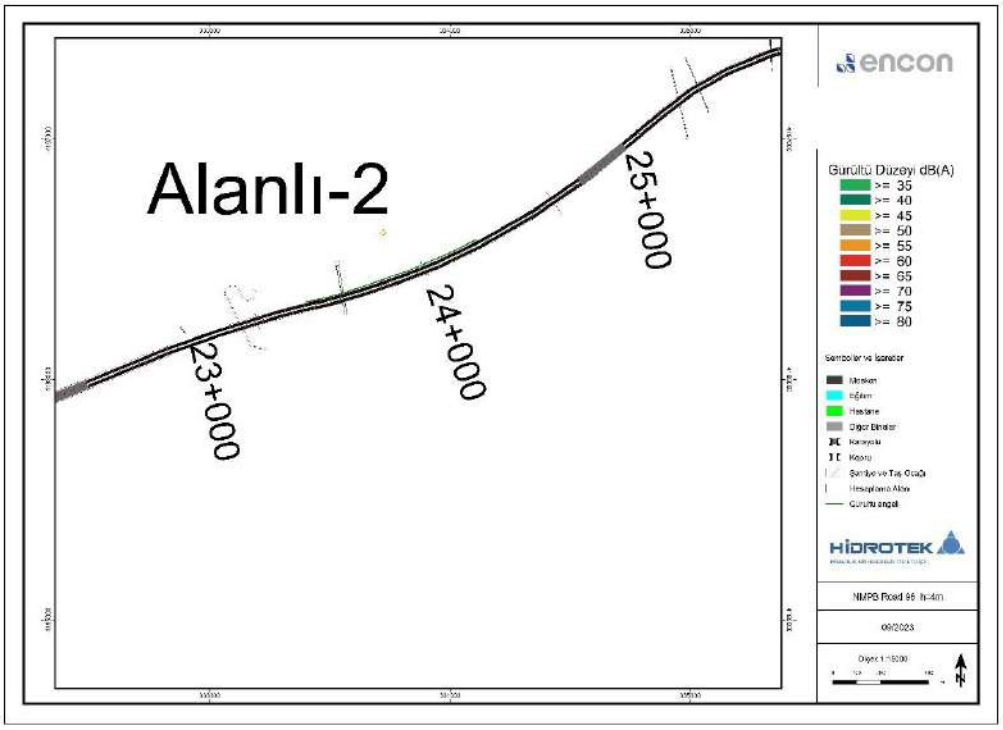


Figure 6.2.1 Alanlı-2 region noise barrier layout

The noise map for the whole day time (L_{den}) period before the noise barrier application is shown in Figure 6.2.2, the night time period (L_{night}) is shown in Figure 6.2.3, and the night time interval is shown in Figure 6.2.5.

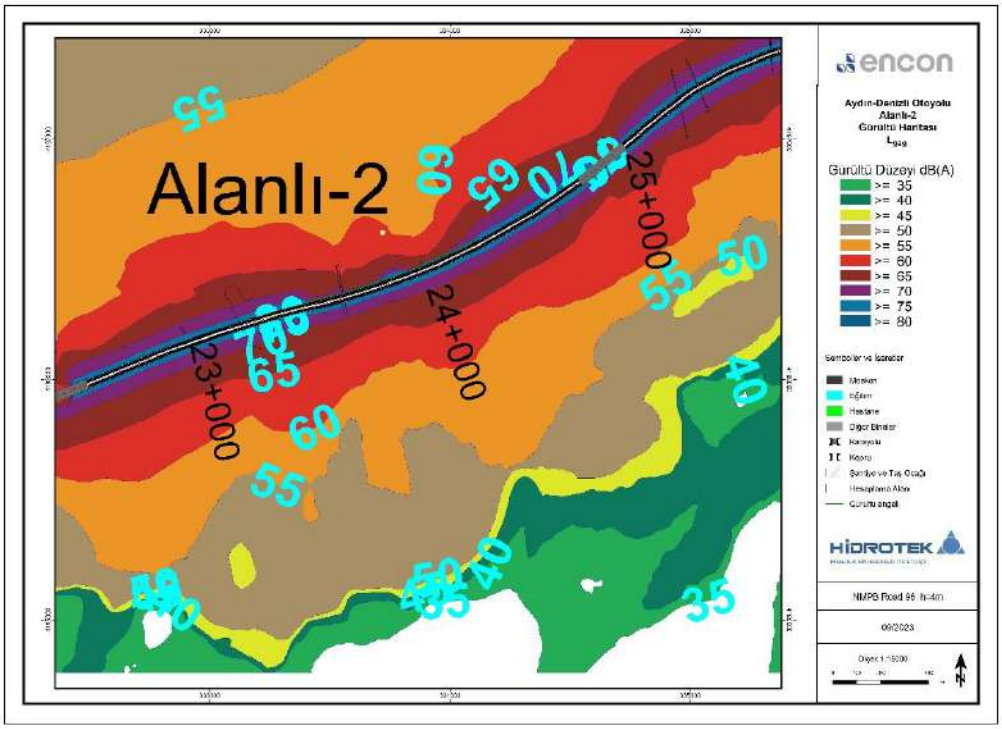


Figure 6.2.2 Alanlı-2 region noise map L_{den}

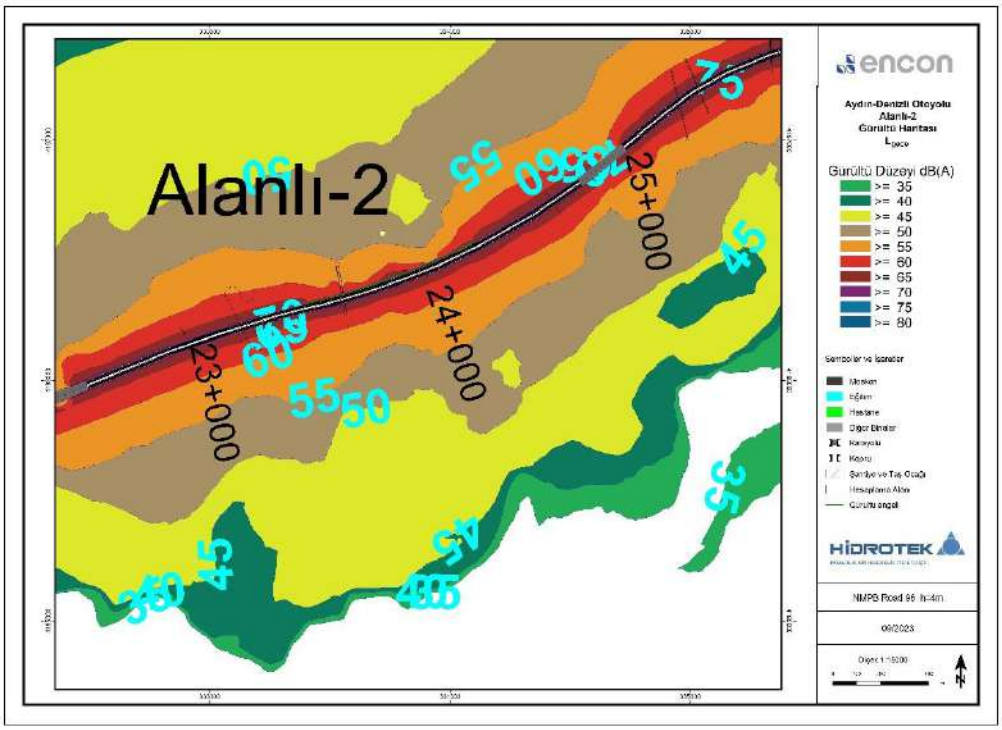


Figure 6.2.3 Alanlı-2 region noise map L_{night}

It is estimated that there will be a noise level difference of 10 dB(A) for this region when a high absorption noise barrier of 800 metres and 4 metres in height is applied in Aydın direction.

7 RESULTS

The noise emission impacts of the South Alternative Project were assessed using the SoundPLAN V 9.0 (64 bit) program within the scope of the RENC and IFC-. The traffic data for the year 2034, which is predicted, were used for noise level estimations. The existing noise levels were measured at 5 points where the motorway route and construction site are located, and the noise levels that may occur were calculated by assigning a virtual receiver for these points. During the construction site activities and motorway construction phase, limit values are not exceeded according to the legislation. It has been calculated that there will be an excess of the motorway-related limit value in the two regions during the commissioning of the motorway and in the following period. Noise barriers have been proposed for Dalama-2 and Alanlı-2 and are explained in Sections 6.1 and 6.2.

7.1 Recommendations for the Action Plan

Based on the modeling results, afforestation is envisaged in the region in order to keep the noise levels within the limit values.

Some conditions must be met in order for afforestation to be used for noise reduction. In the area where afforestation will be made, trees should be planted at least 30 metres wide from the motorway, evergreen and dense. In order for the selected tree type to have an impact on noise reduction, its leaves must be from the absorber type tree category.

As another action planning, it is envisaged to make an elevation application with soil embankments. Soil embankments are an artificial retaining application created by applying elevation above the natural piles. The said application can be made with wood/concrete pieces, steel nets or woven grasses into which tree saplings can be planted. Soil embankments provide the road environment to have a visually aesthetic structure with flowering works.

In places where there is not enough free space, noise barrier can be applied. For the implementation of noise barrier and other measures, background noise measurements should be made in sensitive receptors during the construction and operation phases, and in cases where the results exceed the environmental noise limit values, these practices should be carried out.

All traffic values used in the ADM modeling are calculated according to the number of vehicles assumed to use the motorway in 2034. In this respect, it is recommended that the measurement, assessment and measure-taking (implementation) processes be decided by monitoring.

Ali AKDAĞ
Acoustic Expert

Descriptions:

L_{gag}	:	L_{den}	00:00-24:00	day average (gündüz -akşam gece / day-evening night)
$L_{gündüz}$	:	L_{d}	07:00-19:00	gündüz - day
$L_{akşam}$	:	L_{e}	19:00-23:00	akşam -evening
L_{gece}	:	L_{n}	23:00-07:00	gece-night

ANNEX–9

STAKEHOLDER ENGAGEMENT PLAN (SEP)

Annex-9 STAKEHOLDER ENGAGEMENT PLAN

1. INTRODUCTION

This Stakeholder Engagement Plan ("the Plan" or "SEP") has been prepared by ENCON Environmental Consultancy Co. (Consultant) for the South Alternative, the redesigned part of the Aydın-Denizli Motorway Project ("ADMP").

Stakeholder Engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts. The purpose of stakeholder engagement is to establish and maintain a constructive relationship with a variety of external stakeholders over the entire life of the project. Initiating the engagement process in the early phases of the project helps ensure timely public access to all relevant information and provides the stakeholders with an opportunity to input into the project design and the assessment of impacts.

1.1. Purpose and the Scope of the Stakeholder Engagement Plan

The SEP is a public document which presents plans for stakeholder engagement, information disclosure and consultation. This Plan is valid for the both construction and operation phase of the South Alternative.

SEP covers the following aspects:

- Applicable national and international regulations and IFC requirements on stakeholder engagement, particularly IFC PS1;
- Project plans to engage with stakeholders during the operation phase of the Project;
- Key Project stakeholders that will be identified and will be interacted with;
- Strategy for consultation and information disclosure;
- Timetable for various stakeholder engagement activities;
- Resources and responsibilities for the implementation of the SEP;
- Means of monitoring and reporting on consultation and disclosure activities; and
- A grievance mechanism for stakeholders and the public to raise concerns, provide feedback and comments about the Project operations and how complaints/comments will be handled.

The main goal of this SEP is to ensure that project-affected people and other stakeholders are provided relevant, timely and accessible information so that they have an opportunity to express their views and concerns about the project and its impacts. Stakeholder engagement process helps to:

- Identify the stakeholders that are affected, and/or able to influence the project and its activities;
- Identify their particular interests and requirements related to the project;
- Generate a good understanding of the project among those that will be affected;
- Identify issues early in the project cycle that may pose risks to the project or its stakeholders;
- Provide to these groups opportunities to voice their concerns and opinions;
- Define a consultation approach for stakeholders in relation to operation of the project;
- Ensure that comments are received in a timely manner so that they can be taken into account during the decision-making process;
- Ensure that mitigation measures are appropriate (implementable, effective and efficient);
- Ensure that adequate and timely information is provided to those potentially affected by a project;
- Establish a system for long-term communication between the project and communities that is of benefit to all parties.
- Identify resources and responsibilities for implementation and monitoring of the consultation program; and
- Set up a grievance mechanism for the stakeholders, including a process to address views and concerns.

The ultimate purpose of this SEP is to establish and maintain constructive relationships with the local community and other interested stakeholders that are essential for the successful management of the project's environmental and social impacts. The SEP is the responsibility of Project Sponsor and Project Sponsor is fully committed to undertaking necessary engagement activities in a manner that is consistent with international standards and national legislation as outlined in next sections.

The SEP encompasses planned stakeholder consultation activities and the process of stakeholder engagement. The SEP is prepared in compliance with IFC Performance Standards and international requirements and best practices, in addition to Turkish legislation.

2. PROJECT DESCRIPTION

According to the current design, total length of the South Alternative, including the main carriageway and the access roads, is 26 km.

Aydın-Denizli Motorway Project ("ADMP"), which is a continuation of the previously completed İzmir-Aydın Motorway, is designed to connect Aydın and Denizli provinces of the Aegean Region of Türkiye. At the construction phase of the ADMP, General Directorate of Highways ("KGM"), as the owner of the project, has submitted an order for a design change of the main carriageway between Km 15+856 and 34+630 in Section 1 ("South Alternative"). Thus, project description will be done in the scope of said section of the project, and the project information given in this Plan, and the assessments to be done in the following sections, has been prepared based on the current design as of the preparation period of this report. It should be noted that in case of any design change during and after the Supplementary ESIA study has been completed, the project would be managed in the scope of Environmental and Social Management System ("ESMS") by means of Change Management Procedure.

Table 1 The Actual Design of the Section that Formed the Basis of Assessments

Section	Name	Location		Length (Km)		
		Start	End	Main Road	Access Road	TOTAL
Section 1	South Alternative	Km 15+856	Km 34+630	18.774	7.242	26.016

Ministry of Transportation and Infrastructure (MoTI), General Directorate of Highways ("KGM" or "the Administration"), as the owner of the Aydın-Denizli Motorway Project, has tendered for a contract in July, 2020 in accordance with the Law on Implementation of Some of the Investments and Services in the Framework of Build, Operate and Transfer Model (Law No: 3996). As a result of this tender, KGM has commissioned a special purpose entity (SPV) for the implementation of the Project under the related Build, Operate and Transfer (BOT) contract. In this regard, Fernas Group of Companies (Fernas Otoyol Işletmesi A.Ş. - FOIAS) has been awarded with a BOT Contract for the implementation of the Project.

In accordance with the terms of the BOT Contract signed between the KGM and the Project Sponsor, the ADMP includes, financing, planning, design, construction, operation, full range of maintenance and repair works including landscape activities during the operation period.

According to the BOT Contract, contract duration covers both the construction and operation phases. Construction period is 3 years after the effective date of the contract and the operation period is 17 years, within the total of 20 years of contract duration. If the construction period exceeds 3 years, the delay time will be deducted from the operation period. If the construction of the motorway is completed before the end of foreseen construction period, the remaining time will be added to operation period.

The Project Sponsor will transfer the motorway to the KGM at the end of the contract duration, free from any debt or commitment and in a well-maintained, operating condition, without any charge. Thus, the rights of the Project Sponsor to operate maintain, and repair the motorway will expire at the end of the contract duration.

As the South Alternative is a part of and within the scope of the ADMP, the conditions and/or the terms of the main contract will also be valid for this section. If any change is done about the conditions and/or the terms of contract related to the South Alternative, the actual status will be notified to the relevant parties by the Project Sponsor. Figure 1 presents the general layout of the project.

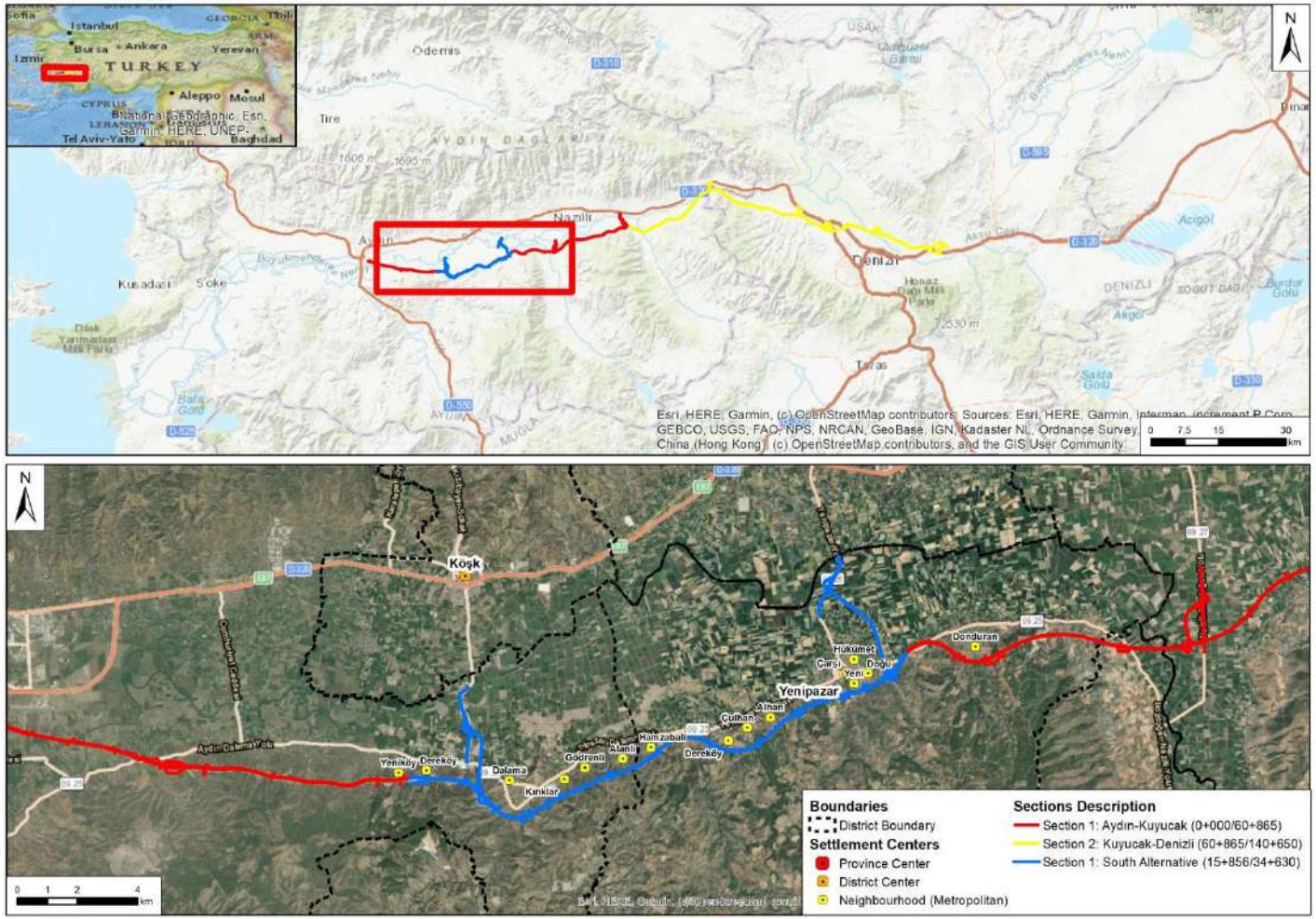


Figure 1 General Layout of the South Alternative

3. PUBLIC CONSULTATION/STAKEHOLDER ENGAGEMENT REQUIREMENTS

Implementation of the project will follow the framework laws and regulations of the Turkish Republic as well as applicable international standard, IFC requirements. In this context, stakeholder engagement activities will conform to relevant IFC Performance Standards (i.e., IFC PS1) Equator Principles IV (EPFI 5 Stakeholder Engagement, Principle 6 Grievance Mechanism and EU Directives.

3.1 National Regulations and Requirements

Environmental Law, which is ratified in August 1983, is one of the principal legislations related to the Project. Several by-laws and decrees are enforced under the Environmental Law. The repealed Environmental Impact Assessment Regulation (Official Gazette date: November 25, 2014, Number: 29186) defines the administrative and technical procedures and principles to be followed throughout the Environmental Impact Assessment (EIA) process. When an activity (a Project) is planned, the Project developer is responsible for preparing an EIA report along with many other permits required to realize the Project. However, facilities are subject to the preparation of an EIA Report depending on the type of the facility, its capacity, or the location of the activity. The activities that are subject to the provisions of the Environmental Impact Assessment Regulation are listed in Annex I and Annex II of the Regulation. For Annex I activities a full EIA report is required and those Projects go through the full EIA process. Since the project is included in the Annex 1 list of the Turkish EIA legislation, the required EIA report was completed in January 2017 and approved by the Ministry of Environment, Urbanization and Climate Change (MoEUCC) on February 2017. EIA report is still valid as per the new EIA Regulation published in the Official Gazette dated July 29, 2022 and numbered 31907.

The main Turkish Regulation requiring public consultation and stakeholder engagement for development/investment/infrastructure projects is the Environmental Impact Assessment Regulation. The 1st Clause of the 9th Article of the Turkish EIA Regulation defines the stakeholder participation process. In accordance with the related article, it is the legal responsibility of a project owner to organize an official Public Participation Meeting for the Projects that are included in Annex 1 of the Regulation (as the case in the EU EIA Directive).

As a result, Project Sponsor aims to develop a communication plan to inform relevant stakeholders about the project activities in operation phase in line with this SEP.

Turkish national policy on protection of environment, cultural heritage and conservation of biological resources has been constituted on the base of relevant international agreements that Türkiye has signed or ratified.

3.2 International Requirements and Best Practices

International financial institutions follow certain policies and procedures regarding assessment and management of environmental and social impacts of the projects to be financed. The relevant environmental and social requirements of these institutions are mainly based on World Bank Group (WBG) Safeguard Policies. For the private sector financing, WBG/International Finance Corporation's (IFC) Environmental Health and Safety Guidelines and Performance Standards on Environmental and Social Sustainability have become the one of the most important international requirements. These standards have also been adopted by the major international private banks through the so called Equator Principles (EPs). These principles aim to ensure that projects to be financed by these banks are developed in a socially and environmentally sound manner.

The project is intended to meet applicable international standards and best practices of the International Finance Institutions (IFIs). IFIs consider community engagement as being central to the successful management of risks and impacts on communities affected by projects, as well as central to achieving enhanced community benefits. In this context, SEP follows the requirements of EU directives, IFC PS1 and EPFI Principle 5 and EPFI Principle 6. The IFC PS1 Assessment and Management of Environmental and Social Risks and Impacts covers public consultation and disclosure and, in this respect, required consultation and disclosure activities have to be conducted taking the scale and nature of the project into account covering the following:

- Identifying the range of stakeholders;
- Providing affected communities with access to relevant project information;
- Implementing and maintaining a grievance mechanism; and
- Engaging with and providing information to project-affected and other interested parties throughout the life-cycle of the project.

3.2.1 Related Equator Principles IV

Principle 5: Stakeholder Engagement

For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.

Principle 6: Grievance Mechanism

For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the Environmental and Social Management System, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user.

3.2.2 IFC's Standards and Guidelines

IFC published its current Policy on Environmental and Social Sustainability in 2012. Within the framework of this Policy, it applies a comprehensive set of Performance Standards to manage social and environmental risks and impacts and to enhance development opportunities in its private sector financing in the member countries eligible for financing. The Performance Standards may also be applied by other financial institutions electing to apply them to projects in emerging markets.

The following eight Performance Standards establish the requirements that the client has to meet throughout the life of an investment supported by IFC or other relevant financial institution using these Standards:

PS 1: Assessment and Management of Environmental and Social Risks and Impacts
PS 2: Labor and Working Conditions
PS 3: Resource Efficiency and Pollution Prevention
PS 4: Community Health, Safety and Security
PS 5: Land Acquisition and Involuntary Resettlement
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
PS 7: Indigenous Peoples
PS 8: Cultural Heritage

The objectives of Performance Standard 1 which is related with this SEP are;

- To identify and evaluate environmental and social risks and impacts of the project,
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and where residual impacts remain, compensate/offset risks and impacts to workers, Affected Communities, and the environment,
- To promote improved environmental and social performance of clients through the effective use of management systems,
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately,
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

4. PREVIOUS STAKEHOLDER ENGAGEMENT ACTIVITIES

In the scope of the project, various studies were carried out with both internal and external stakeholders before the planned Public Consultation activities in the scope of this SEP. The Project Sponsor recognizes the importance of the stakeholder engagement activities and will carry out the activities planned under this SEP in order to make these activities more efficient, inclusive and continuous. Both internal and external previous stakeholder engagement activities are described in this section.

4.1 Public Consultation Meetings (PCMs) in the Scope of EIA Process

Within the scope of the EIA studies, two public consultation meetings were held alongside the route. The aim of the public participation meeting is to inform people who may be potentially affected about the Project and to understand their concerns, opinions and suggestions about the project. This process is the only formal requirement for stakeholder participation according to Turkish legislation.

A more comprehensive program of Public Consultation Meetings (PCMs) was held in February 2022 in the scope of the Aydın Denizli Motorway Project ESIA Studies. As a part of this program, 5 PCMs were held along the entire motorway route between Efeler district of Aydın province and Pamukkale district of Denizli province.

In the scope of the Supplementary ESIA Studies for South Alternative, 2 Public Consultation Meetings (PCMs) were held along the motorway route between Efeler and Yenipazar districts. Selection of the PCM locations is completed during the scoping stage of the Supplementary ESIA process based on the findings of the key informant questionnaires and focus group meetings conducted in the region by the social expert team of the project. As known, the South Alternative has a length of 26 km, including the main carriageway and access roads. Thus, it would not be possible to organize meetings in every settlement within the study area, the selection of settlements where public consultation meetings are planned aims to identify a meeting location every 10 km (plus - minus 5 km) along the route to ensure that the meeting location is as accessible as possible for local people from surrounding settlements.

First Public Consultation Meeting (PCM) was held in Gödrenli (Efeler, Aydın) on 22.08.2023. Approximately 45 people attended the meeting including officials of the relevant official institutions and the local people. The Second Public Participation Meeting was held in Dereköy (Yenipazar, Aydın) on 23.08.2023. Approximately 35 people attended this meeting. During the meetings, presentations were made to inform the public about the project. After the presentations, the questions asked by the local people about the project were answered by both the project owner KGM and KGM 2nd Regional Directorate and the EIA working group officials. These issues were generally about the project route, noise, air quality, the private properties on the route and the views of the owners of these properties. Valuation of the lands and other issues related to expropriation process were also the main topics discussed at this meeting.

4.2. Internal Stakeholder Engagement Activities

4.2.1 Employee Satisfaction Survey

The internal stakeholders of the project are the most important building blocks for the healthy progress of a project. Among these internal stakeholders, the largest group in quantitative terms is employees. Project Sponsor's and sub-contractors' employees are involved in every stage of the project's life cycle. In this context, stakeholder engagement activities with internal stakeholders also have importance. Various stakeholder engagement activities with internal stakeholders are carried out by the Project Sponsor.

Within the scope of internal stakeholder engagement activities, an employee survey study is conducted by the Project Sponsor in order to get the opinions of the Employees about the general operation of the project, to identify the areas that are open to improvement in the management and workplace, and to provide a better working environment for everyone.

4.2.2 Focus Group Meetings

In the socio-economic field study carried out within the scope of Supplementary ESIA studies, studies were carried out with internal and external stakeholders. This meeting was held at Satellite Construction Camp Site. 6 interviewees participated in this focus group interview. These participants were mostly blue-collar and male employees, but were selected by random sampling. In this meeting, which was held on working conditions, accommodation conditions, OHS conditions and other related issues at the construction site, it was aimed to obtain a general insight into the labor and working conditions of the employees.

As a result, stakeholder engagement activities carried out by the Project Sponsor and an effective working Grievance Mechanism are very important for all phases of the project.

4.3. External Stakeholder Engagement Activities

4.3.1 Key Informant Interviews

Another study carried out 25-26 July 2023 as a part of the socio-economic fieldwork of the project is the Key Informant Interviews. The local communities are among the most important external stakeholders of the project. Project Affected People (PAP) is people living in neighborhoods along the project route. Key Informant Interviews as part of Supplementary ESIA studies were held in 4 neighborhoods, expected to be some of the most affected settlements due to the project. These 4

neighborhoods studied were Alanlı (Efeler, Aydın) Neighborhood, Gödrenli (Efeler, Aydın) Neighborhood, Alhan (Yenipazar, Aydın) and Dereköy (Yenipazar, Aydın) Neighborhood, respectively. In these neighborhoods, interviews were held with the neighborhood mukhtars as key informants. The interviews were conducted by the Independent ESIA Consultant's Social Expert. This study was carried out in order to obtain a foresight about the demographic, social, economic and cultural bases of the people involved in the PAP and their possible impact from the project.

Project Sponsor's Environmental and Social Interaction Manager, Expropriation Manager, and Public Relations Specialist answered key informants' questions about the project. These issues were generally related to the expropriation process. In general, the socio-economic fieldwork has been beneficial for both internal and external stakeholders to come together with the Project Sponsor and share their ideas, opinions, questions and suggestions with the Project Sponsor. Apart from this work, the Project Sponsor carries out irregular village visits to inform local communities about the expropriation process and to gather information about the current status of PAP.

4.3.2 Road Trip

In August 2023, there were two Public Consultation Meetings (PCMs) held on the most affected two locations from the project within the scope of the “Road Trip” study. In order to reach more stakeholders, transportation was provided to the meeting places to be selected for the two PCMs in the scope of the Road Trip so that stakeholders from distant neighborhoods with limited access were also able to participate in the consultation activities. The locations of PCMs have been determined as Gödrenli (Efeler-Aydin) and Dereköy (Yenipazar-Aydın) (see Figure 3). The details of PCMs’ dates and locations can be examined in Table 2.

The mukhtars of the settlements in the project's impact area were informed by phone to participate in the Public Consultation Meetings and to acquaint local people about meetings. In addition, an official letter was sent to the Aydın Governorate to inform of Public Consultations Meetings.

During the Public Consultation Meetings, it was found the chance to communicate one-on-one with the Project Affected People. Thus, people had the opportunity to demonstrate their expectations, complaints, or suggestions about the project at these meetings.

The meetings were held with the participation of representatives of Project Sponsor (senior officials and technical project team members including design and expropriation), authorities from 2nd Regional Directorate of KGM, and the Independent Environmental and Social Impact Assessment (ESIA) Consultant (ENCON Environmental Consultancy Co.).

The Independent ESIA Consultant performed the moderation of the meetings. The meetings started with an introduction and explanation of the purpose and scope of the meeting and followed by a presentation given by the Independent ESIA Consultant and a final discussion session where questions, concerns and suggestions were received.

The main topics covered in the presentations were as follows:

- What is the Aydin - Denizli Motorway Project?
- Who are the Project Owner and the Project Sponsor?
- What are the Anticipated Benefits of the Project?
- What is the Environmental and Social Impact Assessment Process?
- Stakeholder Engagement: How to Participate into the Process?
- Discussion (Questions and Answers)

Table 2 Organizational Details of the Public Consultation Meetings Conducted in Aydın

PCM No	Motorway Section	District	Neighborhood	Km Chainage	Date of the Meeting	Time of the Meeting	Meeting Venue	Number of Participants
1	Section 1	Efeler	Gödrenli	Km21	22.08.2023	11.00	Local Teahouse/Open Air	About 45
2	Section 1	Yenipazar	Dereköy	Km27	23.08.2023	11.00	Local Teahouse/Open-air Area	About 35

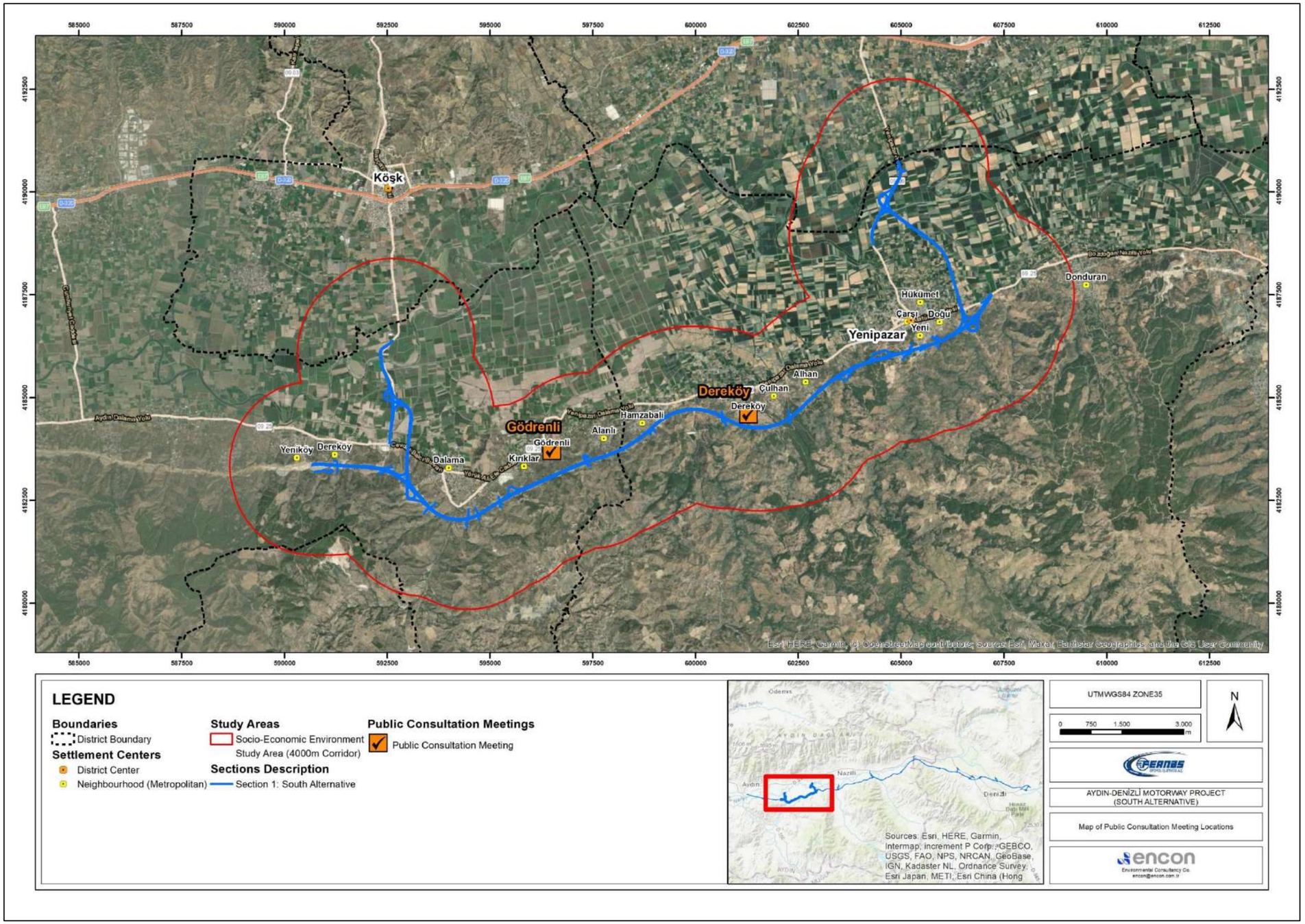


Figure 2 Map of Public Consultation Meeting Locations

Large-scale (in A0 format) maps showing the relevant part of the route in each meeting were posted on the walls of the meeting venue. In addition, project information brochures were shared the participants. As a result of the information efforts, participation levels were high. Attendance of different parties including state officials or adjacent neighborhoods as well as representatives of media and NGOs in addition to local people was achieved.

On average, each meeting lasted for 1 hour. Following the official meeting durations, questions of the participants were replied at the unofficial conversations held after the meetings.

The questions, issues, concerns and suggestions raised by the participants during the PCMs were grouped under five main categories as follows. Each main category included sub-categories and a summary of the PCM findings is provided in Appendix 9.1.

(i) Technical/Design
(ii) Environment
(iii) Socio-economy
(iv) Stakeholder Engagement

5. STAKEHOLDER IDENTIFICATION

In order to develop an effective SEP, it is necessary to determine who is likely to be affected (both directly and indirectly) by the project (“affected parties”); who may have an interest in the project (“interested parties”); and have the potential to influence project outcomes or operations.

An important stage of the stakeholder identification is the groups that are likely to be affected by the project more or differently than other stakeholders, and whose influence on these possible impacts is expected to be relatively low. These groups are defined as "vulnerable groups" in the literature. One of the aims of the stakeholder engagement plan is to carry out an effective and sustainable communication, information and consultation process with these vulnerable groups. For this purpose, this SEP covers the following objectives related to vulnerable groups:

- Identifying vulnerable groups;
- The method and frequency of communication with vulnerable groups;
- Opportunities and priorities for vulnerable groups; and
- Monitoring process.

The vulnerable groups identified in the project are as follows:

- Single-parent and elderly-headed households;
- Women-headed households;
- Unemployed youth and young-headed households;
- Widows;
- Immigrants, refugees;
- Illiterate people;
- Farmers who lost more than 70% of all their land due to expropriation;
- Low-income large families (especially those with unemployed family members);
- Seasonal agricultural workers;
- People with disabilities;
- Elderly or people in need of care without family support;
- Persons who do not own any land;
- Those earning at/below the minimum wage;
- Physically displaced persons;
- Economically displaced persons;
- Homeless affected persons; and
- Significantly affected tenants.

Gender inequality may be seen in stakeholder engagement process. Although it is not defined as a vulnerable group on its own, it is necessary to be sensitive to situations where women cannot take part in these stakeholder engagement activities. Project Sponsor should consider gender equality in the stakeholder engagement processes of the project and should approach with sensitivity to the problems that may arise in this regard. Project Company will take short and long-term steps towards resolving these problems. Arranging time and space so that women can participate in meetings and other events equally is one of the simplest and most effective steps that can be taken in this regard. In addition to the above-mentioned vulnerable groups, gender equality will be considered in the process of stakeholder identification, consultation with stakeholders and grievance management process.

The following categories of stakeholders have been identified as being affected by or potentially interested in the project:

- Project parties;
- National governmental and non-governmental organizations (NGOs);
- Local governmental organizations and NGOs;
- Local residents (potentially project affected persons including vulnerable groups); and
- Local businesses and universities

A list of stakeholders is presented in Table 3 below. It should be noted that the presented stakeholder list provides most prominent stakeholders and that organizations or groups which are not listed, and wish to be informed about the project, can make contact Project Sponsor and provide their contact information. People living in residential areas near the project area are defined as potential project affected people/population (PAP) in this SEP. These settlements are also listed in Table 3 below. Therefore, effective consultation and information sharing with these groups and solving their grievances are among the objectives of the SEP.

Table 3 Project's Stakeholders List

Level	Category	Organization / Entity
Internal	Appointed Company	FOIAS
	Contractor's Personnel	FOIAS
	Sub-contractors	Information N/A
National	Ministries and Relevant Authorities	Ministry of Transportation and Infrastructure
		General Directorate of Highways
		General Directorate of Infrastructure Investments
		General Directorate of Motorways Arrangement
		Ministry of Agriculture and Forestry
		General Directorate of State Hydraulic Works (DSİ)
		General Directorate of Forestry
		General Directorate of Meteorology
		Ministry of Environment, Urbanization and Climate Change
		General Directorate of Spatial Planning
		General Directorate of Environmental Management
		General Directorate of Preservation of Natural Heritage
		General Directorate of Land Registry and Cadastre
		Ministry of Culture and Tourism
		General Directorate of Cultural Heritage and Museums
		Ministry of Energy and Natural Resources
		General Directorate of Mineral Research and Exploration
		General Directorate of Electricity Generation Corporation (EUAS)
		General Directorate of Electricity Transmission Company (TEIAS)
		Ministry of Interior
		Gendarmerie General Command
		General Directorate of Security Affairs
		Ministry of Labor and Social Security
		General Directorate of Turkish Employment Agency (ISKUR)
		Ministry of Development
		Ministry of Defense
		Petroleum Pipeline Company (BOTAS)
		Prime Ministry's Disaster and Emergency Management Presidency (AFAD)
	NGOs	The Union of Chambers and Commodity Exchanges of Turkey (TOBB)
		World Wide Fund for Nature (WWF)
		Foundation for the Protection and Promotion of the Environment and Cultural Heritage (CEKUL)
		Environment Foundation of Turkey
		Turkish Environmental and Woodlands Protection Society (TURCEK)
		Union of Forestry Workers (ORMAN-IS)
		Union of Turkish Roads, Buildings and Construction Workers (YOL-IS)
		Confederation of Unions of Turkish Workers (TURK-IS)
		Union of Construction Industry Employers (INTES)
		The Turkish Foundation for Combating Erosion Reforestation and the Protection of Natural Habitats (TEMA)
		Nature Association
Regional	Governmental Agencies and Authorities	Ministry of Agriculture and Forestry Regional Directorate
		Ministry of Transportation and Infrastructure Regional Directorate of Highways
		Mugla Regional Directorate of Forestry (in scope of duty for Aydın)
		General Directorate of State Hydraulic Works (DSİ) 21st Regional Directorate
		Aydın Regional Directorate of Cultural Heritage Preservation Board
		General Directorate of Turkish State Railways Regional Directorate
	NGOs	Aydın Environment and Nature Society
		Aydın Environment and Culture Society
		Aydın Volunteers Society
		Latmos Nature and Culture Society
Local	Governmental / Local Authorities and Agencies	Governorship of Aydın
		Aydın Metropolitan Municipality

Level	Category	Organization / Entity
		Efeler District Governorship
		Yenipazar District Governorship
		Efeler District Municipality
		Yenipazar District Municipality
		Aydın Provincial Directorate of Security
		Efeler District Police Department
		Yenipazar District Police Department
		Aydın Provincial Gendarmerie Command
		Efeler District Gendarmerie Command
		Yenipazar District Gendarmerie Command
		Aydın Provincial Directorate of Culture and Tourism
		Aydın Provincial Directorate of Agriculture and Forestry
		Aydın Provincial Directorate of National Education
		Aydın Forestry Operation Directorate
		Efeler District Directorate of Agriculture and Forestry
		Yenipazar District Directorate of Agriculture and Forestry
		Aydın Provincial Directorate of Environment and Urbanization
		Aydın Water and Sewerage Administration
		TEIAS Transformation, Installation and Operation Group Division
		Gas Distribution Industry and Trade Incorporated Company (ENERYA)
		Aydın Electricity Distribution Co. (ADM)
		Aydın Turk Telekom Regional Directorate
		Aydın Provincial Directorate of Employment Agency
	NGO's	Relevant local NGOs
		Aydın Environment and Culture Platform (AYÇEP)
		Aydın Chamber of Agricultural Engineers
		Efeler Chamber of Agriculture
	Residential Areas/Local Communities/Potentially Project Affected People	Yenikoy/Efeler/Aydin
		Derekoy/Efeler/Aydin
		Dalama/Efeler/Aydin
		Kiriklar/Efeler/Aydin
		Godrenli/Efeler/Aydin
		Alanli/Efeler/Aydin
		Hamzabali/Yenipazar/Aydin
		Derekoy/Yenipazar/Aydin
		Culhan/Yenipazar/Aydin
		Alhan/Yenipazar/Aydin
		Yenipazar District Center
		Donduran/Yenipazar/Aydin
	Business Enterprises	Business enterprises located along the route
	Universities	Aydın Adnan Menderes University

6. STAKEHOLDER ENGAGEMENT PLAN

6.1 Methods For Information Dissemination and Public Consultation

FOIAS would use appropriate methods to disclose information about the planned project, consult with stakeholders on potential benefits and risks of the planned project and potential adverse impact mitigation measures. Disclosure of relevant project information helps stakeholders better understand the risks, impacts and opportunities associated with the proposed projects. Information will be disclosed using methods, which will be suitable for various groups of stakeholders at all project implementation stages. For all disclosure attempts IFC PS1 and EPFI Principle 5 will be followed and by doing so, the project will be kept in international standards. The relevant means for consultations with stakeholders are provided in Table 4 and with possible timing in Table 5.

Table 4 Stakeholders / Purpose of Communication / Communication Methods

Stakeholders	Purpose for Communication	Type and Method of Communication
Local communities/settlements in the area (See Table 3.) Farmers and owners of the agricultural fields around the motorway route. Related local businesses near the motorway route. Local Universities (Aydin Adnan Menderes University) Vulnerable groups specified under the stakeholder identification section of this document which include as follows: • Single-parent and elderly-headed households; • Women-headed households, • Unemployed youth and young-headed households; • Widows; • Immigrants, refugees; • Illiterate people; • Farmers who lost more than 70% of all their land due to expropriation; • Low-income large families (especially those with unemployed family members); • Seasonal agricultural workers; • People with disabilities; • Elderly or people in need of care without family support; • Persons who do not own any land; • Those earning at/below the minimum wage;	Providing information on the nature of the proposed Project, duration of the project, potential environmental, social and economic impacts (positive and negative) Opportunities for the community to be actively involved in the project activities Mechanism / opportunities for suggestions and proposals Discussions on the potential adverse impacts	Information through the media: newspapers, local TV, etc. Information about the prepared documents related to the project (ESIA report and SEP). Construction signs and warnings during the construction phase Group or individual meetings to identify impacts, agree and implement mitigation measures, project announcement (leaflets, etc.) as necessary
• Physically displaced persons; • Economically displaced persons; • Homeless affected persons; and • Significantly affected tenants.		
Representatives of local communities (See Table 3)	Providing information on the nature of the project, duration of the Project, potential environmental, social and economic impacts (positive and negative) To generate opportunities for the community to be actively involved in the project activities To create mechanisms and/or opportunities for suggestions and proposals To give rise to discussions on the potential adverse impacts	Official correspondence and meetings to provide information on project progress and issues that concern local communities and providing direct information Information through the media: newspapers, media, face to face, etc. Information about the Project (ESIA, SEP, Management Plans) Formal/Informal Meetings with related parties
Interested national and local NGOs Other interested organizations will be added, as identified throughout the life of the Project	Providing information on the nature of the project, duration of the Project, potential environmental, social and economic impacts (positive and	Information through the media: newspapers, media, face to face, etc. Information about the Project (ESIA, SEP, Management Plans)

	negative) These organizations can potentially help to identify key issues pertaining to the local community (vulnerable groups) and the local environment	Formal/Informal Meetings with related parties
AFAD Local emergency services, fire brigades, utility owners and operators, local police, coast guard, health services	Inform relevant local authorities about project and undertake official correspondence when needed	Official correspondence and meetings to prepare for and coordinate activities during operation.
Local and Central Governmental Institutions/Agencies	Informing regarding project progress and undertake official correspondence Getting necessary approvals/opinions during project execution,	Official correspondence and meetings, information disclosure and consultation reporting, monitoring, permit requests.
General Directorate of Highways (KGM)	Providing information about the operation process of the project, providing necessary information and reporting on relevant stakeholder engagement activities.	Official correspondence and regular meetings to provide information on project progress and address issues that concern local communities and stakeholders. Official correspondence and meetings, information disclosure and consultation reporting, monitoring, permit requests.

6.2 Schedule and Timetable

The timing and form of activities for stakeholder engagement activities given in the previous section are detailed in Table 5 below.

Table 5 Proposed Stakeholder Engagement Program during Project Implementation

Activity	**Method**	**Timing***
Field Study	Key informant interviews, focus group discussions etc.	July 2023
Road Trip	Two Public Consultation Meetings alongside the motorway route	August 2023
Public Announcements	Social Media announcements, Website of ADMP, Mass media arrangements etc.	Continuously as required
Disclosure of Environmental and Social Performance Reports	Website of ADMP	Annually
Activities with related parties	Formal/Informal Meetings with representatives of related parties	Continuously as required
Reporting to KGM	Official correspondences, meetings and reports	Semi-annually

** Timing of the activities may change due to changes that may occur during the implementation of the project.*

7. ROLES AND RESPONSIBILITIES

The anticipated activities in the SEP will be conducted and completed in operation phase by Project Company and KGM. In activities such as the grievance mechanism, FOIAS will be responsible for following requests, suggestions and complaints, and in the upcoming process, FOIAS will fulfil the requirements by being responsible for this mechanism in accordance with the IFC PS1, EPFI Principle 5 and Principle 6.

The implementation of this SEP will be conducted and monitored by Project Sponsor's Environmental and Social Interaction Manager who is responsible to appoint a Public Relations Specialist to be responsible for the stakeholder engagement for the Project, implementation of this SEP and grievance management. The Public Relations Specialist will perform the following functions:

- Information disclosure and obtaining feedback;
- Processing, managing and tracking grievances, including ensuring timely responses to and closure of grievances;
- Control over the implementation of the corrective actions to remedy grievances;
- Regular review and if necessary, update of the SEP and stakeholder engagement mechanism to ensure it is effective and reflects Project circumstances;
- Participation in discussion on responses and the resolution of disputes, and
- Assistance in the preparation of the Environmental and Social Performance Reports.

Depending on the complexity of issues, Project Sponsor's project management and experts of KGM may also be involved.

8. GRIEVANCE MECHANISM

8.1 Purpose of the Grievance Mechanism

The purpose of this mechanism is to establish a system for handling, evaluation and resolution of all kinds of internal and external grievances, concerns, queries and proposals of the affected communities and other stakeholders, such as construction workers, regarding the project activities.

Managing grievances, including avoiding and minimizing them as well as effective handling, is an integral part of a sound stakeholder engagement strategy. Experience shows that significant numbers of grievances arise from misunderstandings, and that such grievances can be avoided, or their numbers reduced, through proactive and consistent engagement with communities. Engagement also helps anticipate and review community concerns to prevent them from escalating into grievances.

In accordance with IFC PS 2 and EPFI Principle 6, a process is established by which people who deem that they have been adversely affected by the project during planning, construction or operation can bring grievances to the project for consideration and, if required, resolution. A specific project grievance mechanism is beneficial in addressing community and individual concerns and complaints before they escalate beyond control.

8.2 Responsible Parties

FOIAS is responsible for implementing the grievance mechanism during the land preparation and construction and operation phases. FOIAS has to ensure that the grievance mechanism is implemented effectively.

FOIAS Public Relations Specialist (PR Specialist) is responsible to receive and manage the grievance process and actions to be taken to resolve incoming grievances, as well as reporting to the KGM. The relevant records would be kept and reported to KGM.

8.3 Grievance Mechanism

All grievances related to the project will be evaluated and responded. The grievance mechanism would serve for both internal (such as employees of FOIAS and sub-contractors) and external stakeholders. Any individual or organization may make enquiries and/or lodge complaints personally. The following communication channels could be used for lodging grievances:

- Telephone: +90 256 221 1870
- Web site: www.aydindenizliotoyolu.com.tr/index.html
- E-mail of FOIAS: bilgi@aydindenizliotoyolu.com.tr
- Grievance boxes at construction sites which already placed(mainly for workers)
- Grievance boxes at different settlements which already placed along the motorway route
- Direct contact with Unit Managers and Public Relations Specialist at construction sites
- Meetings
- All complainants can also submit their grievances anonymously if they wish.
- In addition, FOIAS attaches great importance to the resolution of complaints related to sexual exploitation/abuse and/or sexual harassment. The confidentiality of the complainant's identity information and the priority of the complaint will be provided by FOIAS.

The step-by-step grievance redress process for both internal and external grievances to be adopted is provided below:

- **Step 1** Receiving the grievance by any communication channel.
- **Step 2** Registering/recording through making an entry in the register table (see Table 6 and Table 7 for a sample) and filling of the Grievance Form (see Table 8 and Table 10 for a sample).
- **Step 3** The complaint is forwarded to relevant persons (PR Specialist) responsible for handling the complaint in not later than 7 days upon receiving the complaint (except for any emergent complaint, which has priority and would be handled as soon as possible).
- **Step 4** The complaint is checked/ investigated by the relevant person (PR Specialist) regarding its validity not later than 5 days upon receiving.
- **Step 5** If the complaint is not valid, providing relevant explanation to the complainant. If the complaint is valid, identifying corrective measures for resolving the complaint not later than 30 days upon receiving. If resolving the complaint would take longer, a partial response could be provided to the complainant.
- **Step 6** Take the necessary measures and provide a response to the complainant and fill the Grievance Closeout Form (see Table 9 and Table 11 for a sample). All comments and complaints will be responded to either verbally or in writing, in accordance with the preferred method of communication specified by the complainant, if contact details of the complainant are provided.
- **Step 7** Record the result in the register table.

Table 6 Sample External Grievance Register

	EXTERNAL GRIEVANCE/SUGGESTION REGISTER															
Date of Grievance/ Suggestion	**Grievance/ Suggestion Submission Method**	**Related Facility or Km**	**Complainant Name**	**Complainant Phone**	**Complainant Address Province/District/ Neighborhood**	**Grievance/ Suggestion Channel**	**Grievance/ Suggestion Topic**	**Grievance/Suggestion Detail**	**Risk Level**	**Emergence Action**	**Related Unit**	**Related Officer's Name**	**Related Officer's Phone**	**Mitigation Measure/Action**	**Due Date**	**Grievance/Suggestion Status**	**Grievance/Suggestion Closure Date**

Table 7 Sample Internal Grievance Register

	INTERNAL GRIEVANCE/SUGGESTION REGISTER														
Date of Grievance/Suggestion	**Grievance/ Suggestion Submission Method**	**Related Facility or Km**	**Complainant Name**	**Complainant Phone**	**Grievance/Suggestion Topic**	**Grievance/Suggestion Detail**	**Risk Level**	**Emergence Action**	**Related Unit**	**Related Officer's Name**	**Related Officer's Phone**	**Mitigation Measure/Action**	**Due Date**	**Grievance/Suggestion Status**	**Grievance/Suggestion Closure Date**

Table 8 Sample External Grievance Opening Form

FERNAS OTOYOL İŞLETMESİ A.Ş.	**EXTERNAL GRIEVANCE/SUGGESTION OPENING FORM**

Complainant Information		**Submission Method**
Full Name		☐ Phone Call ☐ Petition **(Attach 1 copy to this form)** ☐ Face to Face public consultations ☐ Village visit / meeting ☐ e-mail ☐ Other.....
Phone		
Address		
Related Project Location/Unit		**Anonymous Grievance/Suggestion** ☐

Details about Grievance/Suggestion
Detailed description of the Grievance/Suggestion (direct statements of the Grievance/Suggestion Owner can also be added):
Complainant's Suggestion for Solution

Complainant's Signature	**Anonymous Grievance/ Suggestion** ☐	**Date:**
THIS SECTION WILL BE FILLED BY STAFF	**Full Name and Signature:**	

CLARIFICATION TEXT FOR PERSONAL DATA

This clarification text has been prepared by "Fernas Otoyol İşletmesi A.Ş" in accordance with Article 10 of the Law on the Protection of Personal Data No. 6698 and the Communiqué on the Procedures and Principles to be Complied with in Fulfilling the Obligation of Clarification.

1. Purpose of Processing Personal Data

As Fernas Otoyol İşletmesi A.Ş., within the scope of our public relations unit activities, your images, your name, surname, contact information, signature information included in these texts are processed as personal data, in case you send us your opinions, feedback, complaints and suggestions. Your personal data in question; It is processed for the purpose of receiving, evaluating and finalizing complaints and suggestions, management of complaints and suggestions, planning and execution of activities "in case data processing is mandatory for the establishment, exercise or protection of a right in accordance with Article 5/2/e of Law 6698".

2. To Whom Personal Data Can Be Transferred And For What Purpose

Your personal data can be shared with our Fernas İnşaat A.Ş group companies and legally authorized public institutions, and to related institutions abroad in accordance with our reporting obligation, within the framework of the personal data processing conditions and purposes specified in Articles 8 and 9 of the Law No. 6698, and can be processed at home or abroad in order to resolve your complaints and suggestions in line with the above-mentioned purposes.

3. Method and Legal Reason for Personal Data Collection

Personal data, name, surname, contact information, signature information in these texts are collected by taking photos at meetings and events, in order to convey your opinions, feedback, complaints and suggestions. Personal data collected for the above-mentioned legal reasons can be processed and transferred for the purposes specified in Articles 1 and 2 of this Clarification Text within the scope of the personal data processing conditions and purposes specified in Articles 5 and 6 of the Law No. 6698, and may be processed at home or abroad.

4. Rights of Data Owners and Use of These Rights

In accordance with Article 11 of the Law, data owners have the following rights:;

1. Learning whether their personal data is processed,
2. Requesting information about it, if personal data has been processed,
3. Learning the purpose of processing personal data whether they are used in accordance with its purpose,
4. Learning the third parties to whom personal data is transferred at home or abroad,
6. Requesting correction of personal data in case of incomplete or incorrect processing and requesting notification of the transaction made within this scope to the third parties to whom the personal data has been transferred,
7. Requesting the deletion or destruction of personal data in the event that the reasons requiring its processing cease to exist despite the fact that it has been processed in accordance with the provisions of the law and other relevant laws, and requesting that the transaction carried out within this scope be notified to the third parties to whom the personal data has been transferred,
8. Objecting to the emergence of a result against the person himself by analyzing the processed data exclusively through automated systems,
9. In case of loss due to unlawful processing of personal data, the data owner has the right to demand the compensation of the damage.

You can send your requests within the scope of Article 11 of the Law, which regulates the rights of the person concerned, to Fernas İnşaat's website www.fernas.com.tr in accordance with the "Communiqué on the Procedures and Principles of Application to the Data Controller". Your request will be concluded free of charge within thirty days at the latest.

EXPRESS CONSENT STATEMENT ON THE PROCESSING OF INFORMATION AND PERSONAL DATA RECEIVED WITH THE GRIEVANCE/SUGGESTION FORM

I accept, declare and undertake. **Name, Surname and Signature:**	**I do not accept, I do not have my express consent.** **Name, Surname and Signature:**

Table 9 Sample External Grievance Closeout Form

FERNAS OTOYOL İŞLETMESİ A.Ş.	**EXTERNAL GRIEVANCE/SUGGESTION CLOSEOUT FORM**
Determined Corrective Action	
Responsible Unit(s)	
Closeout Date	
B- Grievance/Suggestion Closeout	
This section will be filled and signed by the responsible when the file is closed. This section will include information on how the grievance was resolved or how the suggestion was managed; There will also be a statement and signature indicating that there is an agreement with the complainant. *(Grievance received over the internet will be expected to respond by e-mail instead of signature).*	
Explanation: ***Complainant's Name, Surname and Signature:***	
THIS SECTION WILL BE FILLED BY STAFF	**Name, Surname and Signature**

Table 10 Sample Internal Grievance Opening Form

FERNAS OTOYOL İŞLETMESİ A.Ş.	**INTERNAL GRIEVANCE/SUGGESTION OPENING FORM**

Complainant Information		**Submission Method**
Full Name		☐ Petition **(Attach 1 copy to this form)** ☐ Face to face consultation ☐ Meeting ☐ e-mail ☐ Other:.....
Phone		
Address		
Related Project Location/Unit		**Anonymous Grievance/Suggestion** ☐

Details about Grievance/Suggestion
Detailed description of the Grievance/Suggestion (direct statements of the Grievance/Suggestion Owner can also be added):
Complainant's Suggestion for Solution

Complainant's Signature	**Anonymous Grievance/suggestion** ☐	**Date**
THIS SECTION WILL BE FILLED BY STAFF	**Name, Surname and Signature**	
CLARIFICATION TEXT FOR PERSONAL DATA		

This clarification text has been prepared by "Fernas Otoyol İşletmesi A.Ş" in accordance with Article 10 of the Law on the Protection of Personal Data No. 6698 and the Communiqué on the Procedures and Principles to be Complied with in Fulfilling the Obligation of Clarification.

5. Purpose of Processing Personal Data

As Fernas Otoyol İşletmesi A.Ş., within the scope of our public relations unit activities, your images, your name, surname, contact information, signature information included in these texts are processed as personal data, in case you send us your opinions, feedback, complaints and suggestions. Your personal data in question; It is processed for the purpose of receiving, evaluating and finalizing complaints and suggestions, management of complaints and suggestions, planning and execution of activities "in case data processing is mandatory for the establishment, exercise or protection of a right in accordance with Article 5/2/e of Law 6698".

6. To Whom Personal Data Can Be Transferred And For What Purpose

Your personal data can be shared with our Fernas İnşaat A.Ş group companies and legally authorized public institutions, and to related institutions abroad in accordance with our reporting obligation, within the framework of the personal data processing conditions and purposes specified in Articles 8 and 9 of the Law No. 6698, and can be processed at home or abroad in order to resolve your complaints and suggestions in line with the above-mentioned purposes.

7. Method and Legal Reason for Personal Data Collection

Personal data, name, surname, contact information, signature information in these texts are collected by taking photos at meetings and events, in order to convey your opinions, feedback, complaints and suggestions. Personal data collected for the above-mentioned legal reasons can be processed and transferred for the purposes specified in Articles 1 and 2 of this Clarification Text within the scope of the personal data processing conditions and purposes specified in Articles 5 and 6 of the Law No. 6698, and may be processed at home or abroad.

8. Rights of Data Owners and Use of These Rights

In accordance with Article 11 of the Law, data owners have the following rights:;

1. Learning whether their personal data is processed,
2. Requesting information about it, if personal data has been processed,
3. Learning the purpose of processing personal data whether they are used in accordance with its purpose,
4. Learning the third parties to whom personal data is transferred at home or abroad,
6. Requesting correction of personal data in case of incomplete or incorrect processing and requesting notification of the transaction made within this scope to the third parties to whom the personal data has been transferred,
7. Requesting the deletion or destruction of personal data in the event that the reasons requiring its processing cease to exist despite the fact that it has been processed in accordance with the provisions of the law and other relevant laws, and requesting that the transaction carried out within this scope be notified to the third parties to whom the personal data has been transferred,
8. Objecting to the emergence of a result against the person himself by analyzing the processed data exclusively through automated systems,
9. In case of loss due to unlawful processing of personal data, the data owner has the right to demand the compensation of the damage.

You can send your requests within the scope of Article 11 of the Law, which regulates the rights of the person concerned, to Fernas İnşaat's website www.fernas.com.tr in accordance with the "Communiqué on the Procedures and Principles of Application to the Data Controller". Your request will be concluded free of charge within thirty days at the latest.

EXPRESS CONSENT STATEMENT ON THE PROCESSING OF INFORMATION AND PERSONAL DATA RECEIVED WITH THE GRIEVANCE/SUGGESTION FORM

I accept, declare and undertake. **Name, Surname and Signature:**	**I do not accept, I do not have my express consent.** **Name, Surname and Signature:**

Table 11 Sample Internal Grievance Closeout Form

FERNAS OTOYOL İŞLETMESİ A.Ş.	**INTERNAL GRIEVANCE/SUGGESTION CLOSEOUT FORM**
Determined Corrective Action	
Responsible Unit(s)	
Closeout Date	
B- Grievance/Suggestion Closeout	
This section will be filled and signed by the responsible when the file is closed. This section will include information on how the grievance was resolved or how the suggestion was managed; There will also be a statement and signature indicating that there is an agreement with the complainant. *(Grievance received over the internet will be expected to respond by e-mail instead of signature).*	
Explanation: ***Complainant's Name, Surname and Signature:***	
THIS SECTION WILL BE FILLED BY STAFF	**Name, Surname and Signature**

9. MONITORING AND REPORTING

The SEP is a living document, which will be updated periodically (at least once every six months) to record consultations undertaken, issues raised, actions taken; to describe lessons learned and any changes to the consultation process, and to outline the schedule for on-going and future interaction.

9.1. Internal Monitoring

Project Sponsor will monitor participation of the stakeholders to the planned engagement activities. Through evaluation of outcomes and effect of engagement, FOIAS intends to obtain regular feedback from stakeholders and to learn if the planned outcomes are achieved or if there is a need for changing the approach.

Throughout the Project, Project Sponsor will communicate with stakeholders and inform them about any significant issues, for example, changes in the Project schedule.

Monthly summaries/reports of grievances, queries and related incidents together with the implementation status of corrective/preventive actions will be prepared by PR Specialist. The monthly summaries/reports will be a means to assess both the number and nature of complaints (if any), along with Project Sponsor's ability to address complaints in a timely and effective manner.

During the operation phase, PR Specialist will also prepare quarterly overall performance reports.

9.2. External Monitoring

In addition to internal monitoring, external monitoring activities will be carried out semi-annually in the construction phase and annually during the operation phase of the project by external/independent third party experts (ESAP monitoring experts) to verify environmental and social monitoring information and perform monitoring services. Within the scope of external monitoring, final external evaluation will be carried out to assess if the outcome of the ESMS/ESMP implementation is in conformity with the requirements of the national environmental legislation, international agreements and protocols and international environmental and social standards including the Equator Principles and IFC Policy (2012) and related Performance Standards on Environmental and Social Sustainability that would be applicable to the Aydın-Denizli Motorway Project and so that South Alternative.

Besides, local authorities and the Ministry of Environment, Urbanization and Climate Change (MoEUCC) has the authority to execute monitoring and inspection activities to follow-up the conformity of the project activities with the environmental requirements as per the relevant legislation.

APPENDIX 9.1

SUMMARY OF PCM FINDINGS

The participants' questions, issues, concerns, and suggestions during the PCMs are provided in Table 12.

Table 12 Summary of the PCM Findings for the South Alternative

PCM N	Party who Raised the Question/ Issue/Concern/ Suggestion	Category	Sub-category	Question/Issue/Concern/Suggestion Raised	Response of Project Sponsors/Environmental Consultant
Aydin, Efeler, Gödrenli Neighborhood (22.08.2023)					
1.1	Participant*	Socio-economy	Construction Impact/ Infrastructure	It was asked that whether the existing fountains would be reconnected after the construction process.	It was stated that after the completion of the construction phase, the fountains will be reconnected.
1.2	Participant*	Socio-economy	Urgent Expropriation Construction Impact	There are some of the parcels which expropriation payments have been partially paid yet. Information about when the remaining payment will be made was requested.	The main framework of Expropriation Law and the Urgent Expropriation process were explained. It has been stated that the amounts received do not reflect the entire expropriation value, since the expropriation processes have not been completed at the moment, and that the price will reach a reasonable amount at the end of the process.
1.3	Participant*	Socio-economy	Urgent Expropriation Construction Impact	It was asked the centuries-old trees in the pasture belonged to participant's family and whether they could receive product price/compensation	It was stated that legally they do not have rights regarding the centuries-old trees in the pasture, but compensation/product price can be paid if a registration letter is obtained from the Provincial Directorate of Agriculture.
1.4	Headmen of Gödrenli Neighborhood	Socio-economy	Urgent Expropriation Construction Impact	There are a few trees that are outside the expropriation corridor. These trees are currently not accessible. The condition of the trees was asked.	Within the scope of the project, it was informed that a field crossing roads would be provided and trees would be accessible.
1.5	Participant*	Environment	Construction and Operation Phase Impact	It was asked whether noise-preventing measures would be taken.	It was stated that noise measurement studies were implemented throughout the project and that the noise barrier method would be applied if necessary after KGM's approval.
1.6	Resident of Gödrenli Neighborhood	Socio-economy	Construction Impact	It was stated that there were deformations on the existing roads used, and it was asked if remediation would be made.	It was stated that the remediation are being made to existing roads and will be made again if the deformations are repeated.
1.7	Resident of Gödrenli Neighborhood	Socio-economy and Environment	Traffic, Road Community Health and Safety	It was stated that the truck drivers working on the project were driving fast and carelessly. It was also stated that there was no change despite complaints. It was also stated that the heavy trucks had damaged the neighborhood roads and that truck traffic created a security problem in the neighborhood.	It was informed that truck drivers were first given a warning and if the complaint continued, their employment contract was terminated. However, it was also stated that this situation is not only about discipline and that public consciousness is needed. It was stated that relevant impacts are being considered in the ESIA studies. Local people have also been recommended to submit their complaints through Project's grievance/comment mechanisms so that they would be considered.
1.8	Participant*	Socio-economy	Construction Impact	There are 10-15 trees that need to be cut on the service roads. It was asked whether they could take it as wood when the trees were cut down.	It was stated that it depends on the locations of the trees whether they were in the expropriation corridor on not, and detail information was given about the expropriation corridor.
1.9	Resident of Gödrenli Neighborhood	Socio-economy	Construction Impact	It was demanded to spread the gravel on the field roads.	It was noted that gravel will be supplied for the field crossing roads.
Aydin, Yenipazar, Dereköy Neighborhood (23.08.2023)					
2.1	Resident of Dereköy Neighborhood	Environment	Road	It was stated that the vehicles were damaged due to the deformed roads.	It was stated that relevant impacts are being considered in the ESIA studies. Local people have also been recommended to submit their complaints through Project's grievance/comment mechanisms so that they would be considered.
2.2	Resident of Dereköy Neighborhood	Environment	Energy Transmission Lines	It was stated that the energy transmission line was destroyed and demanded that it be fixed.	Parcel numbers have been and contact details of related persons noted down for further evaluation and feedback.
2.3	Resident of Dereköy Neighborhood	Socio-economy	Expropriation	It was stated that due to the fact that half of the land is private and half is pasture, incomplete compensation was received.	The main framework of Expropriation Law and the Urgent Expropriation process were explained. In this context, it was stated that the expert determined the land prices, and the payments were made according to this determination. It was noted that the determined value was determined according to the data of the date when the expropriation case was filed. It was stated that legally they do not have rights regarding in the pasture, but compensation/product price can be paid if a registration letter is obtained from the Provincial Directorate of Agriculture.
2.4	Resident of Dereköy Neighborhood	Socio-economy	Construction Impact	It was stated that the motorway divides the olive groves and the living area, and it was asked whether there would be any underpass.	It was informed that under and overpasses, culverts and field crossing roads will be implemented within the scope of the project.
2.5	Resident of Dereköy Neighborhood	Environment	Afforestation	It was asked whether afforestation will be carried out within the scope of the project.	It was stated that afforestation works were carried out within the scope of the project.
2.6	Headman of Dereköy Neighborhood	Socio-economy	Construction Impact	It was stated that the roads were rough and the heavy truck drivers were driving fast. It was asked whether heavy tonnage truck drivers were psychologically tested.	It has been stated that the roads will be repaired. It has been stated that heavy truck drivers must have a SRC certificate in recruitment.

PCM N	Party who Raised the Question/ Issue/Concern/ Suggestion	Category	Sub-category	Question/Issue/Concern/Suggestion Raised	Response of Project Sponsors/Environmental Consultant
2.7	Resident of Dereköy Neighborhood	Environment	Construction and Operation Phase Impact	It was asked whether noise-preventing measures would be taken.	It was stated that noise measurement studies were implemented throughout the project and that the noise barrier method would be applied if necessary after KGM's approval.
2.8	Participant*	Socio-economy	Urgent Expropriation Construction Impact	There are some of the parcels which expropriation payments have been partially paid yet. Information about when the remaining payment will be made was requested.	The main framework of Expropriation Law and the Urgent Expropriation process were explained. It has been stated that the amounts received do not reflect the entire expropriation value, since the expropriation processes have not been completed at the moment, and that the price will reach a reasonable amount at the end of the process.

* Information about which neighborhood the participant lived in could not be obtained

ANNEX–10

VISIBILITY MAPS

593000 594000 595000 596000 597000 598000 599000 600000 601000 602000

4186000 4185000 4184000 4183000 4182000

Alanlı

Esri, HERE, Garmin, (c) OpenStreetMap contributors, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Alanlı Neighbourhood

encon
Environmental Consultancy Co.
encon@encon.com.tr

598000 599000 600000 601000 602000 603000 604000 605000 606000 607000

4188000 4187000 4186000 4185000 4184000

Alhan

Esri, HERE, Garmin, (c) OpenStreetMap contributors, Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

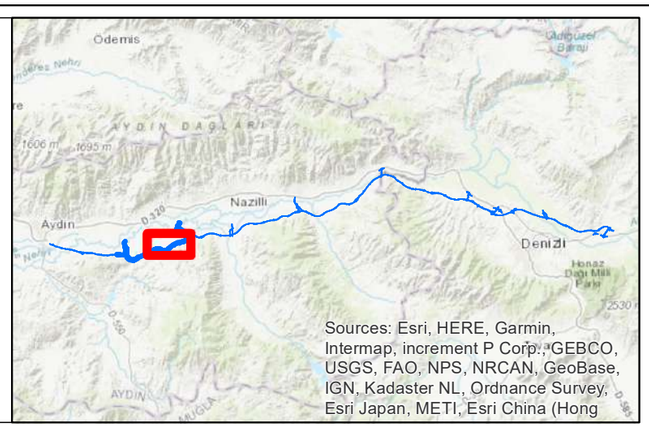
LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible



UTMWGS84 ZONE35

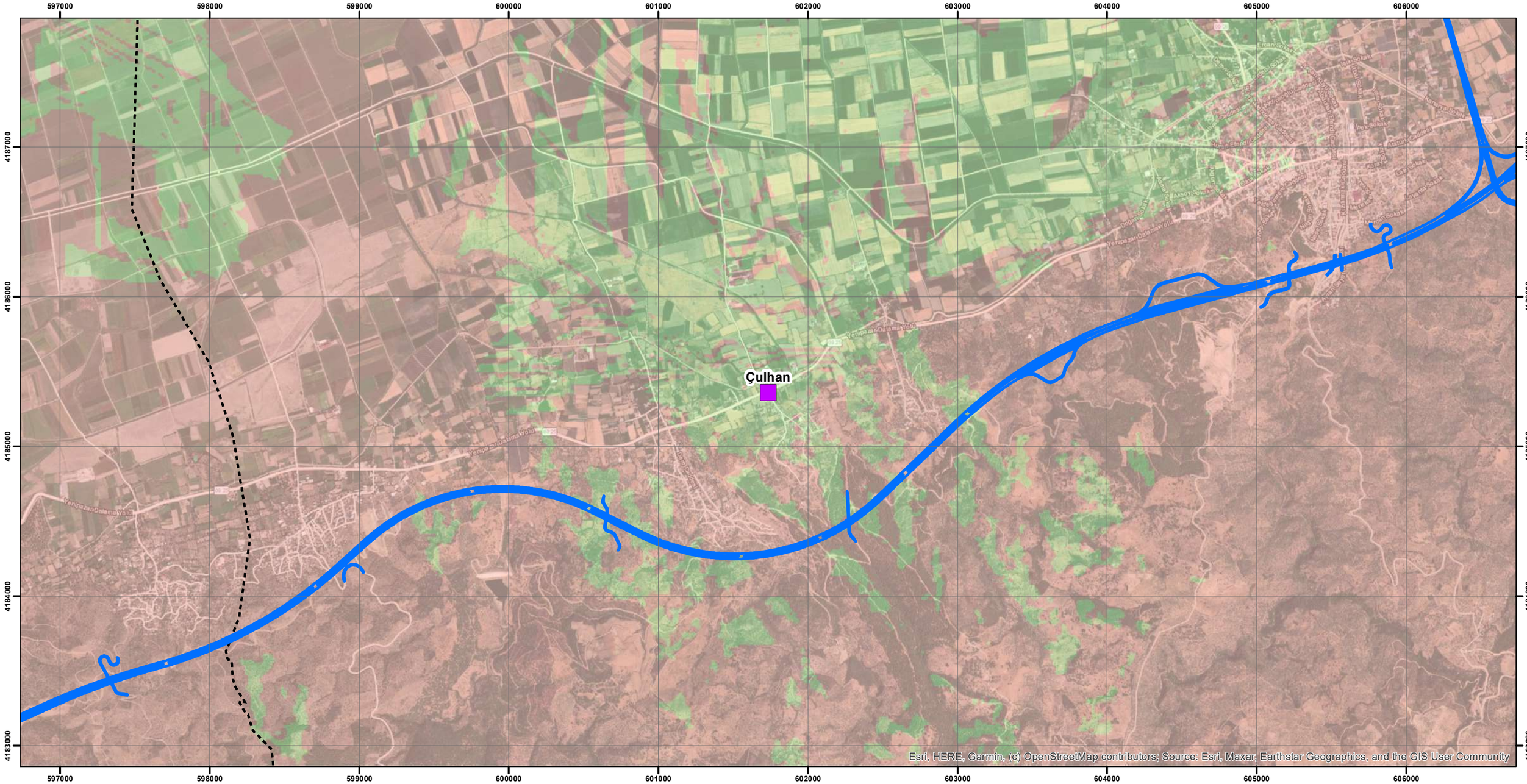
N

0 250 500 1.000 m

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Alhan Neighbourhood

encon
Environmental Consultancy Co.
encon@encon.com.tr



LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Çulhan Neighbourhood

encon
Environmental Consultancy Co.
encon@encon.com.tr

590000 591000 592000 593000 594000 595000 596000 597000 598000 599000

4185000 4184000 4183000 4182000 4181000

Dalama

Aydın Dalama Yolu

Yenipazar Dalama Yolu

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LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Dalama Neighbourhood

encon
Environmental Consultancy Co.
encon@encon.com.tr

587000 588000 589000 590000 591000 592000 593000 594000 595000 596000

4186000 4185000 4184000 4183000 4182000

Dereköy

Aydın Dalama Yolu

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LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Dereköy (Efeler) Neighbourhood

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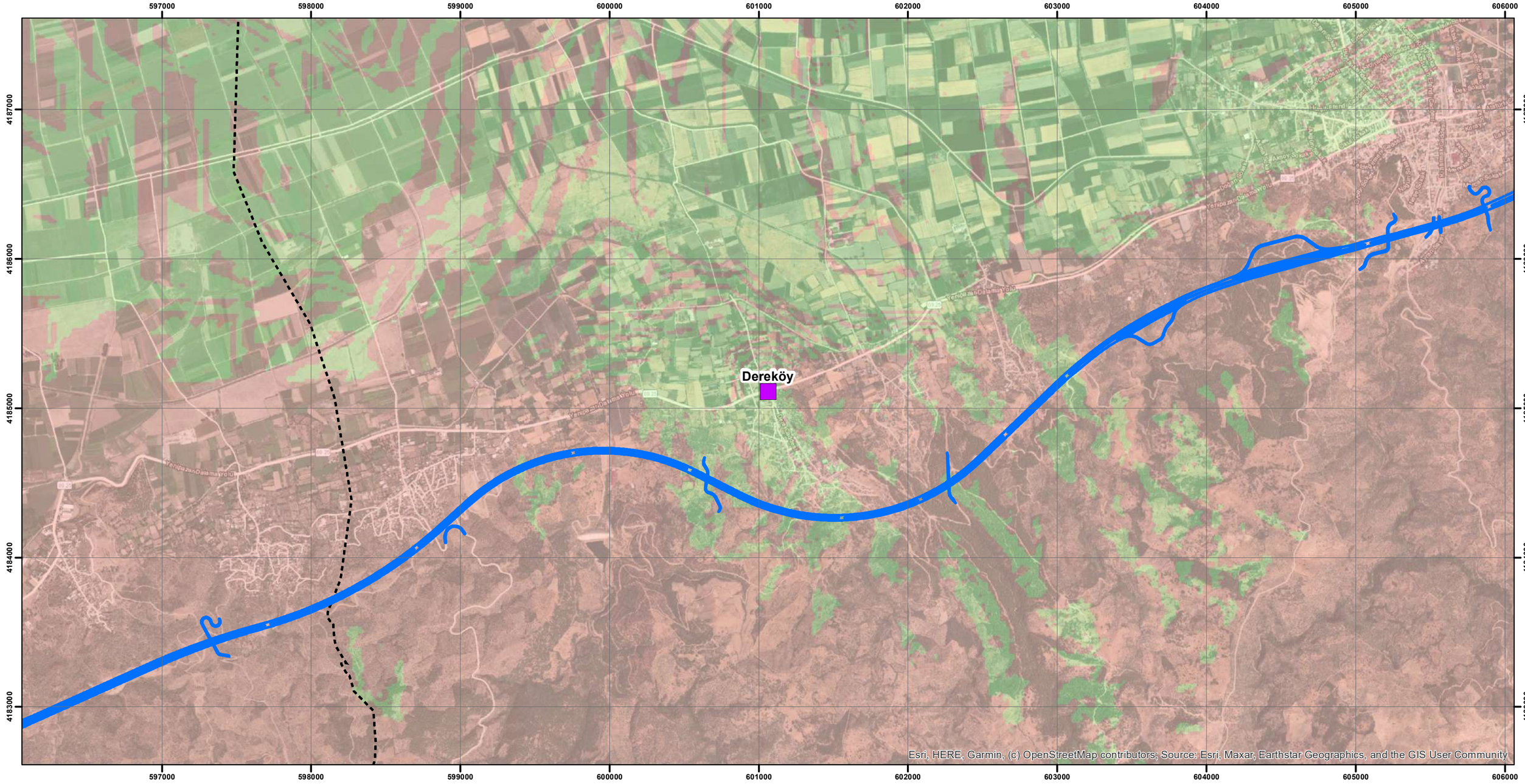
encon@encon.com.tr



LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Dereköy (Yenipazar) Neighbourhood

encon
Environmental Consultancy Co.
encon@encon.com.tr

605000 606000 607000 608000 609000 610000 611000 612000 613000 614000

4190000 4189000 4188000 4187000 4186000

Donduran

Bozdoğan Nazilli Yolu

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LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Donduran Neighbourhood

encon
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encon@encon.com.tr

592000 593000 594000 595000 596000 597000 598000 599000 600000 601000

4186000 4185000 4184000 4183000 4182000

Gödrenli

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LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Gödrenli Neighbourhood

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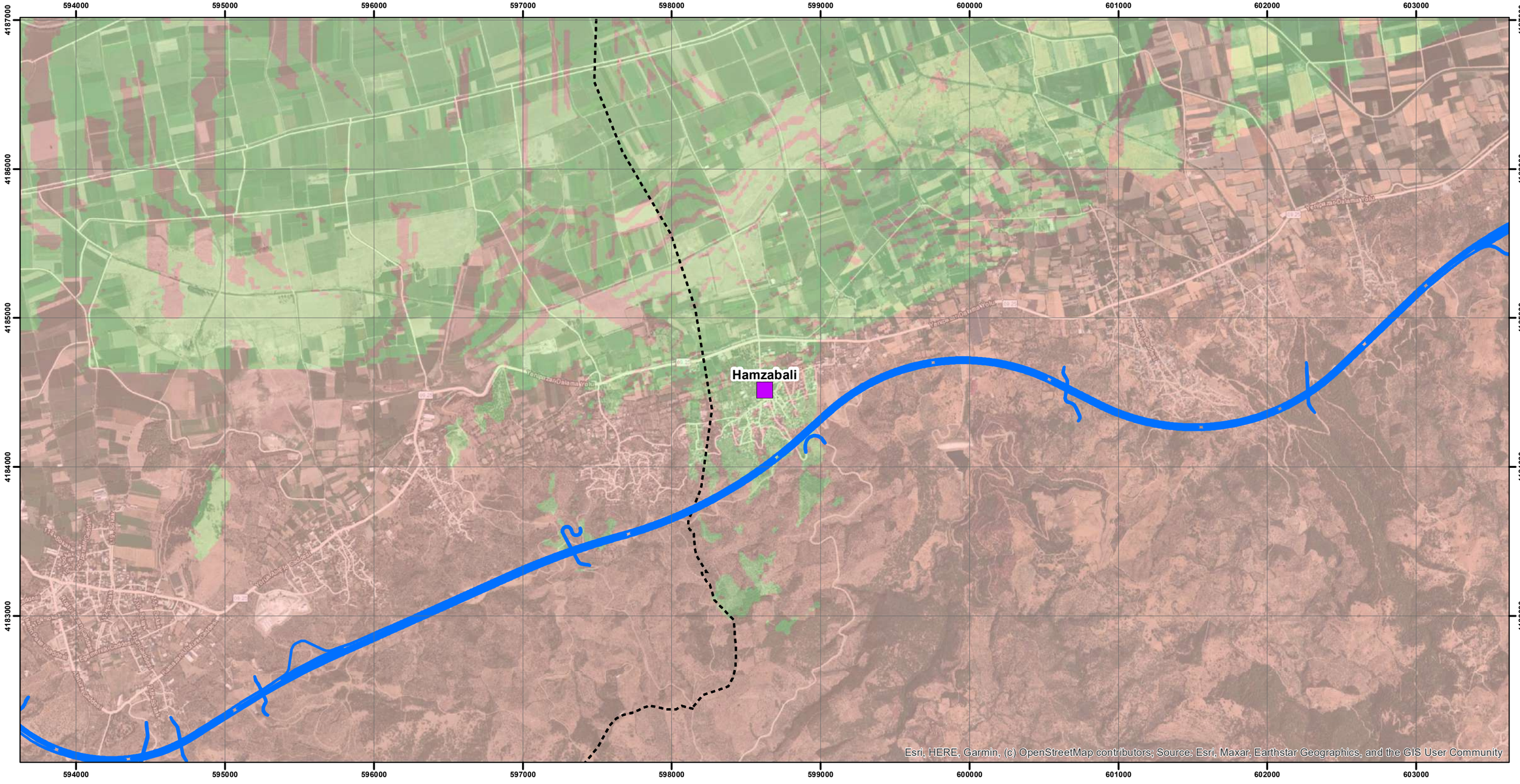
encon@encon.com.tr



LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Hamzabali Neighbourhood

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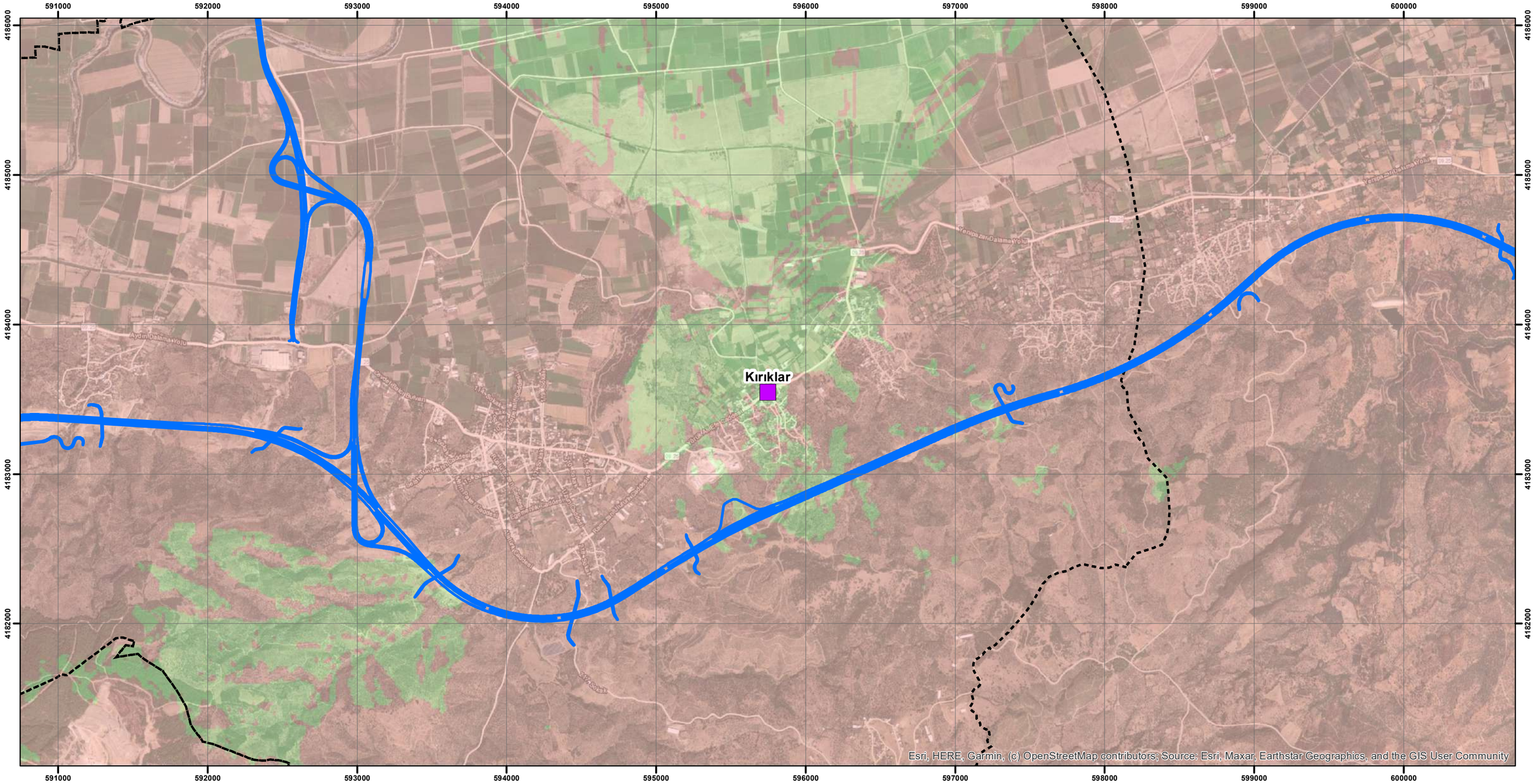
encon@encon.com.tr



LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Kırıklar Neighbourhood

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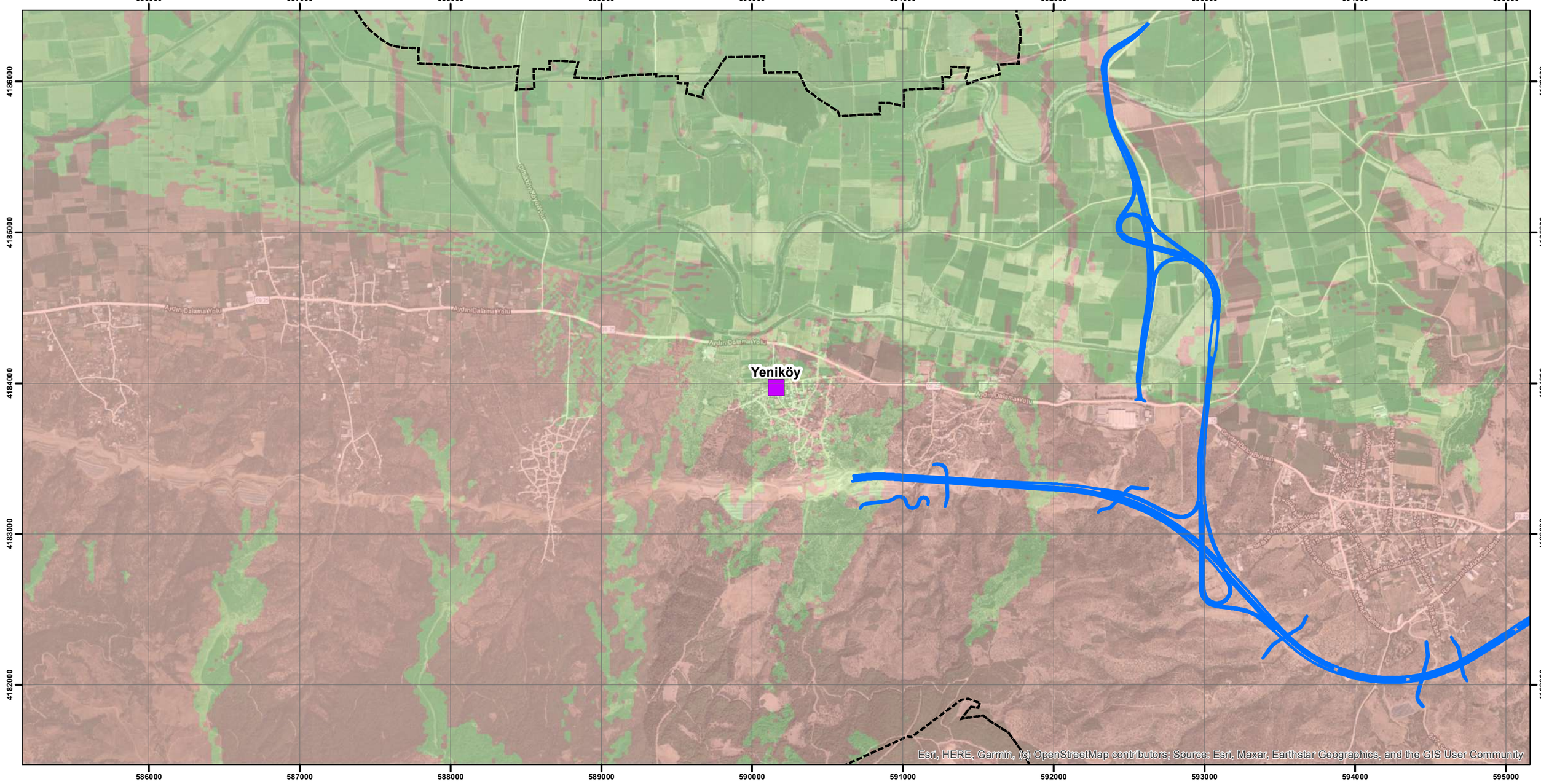

LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

0 250 500 1.000 m

N

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Yeniköy Neighbourhood

encon
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encon@encon.com.tr

600000 601000 602000 603000 604000 605000 606000 607000 608000 609000

4189000 4188000 4187000 4186000 4185000

Yenipazar

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LEGEND

Boundaries
- District Boundary

Settlements
- Settlement

Sections Description
- Section 1: South Alternative

Visibility
- Not Visible
- Visible

UTMWGS84 ZONE35

N

0 250 500 1.000 m

AYDIN-DENİZLİ MOTORWAY PROJECT

Visibility Map of Yenipazar District

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encon@encon.com.tr

ANNEX–11

AIR QUALITY MODELING REPORT

AYDIN-DENİZLİ MOTORWAY PROJECT SOUTH ALTERNATIVE km15+856 - 34 +630

AIR QUALITY MODELING REPORT

HACETTEPE UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL ENGINEERING

Prof. Dr. GÜLEN GÜLLÜ

OCTOBER 2023

TABLE OF CONTENTS

TABLE LISTS

FIGURE LIST

LIST OF SYMBOLS AND ABBREVIATIONS

EEA	European Environment Agency
EET	Emission Estimation Technique
EMEP	European Monitoring and Evaluation Programme
EPA	Environmental Protection Agency
EU	European Union
GLC	Yer Seviyesi Konsantrasyonu
HKKD	Contribution to Air Pollution
KVS	Short Term Limit
SKHKKY	Industrial Air Pollution Control Regulation
UVS	Long Term Limit
VKT	Vehicle Kilometres Travelled

1. INTRODUCTION

The report has been prepared by Hacettepe University Environmental Engineering Department to be used in the Environmental Impact Assessment Report prepared for Aydın-Denizli Motorway Project South Alternative:km 15+856 - 34+630.

The report has been prepared using the AERMOD distribution model to examine the distribution of the emissions of the Aydın-Denizli Motorway Project South Alternative:km 15+856 - 34+630 and the contribution values of the other facilities within the impact area to the regional air pollution and their distribution in the impact area of the project.

With the air quality modeling study, the air pollution contribution value (HKKK) and air quality values within the facility's impact area were calculated and compared with the relevant limit values. The results obtained from the modeling studies were evaluated in accordance with the Industrial Air Pollution Control Regulation (SKHKKY), which entered into force on 03.07.2009.

The following part of the report gives information about the national legislation determining the limit values of the emissions arising from the project's construction phase in the external environment. Emission data obtained from the environmental impact assessment reports of the facilities in the project's impact area are summarized in the following sections. The method and model inputs used in the modeling are given in Chapter 3 of the report. Chapter 4 includes the results of the modeling studies within the specified framework of the Industrial Air Pollution Control Regulation (SKHKKY) (Official Gazette, Industrial Air Pollution Control Regulation, 2009) and an overall assessment of their possible effects on local air quality.

1.1 Legal Status

Improvements in air management policies in Turkey gained momentum with Turkey's acceptance of the European Union (EU) Integrated Environment Strategy. Accordingly, Turkey's legislation has fully complied with the EU Air Quality Framework Directive (and related directives).

The regulations in force in Turkey regarding emissions and air quality from highway projects and mining facilities are listed below:

- Air Quality Assessment and Management Regulation (HKDYY), published in the Official Gazette dated 06 June 2008 and numbered 26898;

- Industrial Air Pollution Control Regulation (SKHKKY) published in the Official Gazette No. 27277 dated 03 July 2009 (Official Gazette, Industrial Air Pollution Control Regulation, 2009); (SKHKKY)

As a result of the Air Quality Assessment and Management Regulation (HKDYY) being published in the Official Gazette No. 26898 on 06.06.2008, the Air Quality Protection Regulation (HKKY) was repealed. The HKDYY aims to improve ambient air quality and provide the limit value determined on a targeted date. Therefore, the regulation defines two types of limit values: transition period limit values and target limit values for gaseous pollutants and particulate matter. The values used in the evaluation study and the dates they were put into practice are shown in Table 1.

With SKHKKY, to control the emissions in the form of soot, smoke, dust, gas, steam, and aerosol emitted into the atmosphere as a result of the activities of industry and power generation facilities; to protect people and their environment from the dangers arising from pollution in the air-receiving environment; to eliminate the adverse effects that cause significant damage to the public and neighborhood relations due to air pollution in the background and to determine the procedures and principles to prevent the emergence of these effects are aimed.

Particulate matter is the primary pollutant emission released into the atmosphere within the scope of motorway projects. Limit values to be provided in outdoor air are defined in Table 2.2 of SKHKKY Annex-2; these limit values are given in Table 1.

Table 1. Limit Values Specified in the Industrial Air Pollution Control Regulation

Pollutant	Average Duration	Limit Value (µg/m^3)	Date to Reach Limit Value
PM_{10}	24 hour (for the protection of human health)	50 (It cannot be exceeded more than 35 times in a year)	1.1.2019
	Yearly (for the protection of human health)	40	1.1.2019
Settled Dust	KVS (mg/m2-day)	390	
	UVS (mg/m2-day)	210	

2. DATA USED IN THE STUDY

In this section, the data used in the modeling study are defined.

2.1 Meteorological Data Set

The long-term meteorological data required for modeling studies are obtained from the existing meteorological stations in the region.

For the AERMOD model, hourly surface station data is measured at air conditioning, synoptic or automatic type stations, and sounding meteorological information is calculated at rawinsonde stations where the vertical profile of the atmosphere is determined.

In this study, hourly meteorological data sets required according to the project region were obtained from the closest synoptic ground observation station Aydın (17234) and rawinsonde station Izmir (17220) for the the planned project. While selecting the meteorological data set, the wind speed and wind direction data of the Aydın (17234) Meteorology Stations measured data between 1960-2019 were used to extract the wind profile of the regions.

The wind profile for the years 1960-2019 is shown in Figure 1 for the Aydın meteorology station. As shown in Table2; there is no exact year matching with the years 1960-2019 from the data of the last ten years. For this reason, the total estimation of the previous ten years was taken into account, and it was seen that the 2019 data matched precisely, as shown in Table 2. The total wind blow numbers for the last ten years are shown in Figure 2, and the total wind blow numbers for 2019 are shown in Figure 3. For this reason, 2019 was deemed appropriate to represent Aydın meteorological station.

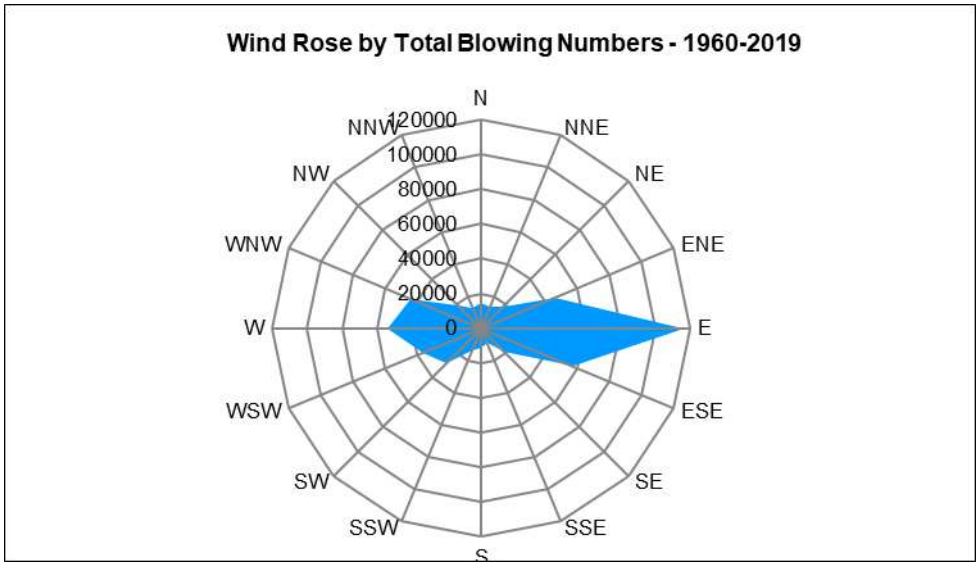

Figure 1. Aydın Meteorology Station 1960-2019 Wind Diagram

Table 2. Aydın Meteorology Station 1960-2019, Last 10 Years and Last 10 Years Total Wind Direction

Direction/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Last ten years	1960-2019
N	418	211	198	146	223	223	232	232	207	432	2522	14344
NNE	1043	176	173	128	165	161	158	218	165	277	2664	13453
NE	1425	193	193	140	231	173	225	296	292	413	3581	17670
ENE	1535	640	718	674	834	711	1431	1666	1539	1790	11538	45872
E	813	2612	2680	2491	2502	2223	2094	1841	1977	1036	20269	116644
ESE	250	628	751	607	602	559	362	386	283	160	4588	57016
SE	232	299	311	276	239	289	256	232	194	99	2427	19002
SSW	228	246	217	240	224	242	216	223	164	121	2121	9068
S	328	256	224	265	281	311	353	339	345	300	3002	11161
SSW	561	377	347	374	376	473	597	624	517	635	4881	13757
SW	518	622	595	646	648	710	990	965	706	910	7310	28583
WSW	337	970	858	1043	846	908	663	745	648	708	7726	36317
W	318	724	747	759	648	761	455	436	628	283	5759	53975
WNW	218	415	340	452	341	412	147	187	225	115	2852	43865
NW	195	238	212	222	156	197	94	109	120	133	1676	18048
NNW	260	161	145	96	111	136	117	147	103	190	1466	12742

Highest
Second Highest
Third Highest

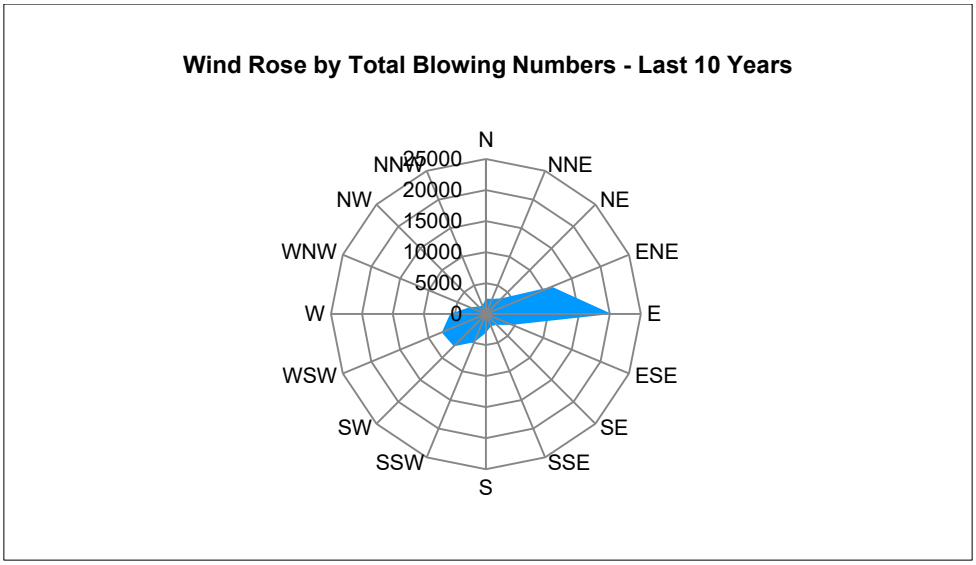

Figure 2. Aydın Meteorology Station Total Number of Winds, Wind Diagram for the Last 10 Years

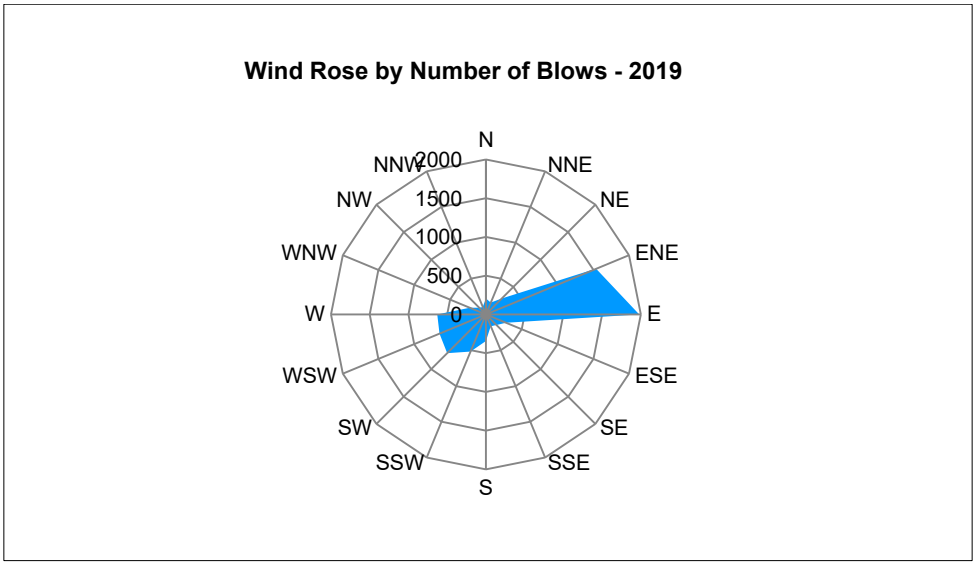

Figure 3. Aydın Meteorology Station Total Winds in 2019 Wind Diagram

2.2 Emissions

In this section, the emissions that will arise from the construction phase of the planned project the measures to be taken to keep these emissions to a minimum are summarized.

Dust emissions will occur during the construction activities to be carried out in the activity area. Dust emissions that will occur during the facility's operation are calculated according to the emissions released by the Australian Government Department of Environment in the Technique Manual for Mining" and given in Table 3.

Table 3 Default Emission Factors for Various Operations at Mines

Activity	PM_{10} Default Emission Factor	Unit
Excavators/Shovels/Front-end loaders (on overburden).	0.012	kg/t
Excavators/Shovels/ Front-end loaders (on coal).	0.014	kg/t
Scrapers (removing topsoil)	0.0073	kg/t
Material loading-unloading	0.0043	kg/t
Blasting	0.00114 ×A^1.5	kg/patlatma
Wheel generated dust from unpaved roads at industrial sites	1.25	kg/VKT
Wind Erosion	0.2	kg/ha/saat
Primary crusher	0.02	kg/t

Reference: Australian Government, EET for mining, version 3.1, Table 2

A=blasting area,m^2

2.2.1 Section 1 Emission Calculations

2.2.1.1. Motorway Construction Emissions

Amount of material to be removed(m^3/year) = 26995 m x 45m x 1 m = 1,214,775 m^3/year

Amount of material to be removed (ton/year) = 1,214,775 m^3 x 1.6 ton/m3= 1,943,640 ton/year

Amount of material to be removed (ton/hour) = 1,943,640 ton/year x 1year/365 day x 8 day /24 h = 665.63 ton/hour

road-lenght=26,995 m

road-width=45m

road-depth=1 m

75% of the calculated amount was used in the modeling study since it is known that there will be no work all the motorway at the same time.

a) The amount of dust that may occur during the excavate of overburden:

Uncontrolled = 499.2 tons/hour x 0.012 kg/t = 5.99 kg/h

Controlled = Uncontrolled x Control Efficiency = 5.99 kg/h x %50 = 2.99 kg/h

b) Amount of dust that may occur during loading- unloading:

Uncontrolled = 499.2 tons/hour x 0.0043 kg/t = 2.148 kg/h

Controlled = Uncontrolled x Control Efficiency = 2.148 kg/h x %50 = 1.074 kg/h

2.2.1.2. Dalama 7 Quarry

The operation period of the mentioned mine is 5 years and 20% of the production is waste. This overburden will be taken and then will be stored for use in rehabilitation works.

As the maximum production amount within the scope of the project will be 1560000 tons/year;

The amount of waste/overburden to be produced in a year: [1560000 tons/year] x [0.2] = 312000 tons/year

Considering that overburdened land will be purchased during one year of work in the operation area;

Annual Amount of overburden= 312,000 tons/year

Daily Overburden Amount = 1,248 tons/day

Hourly Overburden Amount = 156 tons/hour

Number of Shifts = 1

Monthly Working Time = 25 days/month

Daily Working Time = 8 hours/day

Annual total amount of limestone (tonnes)	Daily total amount of limestone (tonnes)	Hourly total amount of limestone (tonnes)
1,248,000	4992	624
Annual total amount of overburden (tonnes)	Daily total amount of overburden (tonnes)	Hourly total amount of overburden (tonnes)
312,000	1248	156

1. Dust Amount That May Occur During Overburden Operations

a) The amount of dust that may occur during the excavate of overburden:

Uncontrolled = 156 tons/hour x 0.012 kg/t = 1.872 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.872 kg/h x %50 = 0.936 kg/h

b) The amount of dust emission that may occur during the loading of overburden into trucks:

Uncontrolled = 156 tons/hour x 0.0043 kg/t = 0.671 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.671 kg/h x %50 = 0.336 kg/h

c) The amount of dust that may occur during the transportation of overburden:

The daily amount of overburden will be around 1248 tons. For transporting the soil 1 truck with a capacity of 40 tons will make a total of 32 trips in 1 day. The overburdened storage area is located at a distance of up to 680 meters. The waste will be stored in the storage area. However, the furthest distance from the waste storage area to the mining area will be taken as

half of it to provide the average distance for a whole year. Considering this, 680 meters will be traveled each time (round trip).

VKT= 32 trips/day x 1day/8 hour x 0.680 km/trip = 2.72 km/h

Uncontrolled = 1.25 kg/VKT x 2.72 km/h kg/t = 3.4 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.4 kg/h x %50 = 1.7 kg/h

d) The amount of dust that may occur during the discharge of overburden to the storage area:

Uncontrolled = 156 tons/hour x 0.0043 kg/t = 0.671 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.671 kg/h x %50 = 0.336 kg/h

e) The amount of dust that may occur during the storage of overburden:

Uncontrolled = 0.2kg/ha/saat x 0.95 ha = 0.19 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.19 kg/h x %50 = 0.095 kg/h

2. Calculation of Dust to be Formed within the Scope of Quarry Activities:

Production of 1248000 tons/year in total (1560000 tons x 80%) per year in the quarry area is planned.

The material to be dismantled by the blasting method will be loaded on trucks and transported. This is the amount of dust that will occur during the work to be carried out in the quarry;

Annual Working Time: 250 days/year

Monthly Working Time: 25 days/month

Daily Working Time: 8 hours/day

Annual Production: 1,248,000 tons/year

Daily Production: 4,992 tons/day

Hourly Production: 624 tons/hour

a) Amount of dust that may occur during blasting operations:

Emission = $0{,}000114 \times A^{1,5} = 0{,}000114 \times 485^{1,5}$ = 2.349 kg/blasting

A= Total Area of Blasting = 485 m^2

Assuming that the dust is damped within 10 seconds in each blast and it will be done in an area of 485 m^2;

2.349 kg/blast x 1 blast/ (10 sec x 485m2) x 1000 gr/kg = 0.4843 g/s.m2.

b) Amount of dust that may occur during excavate:

Uncontrolled = 624 tons/hour x 0.014 kg/t = 8.736 kg/h

Controlled = Uncontrolled x Control Efficiency = 8.736 kg/h x %50 = 4.368 kg/h

c) Amount of dust that may occur during loading:

Uncontrolled = 624 tons/hour x 0.0043 kg/t = 2.6832 kg/h

Controlled = Uncontrolled x Control Efficiency = 2.6832 kg/h x %50 = 1.3416 kg/h

d) The amount of dust that may occur during the movements of the vehicles inside the query:

The daily amount of ore will be around 4,992 tons. For transporting the ore 1 truck with a capacity of 40 tons will make a total of 125 trips in 1 day. Ore storage area is located at a distance of up to 830 meters. If we take half of this 415-meter distance in the quarry area, we get the average distance during the years of production. For this reason, the average distance will be 415 meters and 830 meters will be covered each time (round trip).

VKT= 125 trips/day x 1day/8 hour x 0.830 km/trip = 12.9688 km/h

Uncontrolled = 1.25 kg/VKT x 12.9688 km/h kg/t = 16.21 kg/h

Controlled = Uncontrolled x Control Efficiency = 16.21 kg/h x %50 = 8.11 kg/h

2.2.1.3. Dalama 3 Quarry

The operation period of the mentioned mine is 5 years and 20% of the production is waste. This overburden will be taken and then will be stored for use in rehabilitation works.

As the maximum production amount within the scope of the project will be 1,593,800 tons/year;

The amount of waste/overburden to be produced in a year: [1,593,800 tons/year] x [0.2] =318,760 tons/year

Considering that overburdened land will be purchased during one year of work in the operation area;

Annual Amount of overburden= 318,760 tons/year

Daily Overburden Amount = 1,275 tons/day

Hourly Overburden Amount = 159.4 tons/hour

Number of Shifts = 1

Monthly Working Time = 25 days/month

Daily Working Time = 8 hours/day

Annual total amount of limestone (tonnes)	Daily total amount of limestone (tonnes)	Hourly total amount of limestone (tonnes)
1,275,040	5100.2	637.5
Annual total amount of overburden (tonnes)	Daily total amount of overburden (tonnes)	Hourly total amount of overburden (tonnes)
318,760	1275	159.4

1. Dust Amount That May Occur During Overburden Operations

a) The amount of dust that may occur during the excavate of overburden:

Uncontrolled = 159.4 tons/hour x 0.012 kg/t = 1.913 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.913 kg/h x %50 = 0.957 kg/h

b) The amount of dust emission that may occur during the loading of overburden into trucks:

Uncontrolled = 159.4 tons/hour x 0.0043 kg/t = 0.685 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.685 kg/h x %50 = 0.343 kg/h

c) The amount of dust that may occur during the transportation of overburden:

The daily amount of overburden will be around 1275 tons. For transporting the soil 1 truck with a capacity of 40 tons will make a total of 32 trips in 1 day. The overburdened storage area

is located at a distance of up to 580 meters. The waste will be stored in the storage area. However, the furthest distance from the waste storage area to the mining area will be taken as half of it to provide the average distance for a whole year. Considering this, 580 meters will be traveled each time (round trip).

VKT= 32 trips/day x 1day/8 hour x 0.580 km/trip = 2.3199 km/h

Uncontrolled = 1.25 kg/VKT x 2.3199 km/h kg/t = 2.899 kg/h

Controlled = Uncontrolled x Control Efficiency = 2.899 kg/h x %50 = 1.450 kg/h

d) The amount of dust that may occur during the discharge of overburden to the storage area:

Uncontrolled = 159.4 tons/hour x 0.0043 kg/t = 0.685 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.685 kg/h x %50 = 0.343 kg/h

e) The amount of dust that may occur during the storage of overburden:

Uncontrolled = 0.2kg/ha/saat x 0.95 ha = 0.19 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.19 kg/h x %50 = 0.095 kg/h

2. Calculation of Dust to be Formed within the Scope of Quarry Activities:

Production of 1,275,040 tons/year in total (1,593,800 tons x 80%) per year in the quarry area is planned.

The material to be dismantled by the blasting method will be loaded on trucks and transported. This is the amount of dust that will occur during the work to be carried out in the quarry;

Annual Working Time: 250 days/year

Monthly Working Time: 25 days/month

Daily Working Time: 8 hours/day

Annual Production: 1,275,040 tons/year

Daily Production: 5100.2tons/day

Hourly Production: 637.5 tons/hour

e) Amount of dust that may occur during blasting operations:

Emission = $0{,}000114 \times A^{1,5} = 0{,}000114 \times 485^{1,5}$ = 2.349 kg/blasting

A= Total Area of Blasting = 485 m^2

Assuming that the dust is damped within 10 seconds in each blast and it will be done in an area of 485 m^2;

2.349 kg/blast x 1 blast/ (10 sec x 485m2) x 1000 gr/kg = 0.4843 g/s.m2.

f) Amount of dust that may occur during excavate:

Uncontrolled = 637.5 tons/hour x 0.014 kg/t = 8.925 kg/h

Controlled = Uncontrolled x Control Efficiency = 8.925 kg/h x %50 = 4.463 kg/h

g) Amount of dust that may occur during loading:

Uncontrolled = 637.5 tons/hour x 0.0043 kg/t = 2.7413 kg/h

Controlled = Uncontrolled x Control Efficiency = 2.7413 kg/h x %50 = 1.3707 kg/h

h) The amount of dust that may occur during the movements of the vehicles inside the query:

The daily amount of ore will be around 5100.2 tons. For transporting the ore 1 truck with a capacity of 40 tons will make a total of 128 trips in 1 day. Ore storage area is located at a distance of up to 740 meters. If we take half of this 740-meter distance in the quarry area, we get the average distance during the years of production. For this reason, the average distance will be 370 meters and 740 meters will be covered each time (round trip).

VKT= 128 trips/day x 1day/8 hour x 0.740 km/trip = 11.84 km/h

Uncontrolled = 1.25 kg/VKT x 11.84 km/h kg/t = 14.8 kg/h

Controlled = Uncontrolled x Control Efficiency = 14.81 kg/h x %50 = 7.4 kg/h

2.2.1.4. Yenipazar,Hamzabali Concrete Plants

For 1 m^3 of concrete production, according to the properties of the concrete; an average of 1,800 kg of aggregate, 300 kg of cement, 180 liters of water, chemical additives, and water-retaining chemical additives are used. Therefore, for an hourly 90 m^3 concrete production; 162 tons/hour aggregate and 27tons/hour cement will be used.

The production information will enter the Concrete Plant Facility as raw materials are given below;

Hourly Production	**:**	**225**	**Ton**	**90**	**m³**
Number of Shifts	:	1		1	
Annual Working Time	:	250	Days/year	250	Days/year
Monthly Working Time	:	25	Day/Month	25	Day/Month
Daily Working Time	:	8	Hours/day	8	Hours/day

a) The Amount of Dust that May Occurs During the Transport of the Material to the Concrete Plant Facility:

The hourly production amount will be around 162 tons. 1 truck of 40 tons will make a total of 4 trips in 1 hour for transportation of raw materials to the facility.

VKT= 4 trips/hour x 0.200 km/trip = 0.8 km/h

Uncontrolled = 1.25 kg/VKT x 0.8 km/h = 1 kg/h

Controlled = Uncontrolled x Control Efficiency = 1 kg/h x %50 = 0.5kg/h

b) The amount of dust that will occur during the Discharge of aggregate into the Bunker:

Uncontrolled = 162 tons/hour x 0.0043 kg/t = 0.6966 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.6966 kg/h x %50 = 0.3483 kg/h

c) The amount of dust that will occur during the loading the material leaving the concrete plant:

Uncontrolled = 225 tons/hour x 0.0043 kg/t = 0.9675 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.9675 kg/h x %50 = 0.4838 kg/h

d) The Amount of Dust that May Occurs During the Transport of the Material from the Concrete Plant Facility:

The hourly production amount will be around 162 tons. 1 truck of 40 tons will make a total of 4 trips in 1 hour for transportation of raw materials to the facility.

VKT= 4 trips/hour x 0.200 km/trip = 0.8 km/h

Uncontrolled = 1.25 kg/VKT x 0.8 km/h = 1 kg/h

Controlled = Uncontrolled x Control Efficiency = 1 kg/h x %50 = 0.5kg/h

2.2.1.5. Yenipazar,Direcik Concrete Plants

For 1 m^3 of concrete production, according to the properties of the concrete; an average of 1,800 kg of aggregate, 300 kg of cement, 180 liters of water, chemical additives, and water-retaining chemical additives are used. Therefore, for an hourly 90 m^3 concrete production; 162 tons/hour aggregate and 27tons/hour cement will be used.

The production information will enter the Concrete Plant Facility as raw materials are given below;

Hourly Production	**:**	**225**	**Ton**	**90**	**m³**
Number of Shifts	:	1		1	
Annual Working Time	:	250	Days/year	250	Days/year
Monthly Working Time	:	25	Day/Month	25	Day/Month
Daily Working Time	:	8	Hours/day	8	Hours/day

a) The Amount of Dust that May Occurs During the Transport of the Material to the Concrete Plant Facility:

The hourly production amount will be around 162 tons. 1 truck of 40 tons will make a total of 4 trips in 1 hour for transportation of raw materials to the facility.

VKT= 4 trips/hour x 0.200 km/trip = 0.8 km/h

Uncontrolled = 1.25 kg/VKT x 0.8 km/h = 1 kg/h

Controlled = Uncontrolled x Control Efficiency = 1 kg/h x %50 = 0.5kg/h

b) The amount of dust that will occur during the Discharge of aggregate into the Bunker:

Uncontrolled = 162 tons/hour x 0.0043 kg/t = 0.6966 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.6966 kg/h x %50 = 0.3483 kg/h

c) The amount of dust that will occur during the loading the material leaving the concrete plant:

Uncontrolled = 225 tons/hour x 0.0043 kg/t = 0.9675 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.9675 kg/h x %50 = 0.4838 kg/h

d) The Amount of Dust that May Occurs During the Transport of the Material from the Concrete Plant Facility:

The hourly production amount will be around 162 tons. 1 truck of 40 tons will make a total of 4 trips in 1 hour for transportation of raw materials to the facility.

VKT= 4 trips/hour x 0.200 km/trip = 0.8 km/h

Uncontrolled = 1.25 kg/VKT x 0.8 km/h = 1 kg/h

Controlled = Uncontrolled x Control Efficiency = 1 kg/h x %50 = 0.5kg/h

2.2.1.6. Yeniköy- Mechanical Plant

The mechanical stabilization facility to be established will have a capacity of 400 tons/hour.

The facility will operate 300 days a year, 8 hours a day. Therefore,

1-The Amount of Dust That May Occur During Loading:

Uncontrolled = 400 tons/hour x 0.0043 kg/t = 1.72 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.72 kg/h x %50 = 0.86 kg/h

2-The Amount of Dust That May Be Occurred During the Movements of the Vehicles:

1 truck of 40 tons will make a total of 10 trips in 1 a hour for transportation.

VKT= 10 trips/day x 1day/8 hour x 0.200 km/trip = 0.2km/h

Uncontrolled = 1.25 kg/VKT x 0.2 km/h = 0.25kg/h

Controlled = Uncontrolled x Control Efficiency =0.25 kg/h x %50 = 0.125 kg/h

3. Amount of dust that may occur during unloading:

Uncontrolled = 400 tons/hour x 0.0043 kg/t = 1.72 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.72 kg/h x %50 = 0.86 kg/h

2.2.1.7. Dereköy Crushing and Screening Plant

1. Amount of Dust to be Formed within the Scope of Crushing Activities:

395,000 tons of the material to be extracted from the quarry will be installed into crushing units. According to this:

Annual Working Time: 250 days/year

Monthly Working Time: 25 days/month

Daily Working Time: 8 hours/day

Annual Production: 395,000 tons/year

Daily Production: 1,580 tons/day

Hourly Production: 197.5 tons/hour

a) The amount of dust that may occur during the discharge of the material:

Uncontrolled = 197.5 tons/hour x 0.0043 kg/t = 0.8493 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.8493 kg/h x %50 = 0.4246 kg/h

b) The amount of dust that may occur during primary crushing operations:

Uncontrolled = 197.5 tons/hour x 0.02 kg/t = 3.95 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.95 kg/h x %95 = 0.1975 kg/h

c) The amount of dust that may occur during secondary crushing operations:

Uncontrolled = 197.5 tons/hour x 0.02 kg/t = 3.95 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.95 kg/h x %95 = 0.1975 kg/h

d) The amount of dust that may occur during the loading of the material:

Uncontrolled = 197.5 tons/hour x 0.0043 kg/t = 0.8493 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.8493 kg/h x %50 = 0.4246 kg/h

2.2.1.8. Akçaköy Crushing and Screening Plant

1. Amount of Dust to be Formed within the Scope of Crushing Activities:

332,800 tons of the material to be extracted from the quarry will be installed into crushing units. According to this:

Annual Working Time: 250 days/year

Monthly Working Time: 25 days/month

Daily Working Time: 8 hours/day

Annual Production: 332,800 tons/year

Daily Production: 1,331.2 tons/day

Hourly Production: 166.4 tons/hour

a) The amount of dust that may occur during the discharge of the material:

Uncontrolled = 166.4 tons/hour x 0.0043 kg/t = 0.7155 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.7155 kg/h x %50 = 0.3578 kg/h

b) The amount of dust that may occur during primary crushing operations:

Uncontrolled = 166.4 tons/hour x 0.02 kg/t = 3.33 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.33 kg/h x %95 = 0.17 kg/h

c) The amount of dust that may occur during secondary crushing operations:

Uncontrolled = 166.4 tons/hour x 0.02 kg/t = 3.33 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.33 kg/h x %95 = 0.17 kg/h

d) The amount of dust that may occur during the loading of the material:

Uncontrolled = 166.4 tons/hour x 0.0043 kg/t = 0.7155 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.7155 kg/h x %50 = 0.3578 kg/h

2.2.1.9. Cine- Mechanical Plant Dust Calculation

The mechanical stabilization facility to be established will have a capacity of 400 tons/hour. The facility will operate 300 days a year, 8 hours a day. Therefore,

1-The Amount of Dust That May Occur During Loading:

Uncontrolled = 400 tons/hour x 0.0043 kg/t = 1.72 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.72 kg/h x %50 = 0.86 kg/h

2-The Amount of Dust That May Be Occurred During the Movements of the Vehicles:

1 truck of 40 tons will make a total of 10 trips in 1 a hour for transportation.

VKT= 10 trips/day x 1day/8 hour x 0.200 km/trip = 0.2km/h

Uncontrolled = 1.25 kg/VKT x 0.2 km/h = 0.25kg/h

Controlled = Uncontrolled x Control Efficiency =0.25 kg/h x %50 = 0.125 kg/h

3. Amount of dust that may occur during unloading:

Uncontrolled = 400 tons/hour x 0.0043 kg/t = 1.72 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.72 kg/h x %50 = 0.86 kg/h

2.2.1.10. Dalama 2 Quarry

The operation period of the mentioned mine is 5 years and 20% of the production is waste. This overburden will be taken and then will be stored for use in rehabilitation works.

As the maximum production amount within the scope of the project will be 1560000 tons/year;

The amount of waste/overburden to be produced in a year: [1560000 tons/year] x [0.2] = 312000 tons/year

Considering that overburdened land will be purchased during one year of work in the operation area;

Annual Amount of overburden= 312,000 tons/year

Daily Overburden Amount = 1,248 tons/day

Hourly Overburden Amount = 156 tons/hour

Number of Shifts = 1

Monthly Working Time = 25 days/month

Daily Working Time = 8 hours/day

Annual total amount of limestone (tonnes)	Daily total amount of limestone (tonnes)	Hourly total amount of limestone (tonnes)
1,248,000	4992	624
Annual total	Daily total	Hourly total

amount of overburden (tonnes)	amount of overburden (tonnes)	amount of overburden (tonnes)
312,000	1248	156

1. Dust Amount That May Occur During Overburden Operations

a) The amount of dust that may occur during the excavate of overburden:

Uncontrolled = 156 tons/hour x 0.012 kg/t = 1.872 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.872 kg/h x %50 = 0.936 kg/h

b) The amount of dust emission that may occur during the loading of overburden into trucks:

Uncontrolled = 156 tons/hour x 0.0043 kg/t = 0.671 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.671 kg/h x %50 = 0.336 kg/h

c) The amount of dust that may occur during the transportation of overburden:

The daily amount of overburden will be around 1248 tons. For transporting the soil 1 truck with a capacity of 40 tons will make a total of 32 trips in 1 day. The overburdened storage area is located at a distance of up to 200 meters. The waste will be stored in the storage area. However, the furthest distance from the waste storage area to the mining area will be taken as half of it to provide the average distance for a whole year. Considering this, 680 meters will be traveled each time (round trip).

VKT= 32 trips/day x 1day/8 hour x 0.20 km/trip = 0.8 km/h

Uncontrolled = 1.25 kg/VKT x 0.8 km/h kg/t = 1 kg/h

Controlled = Uncontrolled x Control Efficiency = 1 kg/h x %50 = 0.5 kg/h

d) The amount of dust that may occur during the discharge of overburden to the storage area:

Uncontrolled = 156 tons/hour x 0.0043 kg/t = 0.671 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.671 kg/h x %50 = 0.336 kg/h

e) The amount of dust that may occur during the storage of overburden:

Uncontrolled = 0.2kg/ha/saat x 0.95 ha = 0.19 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.19 kg/h x %50 = 0.095 kg/h

2. Calculation of Dust to be Formed within the Scope of Quarry Activities:

Production of 1248000 tons/year in total (1560000 tons x 80%) per year in the quarry area is planned.

The material to be dismantled by the blasting method will be loaded on trucks and transported. This is the amount of dust that will occur during the work to be carried out in the quarry;

Annual Working Time: 250 days/year

Monthly Working Time: 25 days/month

Daily Working Time: 8 hours/day

Annual Production: 1,248,000 tons/year

Daily Production: 4,992 tons/day

Hourly Production: 624 tons/hour

a) Amount of dust that may occur during blasting operations:

Emission = $0{,}000114 \times A^{1,5} = 0{,}000114 \times 485^{1,5}$ = 2.349 kg/blasting

A= Total Area of Blasting = 485 m^2

Assuming that the dust is damped within 10 seconds in each blast and it will be done in an area of 485 m^2;

2.349 kg/blast x 1 blast/ (10 sec x 485m2) x 1000 gr/kg = 0.4843 g/s.m2.

b) Amount of dust that may occur during excavate:

Uncontrolled = 624 tons/hour x 0.014 kg/t = 8.736 kg/h

Controlled = Uncontrolled x Control Efficiency = 8.736 kg/h x %50 = 4.368 kg/h

c) Amount of dust that may occur during loading:

Uncontrolled = 624 tons/hour x 0.0043 kg/t = 2.6832 kg/h

Controlled = Uncontrolled x Control Efficiency = 2.6832 kg/h x %50 = 1.3416 kg/h

d) The amount of dust that may occur during the transport of the ore to the crushing plant:

The daily amount of ore will be around 4,992 tons. For transporting the ore 1 truck with a capacity of 40 tons will make a total of 125 trips in 1 day. Crushing plant is located at a distance of up to 50 meters. The average distance will be 50 meters and 100 meters will be covered each time (round trip).

VKT= 125 trips/day x 1day/8 hour x 0.10 km/trip = 1.5625 km/h

Uncontrolled = 1.25 kg/VKT x = 1.5625 km/h kg/t = 1.953 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.953 kg/h x %50 = 0.977 kg/h

3. Amount of Dust to be Formed within the Scope of Crushing Activities:

395,000 tons of the material to be extracted from the quarry will be installed into crushing units. According to this:

Annual Working Time: 250 days/year

Monthly Working Time: 25 days/month

Daily Working Time: 8 hours/day

Annual Production: 395,000 tons/year

Daily Production: 1,580 tons/day

Hourly Production: 197.5 tons/hour

a) The amount of dust that may occur during the discharge of the material:

Uncontrolled = 197.5 tons/hour x 0.0043 kg/t = 0.8493 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.8493 kg/h x %50 = 0.4246 kg/h

b) The amount of dust that may occur during primary crushing operations:

Uncontrolled = 197.5 tons/hour x 0.02 kg/t = 3.95 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.95 kg/h x %95 = 0.1975 kg/h

c) The amount of dust that may occur during secondary crushing operations:

Uncontrolled = 197.5 tons/hour x 0.02 kg/t = 3.95 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.95 kg/h x %95 = 0.1975 kg/h

d) The amount of dust that may occur during the loading of the material:

Uncontrolled = 197.5 tons/hour x 0.0043 kg/t = 0.8493 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.8493 kg/h x %50 = 0.4246 kg/h

4. The amount of dust that may occur during the transportation of the material out of the project area:

The daily production amount will be around 4,992 tons. 1 truck of 40 tons will make a total of 125 trips in 1 day for transportation to the abroad quarry area border. The stabilized road length between the asphalt road and the project area was measured as 100 meters. To prevent dusting, after 100 m, the road will be covered with bitumen or asphalt material until the connection point of the stabilized road.)

VKT= 125 trips/day x 1day/8 hour x 0.200 km/trip = 3.1251 km/h

Uncontrolled = 1.25 kg/VKT x 3.1251 km/h kg/t = 3.9063 kg/h

Controlled = Uncontrolled x Control Efficiency = 3.9063 kg/h x %50 = 1.9531 kg/h

2.2.1.11. Dalama Asphalt Plant

The production information will enter the Asphalt Plant Facility as raw materials are given below;

Annual Working Time: 300 days/year

Monthly Working Time: 25 days/month

Daily Working Time: 8 hours/day

Annual Production: 816,000 tons/year

Daily Production: 2,720 tons/day

Hourly Production: 340 tons/hour

a) The Amount of Dust that May Occurs During the Transport of the Material to the Asphalt Plant Facility:

A total of 68 trips in 1 day by 1 truck of 40 tons to transport the aggregate to the asphalt plant. There is a distance of 85 meters between the construction site and the asphalt plant. According to this;

VKT= 68 trips/day x 1day/8 hour x 0.170 km/trip = 1.445 km/h

Uncontrolled = 1.25 kg/VKT x 1.445 km/h kg/t = 1.8063 kg/h

Controlled = Uncontrolled x Control Efficiency = 1.8063 kg/h x %50 = 0.9031 kg/h

b) The Amount of Dust that May Be Occurs During the Discharging of the Material into the Silo:

Uncontrolled = 340 tons/hour x 0.0043 kg/t = 1.462 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.0043 kg/h x %50 = 0.731 kg/h

c) The Amount of Dust that May Be Occurs During the Discharging of the Material into the Storage Area:

A large part of the produced material will be shipped directly to the working area without stockpiling.

Aggregate will be stored in an area of approximately 5,300 m² for cases where stockpiling is required. 5m

Considering that the material will be stored at the height;

Limestone density x Storage Height x Area

5,300 m² x 5 m x 2.5 tons/m3 = 66,250 tons of material can be stored in the warehouse area. According to this;

Annual = 66,250 tons

Monthly = 5,520.8 tons

Daily = 220.8 tons

Hourly = 27.604 tons

Uncontrolled = 27.604 tons/hour x 0.0043 kg/t = 0.1187 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.1187 kg/h x %50 = 0.0593 kg/h

d)The amount of dust that may occur during the storage of the material:

Uncontrolled = 0.2 kg/ha/saat x 0.2 ha = 0.04 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.04 kg/h x %50 = 0.02 kg/h

e) The amount of dust that may occur during the transportation of the raw material out of the project area:

The daily production amount will be around 2720 tons. 1 truck of 40 tons will make a total of 68 trips in 1 day for transportation abroad. The stabilized road length between asphalt roads and the facility area was measured as 100 meters. However, since the round trip distance will be taken into account in the calculations, it will be considered as 200 meters.

VKT= 68 trips/day x 1day/8 hour x 0.200 km/trip = 1.7 km/h

Uncontrolled = 1.25 kg/VKT x 1.7 km/h kg/t = 2.125 kg/h

Controlled = Uncontrolled x Control Efficiency = 2.125 kg/h x %50 = 1.625 kg/h

2.2.1.12. Dalama Concrete Plant

For 1 m^3 of concrete production, according to the properties of the concrete; an average of 1,800 kg of aggregate, 300 kg of cement, 180 liters of water, chemical additives, and water-retaining chemical additives are used. Therefore, for an hourly 90 m^3 concrete production; 162 tons/hour aggregate and 27tons/hour cement will be used.

The production information will enter the Concrete Plant Facility as raw materials are given below;

Hourly Production	**:**	**225**	**Ton**	**90**	**m³**
Number of Shifts	:	1		1	
Annual Working Time	:	250	Days/year	250	Days/year
Monthly Working Time	:	25	Day/Month	25	Day/Month
Daily Working Time	:	8	Hours/day	8	Hours/day

a) The Amount of Dust that May Occurs During the Transport of the Material to the Concrete Plant Facility:

The hourly production amount will be around 162 tons. 1 truck of 40 tons will make a total of 4 trips in 1 hour for transportation of raw materials to the facility.

VKT= 4 trips/hour x 0.200 km/trip = 0.8 km/h

Uncontrolled = 1.25 kg/VKT x 0.8 km/h = 1 kg/h

Controlled = Uncontrolled x Control Efficiency = 1 kg/h x %50 = 0.5kg/h

b) The amount of dust that will occur during the Discharge of aggregate into the Bunker:

Uncontrolled = 162 tons/hour x 0.0043 kg/t = 0.6966 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.6966 kg/h x %50 = 0.3483 kg/h

c) The amount of dust that will occur during the loading the material leaving the concrete plant:

Uncontrolled = 225 tons/hour x 0.0043 kg/t = 0.9675 kg/h

Controlled = Uncontrolled x Control Efficiency = 0.9675 kg/h x %50 = 0.4838 kg/h

d) The Amount of Dust that May Occurs During the Transport of the Material from the Concrete Plant Facility:

The hourly production amount will be around 162 tons. 1 truck of 40 tons will make a total of 4 trips in 1 hour for transportation of raw materials to the facility.

VKT= 4 trips/hour x 0.200 km/trip = 0.8 km/h

Uncontrolled = 1.25 kg/VKT x 0.8 km/h = 1 kg/h

Controlled = Uncontrolled x Control Efficiency = 1 kg/h x %50 = 0.5kg/h

3. METHOD

3.1 Methods Used in Modeling Studies

The latest AERMOD dispersion model (version 19191) published by the US-EPA was used in the modeling studies. The AERMOD model is internationally accepted and is used by many researchers, inspection, and authority bodies worldwide to estimate pollutant concentrations. (Langner and Kleemm, 2011).

The BREEZE (Trinity Consultants, version 7.7) graphical modeling interface was used to organize the modeling work. The model is one of the most advanced computer models that can predict hourly, daily and annual Ground Level Concentration (GLC) values based on real-time data that changes over time. The model includes many different emission model calculations ranging from isolated chimneys to fugitive pollutants (point, volume area), anconsidersaccount aerodynamic waves, turbulence, and similar events that pollutants can experience from sources in any industrial area.

The AERMOD model works in a mesh system defined by the user, and the calculations are made for the corner points of each receiving environment element that makes up the mesh system. The network system in which the AERMOD model is used can be defined as polar or cartesian, and more detailed calculations can be made at these points by determining discrete receiving points outside the network system. "Atmospheric Boundary Layer" is used as a stability model in diffusion calculations. The model also considers rough terrain. The AERMOD model uses the following four different data types:

- Hourly meteorological data of the nearest ground observation station such as wind direction, wind speed, temperature, cloud cover, and height,
- Meteorological sounding dataset representing upper atmosphere conditions, including the wind profile exponent and the potential vertical temperature difference observed at every 10 mb pressure change from ground level to 6000 m altitude.
- The coordinates and height and land use classes of each element in the network system defined as the receiving environment, as well as the Bowen ratio, roughness coefficient, and albedo value,
- Source data including source coordinates, source height, diameter, pollutant velocity, temperature, and flow rate determined by a user-defined starting point.

The model outputs are in a structure that will allow the preparation of distribution maps for the entire study area. Thus, it is possible to evaluate the region's air quality under different scenarios (ee.g., other treatment conditions, different sulfur contents, various pollutant sources, or changing seasonal conditions).

The modeling study, which enables the estimation of the concentrations of gaseous and dusty pollutants in the ambient air through mathematical calculations, consists of the following steps:

- The “Distribution Region” of the resources is determined.
- This distribution area is divided into 1000 m × 1000 m squares; latitude, longitude, and altitude information are provided. The vertices of the squares are the vertices.
- Coordinates and height information of sensitive receptors in the distribution region is defined in the model.
- Hourly ground and upper atmosphere meteorological data for a representative year are provided.

After transferring the processes listed above to the program, hourly, daily and annual ground-level content, ration values of pollutants in the ambient air can be estimated by running the modeling program. The model inputs used in this study are given in Chapter 2.

Using the EPA AERMET computer program (AERMOD Meteorological Pre-Processor) AERMET, the surface meteorological data taken from the stations determined as the most suitable year and the upper layers weather data taken from the rawinsonde stations were combined as a surface and upper air entry file to be used in AERMOD. The AERMET program is used as the meteorological preprocessor for AERMOD. AERMET is designed to combine surface and atmospheric weather data from field measurements and the National Meteorological Service for use in the AERMOD program. For example, site-specific parameters such as surface roughness coefficient, Bowen ratio, and albedo are defined at this stage. The wind rose obtained from the surface meteorological measurements carried out in the field of the selected years is given in Figure 4.

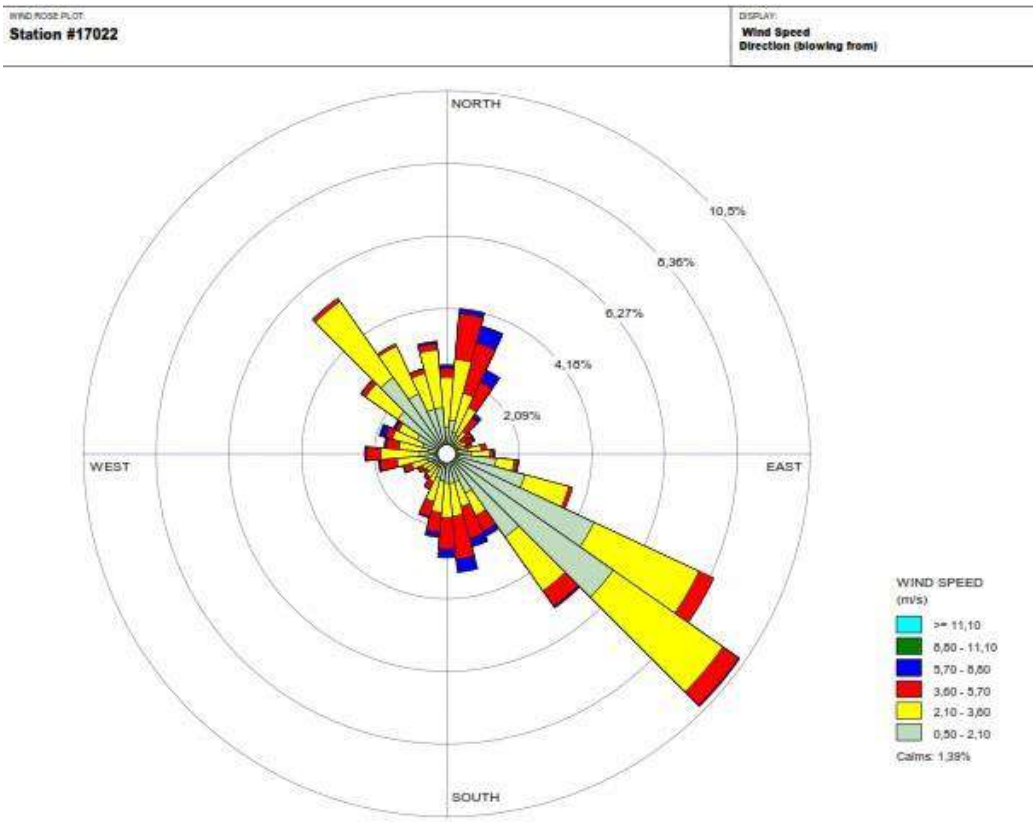

Figure 4. Wind Rose of Aydın Meteorology Station-2019

3.2 Receiving Environment System

As mentioned above, for the AERMOD model, the working area must be defined, and this area must be separated into the receiving environment elements.

The grid area defined as the study area for this study was determined by reference to the domain specified in SKHKKY for the modeling study. The model study used the grid system shown in Figure 5, which covers the impact area of all facilities at 500 m intervals. In addition, measurements were made in areas with high population density, and receptor points were defined within these areas, as seen in Figure 6. The coordinates and measurement results of points are given in Table 4 and Table 5. The measurements taken in August 2023 at the measurement points Yenipazar-2, Dereköy (Yenipazar), Alanlı-2, Dalama-2, and Dereköy (center) have not been included in the modeling work because they were taken while the construction phase was ongoing.

For all pollutants modeled with the help of the model, the GLC values formed at the corner points of each receiving environment element in the impact area were calculated daily and

annually. GLC values were calculated for each receiving environment point, and these values were compared with the limit values specified in the regulation for the relevant parameter.

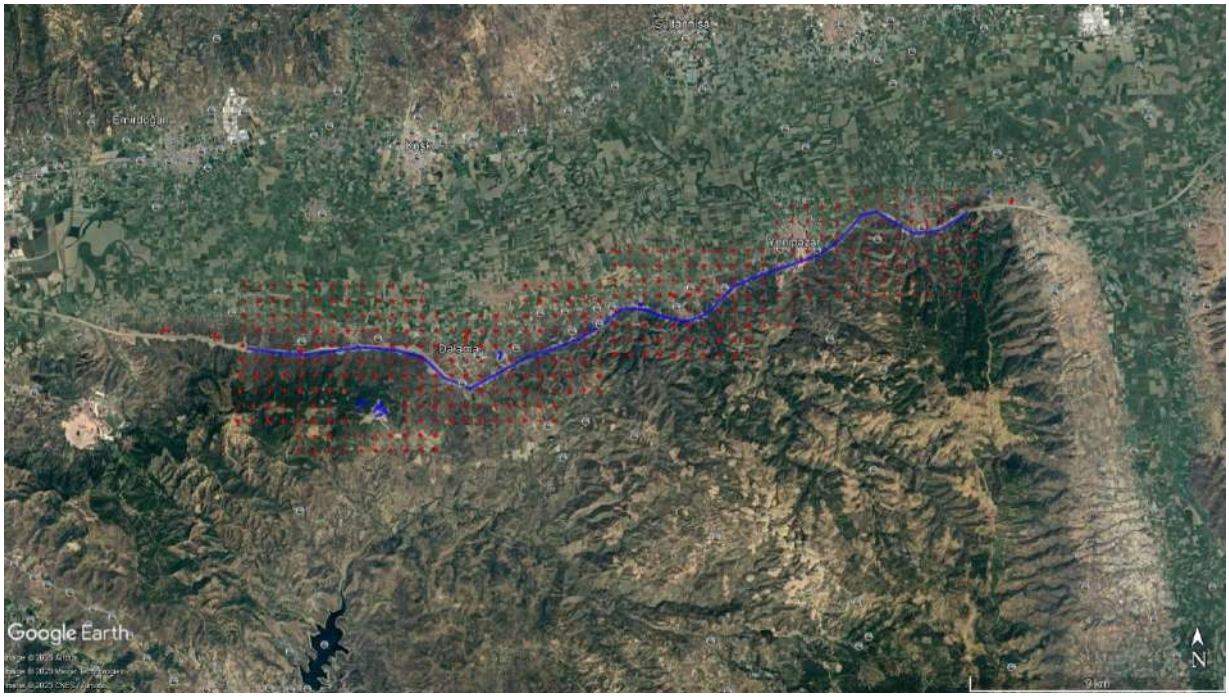

Figure 5. Grid System Used in Model Study

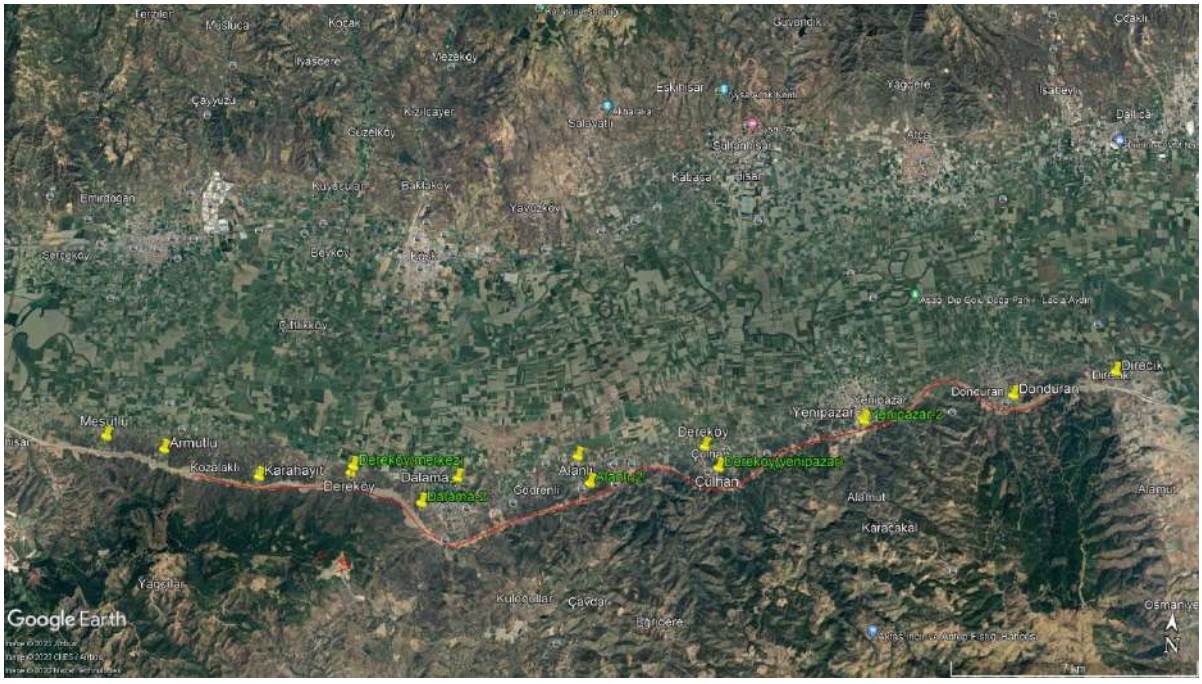

Figure 6 Sensitive Receptor-Measurement Points Location

Table 4. Passive Sampling Results of PM_{10} in Residential Areas

Location Name	Coordinates		Result Concentration (µg/m³)
	X	Y	
Direcik	612572	4188267	34.56
Alanlı	597487	4184519	38.00
Dereköy	591160	4183514	43.12
Yenipazar	605476	4186318	26.98
Donduran	609682	4187390	39.45
Karahayıt	588636	4183239	19.79
Mesutlu	583958	4183876	57.59
Armutlu	585827	4183684	40.06
Dalama	594177	4183632	62.15
Yenipazar-2	605505	4186287	186.54
Dereköy(yenipazar)	601492	4184590	77.77
Alanlı-2	597914	4183834	457.43
Dalama-2	593238	4182857	348.13
Dereköy(merkez)	591203	4183693	134.02

Table 5. Passive Sampling Results of settled dust in Residential Areas

Location Name	Coordinates		Result (mg/m^2 day)
	X	Y	
Direcik	612598	4188332	54.57
Donduran	609707	4187416	61.01
Yenipazar	605505	4186287	64.63
Çulhan	602001	4185289	59.31

Alanlı	597500	4184539	64.21
Dalama	594206	4183795	57.29
Dereköy	601057	4185147	70.83
Karahayıt	588617	4183166	68.55
Armutlu	585666	4183765	64.67
Mesutlu	584118	4183900	61.27
Yenipazar-2	605505	4186287	1097.794
Dereköy(yenipazar)	601492	4184590	139.154
Alanlı-2	597914	4183834	181.250
Dalama-2	593238	4182857	721.507
Dereköy(merkez)	591203	4183693	321.324

3.3 Modeling Studies

Modeling studies were carried out in a scenario, considering that the highway project works with existing facilities.

- **Scenario 1:** Construction work on the section of the highway (12-39km), blasting activities of mines, and activities taking place in quarries and other facilities of section 12-39 km.

3.4 Information Entered in the Modeling Study

Emission inputs and other parameters determined according to different scenarios in modeling studies are summarized in Table 6.

Table 6 Information Entered in Modeling Study

Scenarios	Source Abbreviations	Source Type	Example Source Abbreviations	Mass Flow (g/sec)	Annual Working Area (m^2)	Mass Flow Rate Entered into the Model (g/sec.m^2)
Scenario-1	Dalama7 Quarry-Discharge+ Storage of overburden	PAREA	PAREA2	9526	0.1197	0.00001256556
	Dalama3-transportation of overburden to storage	ARLN	ARLN2	0.4028	287 m	0.00012757073
	Dalama3-Overburden+Ore excavate+Loading	AREA	AREA1	1.9816	43728.7	0.00004531581
	Dalama3-Blasting	OPIT	OPIT1	-	485	0.4843
	Direcik Concrete Plant-Transport of the Material to plant+from plant	ARLN	ARLN7	0.2778	100 m	0.00025184597
	Direcik-Discharge of aggregate into the Bunker+loading the material	PAREA	PAREA5	0.2311	5632.5	0.00004102991
	Dalama3quarry -discharge of overburden +storage	PAREA	PAREA7	0.1217	9526	0.00001277551
	Dalama7-Quarry- excavate+ loading of overburden + ore	AREA	AREA3	1.9393	41579.3	0.00004664101

Scenarios	Source Abbreviations	Source Type	Example Source Abbreviations	Mass Flow (g/sec)	Annual Working Area (m^2)	Mass Flow Rate Entered into the Model (g/sec.m^2)
	Dalama7 Quarry-the transportation of overburden to storage area	ARLN	ARLN8	0.4722	340.2 m	0.00012617656
	Dalama7 quary-blasting	OPIT	OPIT2	-	500	0.4843
	Dalama7 Quarry-the movements of the vehicles inside the query	ARLN	ARLN9	2.2527	415 m	0.00049347493
	Yenikoy-Mechanical Plant-discharging+ loading material	AREA	AREA7	0.4778	2250	0.00021235556
	Yeniköy-the Movements of the Vehicles	ARLN	ARLN16	0.0347	100.6 m	0.00003135715
	Dereköy-Crushing Plant- Loading.Discharge of Material	AREA	AREA8	0.2359	2320.8	0.00010164695
	Dereköy-Crushing Plant-Primary.Secondary Crushing Operations	AREA	AREA9	0.1097	2320.8	0.00004726863
	Dalama3 Quarry-the movements of the vehicles inside the query	ARLN	ARLN17	2.0556	370.7 m	0.00050415444
	Akcakoy crushing plant loading + discharge of the material	AREA	AREA10	0.1988	7684.6	0.00002586985
	Akcakoy crushing plant. primary secondary crushing operations	AREA	AREA11	0.0944	1691.7	0.0000558003

Scenarios	Source Abbreviations	Source Type	Example Source Abbreviations	Mass Flow (g/sec)	Annual Working Area (m^2)	Mass Flow Rate Entered into the Model (g/sec.m^2)
	Hamzabali Transport of the Material to the Concrete Plant	ARLN	ARLN18	0.1389	100.6 m	0.00012547622
	Hamzabali. Discharge of aggregate +loading the material	AREA	AREA12	0.2311	565.5	0.00040867328
	Hamzabali.Transport of the Material from the Concrete Plant	ARLN	ARLN19	0.1389	100.5 m	0.00012565322
	Cine mechanical plant. loading + discharge of the material	AREA	AREA13	0.4778	38024.4	0.00001256563
	Cine mechanical plant.the Movements of the Vehicles	ARLN	ARLN20	0.0347	100.1m	0.00003152773
	Dalama3 Quarry excavate + loading. overburden + ore	AREA	AREA14	2.0534	4301.1	0.00047740833
	Dalama 3 Quarry-transport of overburden to the storage area	ARLN	ARLN21	0.1389	100.3 m	0.00012584584
	Dalama3 Quarry dicharge + storage of the overbuden	AREA	AREA15	0.1150	9500.4	0.00001211326
	Dalama3 quary-blasting	OPIT	OPIT3	-	500	0.4843

Scenarios	Source Abbreviations	Source Type	Example Source Abbreviations	Mass Flow (g/sec)	Annual Working Area (m^2)	Mass Flow Rate Entered into the Model (g/sec.m^2)
	Dalama 3 Quarry. transport of the ore to the crushing plant	ARLN	ARLN22	0.2714	50.1 m	0.00049200546
	Dalama 3 Quarry. Discharge + loading of ore to crushing plant	AREA	AREA16	0.2359	2025	0.00011649383
	Dalama 3 Quarry. primary + secondary crushing operations	AREA	AREA17	0.1097	432.6	0.0002535933
	Dalama 3 Quarry ransportation of the material out of the area	ARLN	ARLN23	0.5425	101 m	0.00048840026
	Dalama asphalt plant Discharging of the Material into the Silo	AREA	AREA18	0.2031	1600	0.0001269375
	Dalama. Transport of the Material to the Asphalt Plant	ARLN	ARLN24	0.2509	85.2 m	0.00026766113
	Dalama Asphalt plant discharge + storage	AREA	AREA19	0.00527	1999.9	0.00000263629
	Dalama asphalt plant. the transportation of the final material	ARLN	ARLN25	0.4514	100.1 m	0.00040993685
	Dalama concrete plant. loading of the material + discharge of aggreg	AREA	AREA20	0.2311	815.1	0.00028351195

Scenarios	Source Abbreviations	Source Type	Example Source Abbreviations	Mass Flow (g/sec)	Annual Working Area (m^2)	Mass Flow Rate Entered into the Model (g/sec.m^2)
	Dalama Concrete the Transport of the Material to the Concrete Plant	ARLN	ARLN26	0.1389	100.5 m	0.00012569721
	Dalama Concrete plant. Transport of the Material from the Plant	ARLN	ARLN27	0.1389	100.6 m	0.00012550505
	excavation-filling operations for roadworks	ARLN	ARLN28	1.1289	26994.9 m	0.00000380173

4. RESULTS

Modeling studies were carried out for PM_{10} and settled dust parameters. For each pollutant, modeling studies were carried out under 1 scenario and the possible effects of pollutant sources on local air quality were examined in accordance with each scenario. The values obtained as a result of the modeling are given below.

Detailed emission model entries are given in Table 6, and the results of the modeling study are shown in Annex-1. This section presents and discusses summaries of modeling study results and explanatory findings.

According to the determined scenarios, the GLC values of the settled dust and PM_{10} that will form near the existing facilities are shown in Table 7. Also, distributions of PM10 and settled dust GLC from all identified scenarios are shown in Figure 7 to Figure 10.

As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded more than 35 times in a year. According to Table 7, the daily 36th value and the annual highest value for PM10 is 10.53 $\mu g/m^3$ and 6.67 $\mu g/m^3$ which is considerably smaller than the limit values found in SKHHKY. The daily and annual settled dust amount is 27.02 mg/m^2.day and 4.51 mg/m^2day, respectively, which is considerably smaller than the limit values found in SKHHKY. This scenario complies with the regulation, with 2 exceedances occurring per year at the maximum daily concentration of 102.87 $\mu g/m^3$.

Table 7. Results of ground-level PM_{10} and settled dust concentrations observed in different scenarios

Scenario	Highest Pollutant Results				
	PM10			Settled Dust	
	Daily Concentration Value (36th value) (µg/m3)	Number of Overruns	Highest Annually Concentration Value (µg/m3)	Maximum Daily Settled Dust ($mg/m^2/day$)	Maximum Annually Settled Dust ($mg/m^2/day$)
Scenario 1	10.53 (594672, 4182904)	2	6.67 (605494, 4186306)	27.02 (595672, 4182904)	4.51 (595672, 4183404)
SKHHKY Limit Values	50	not exceeded more than 35 times in a year	40	390	210

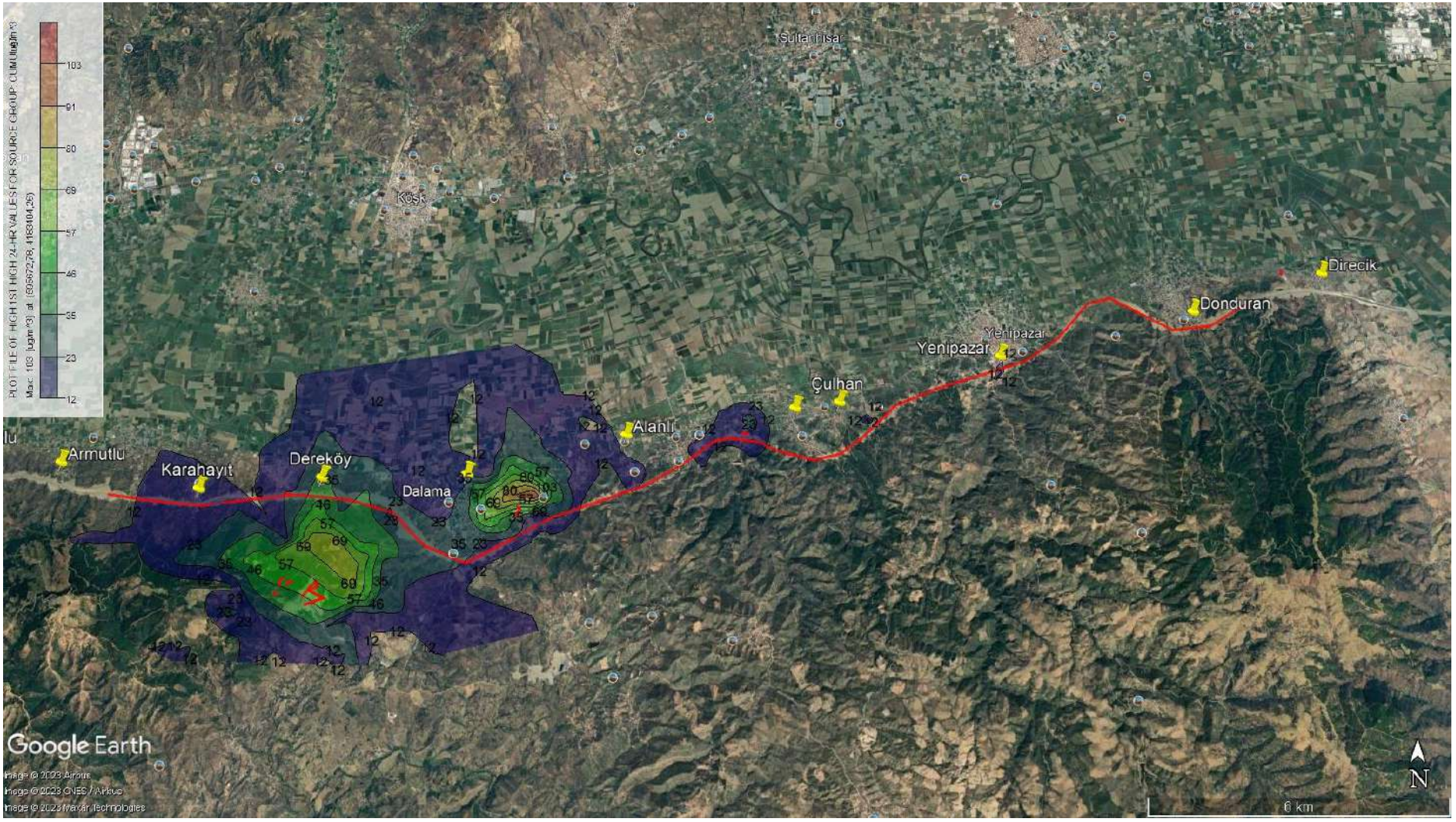

Figure 7. Maximum daily PM10 emission distribution ($\mu g/m^3$)

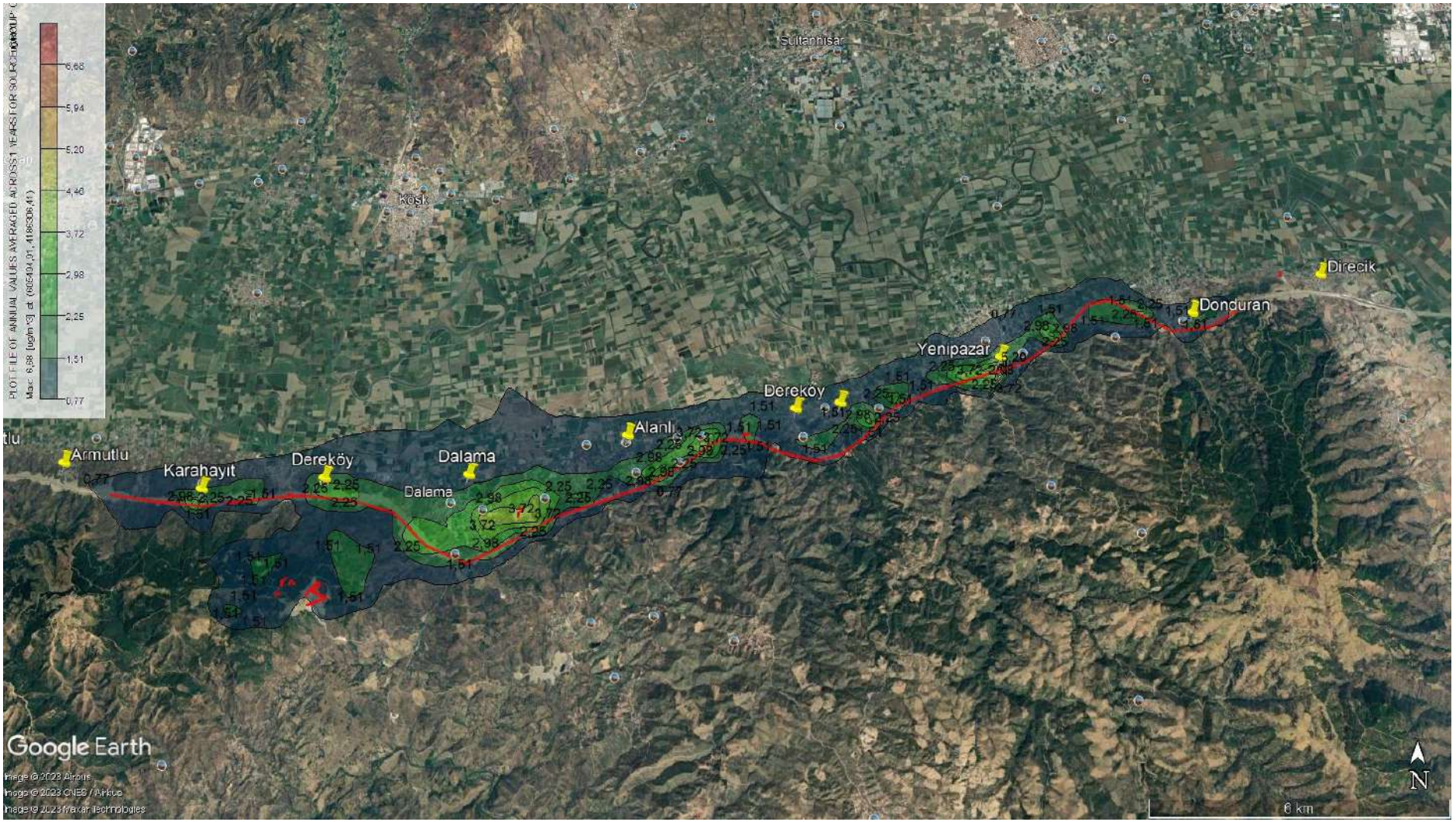

Figure 8. Maximum annual PM10 emission distribution ($\mu g/m^3$)

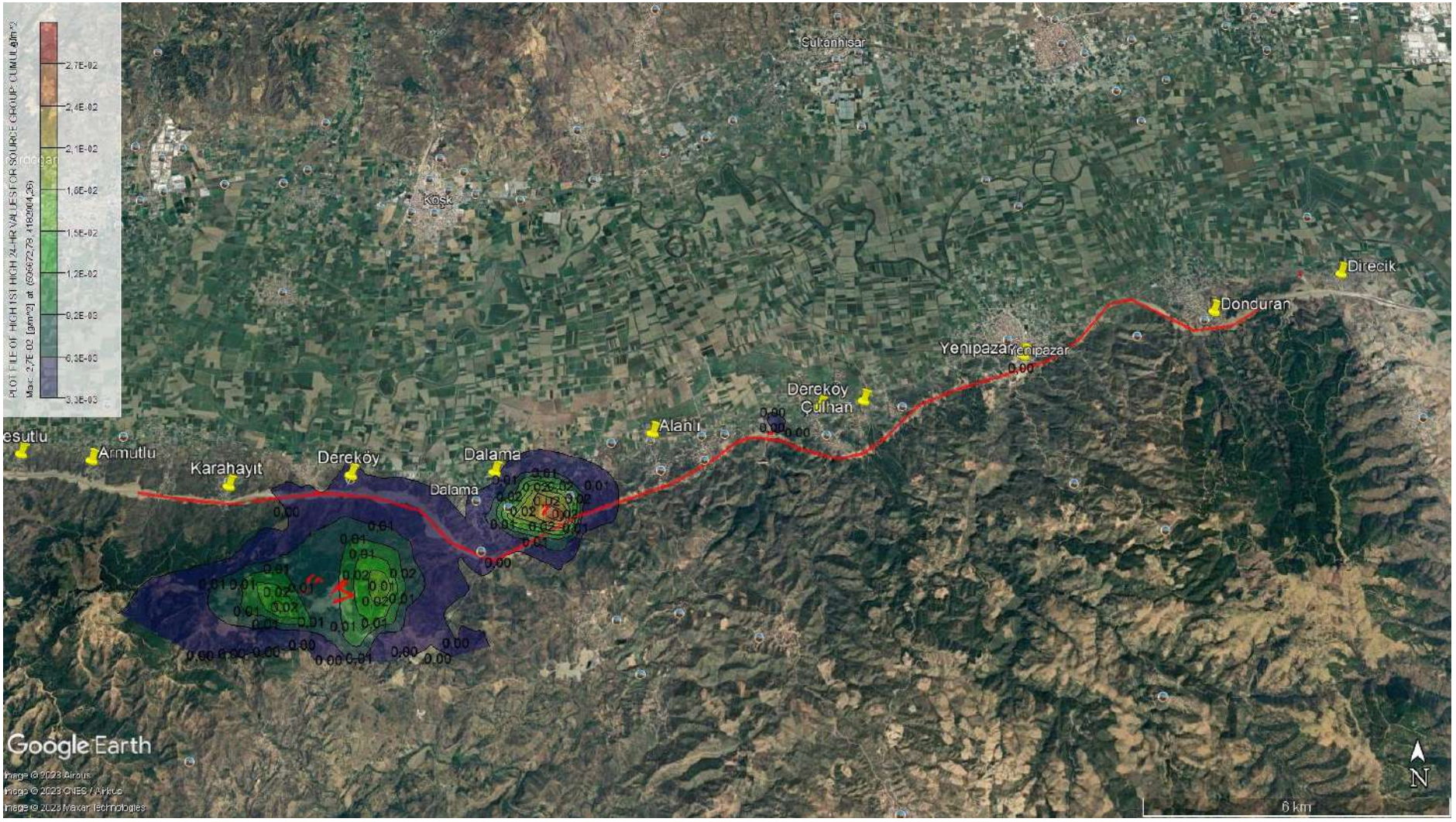

Figure 9. Maximum daily settled dust emission distribution (mg/m^2/day)

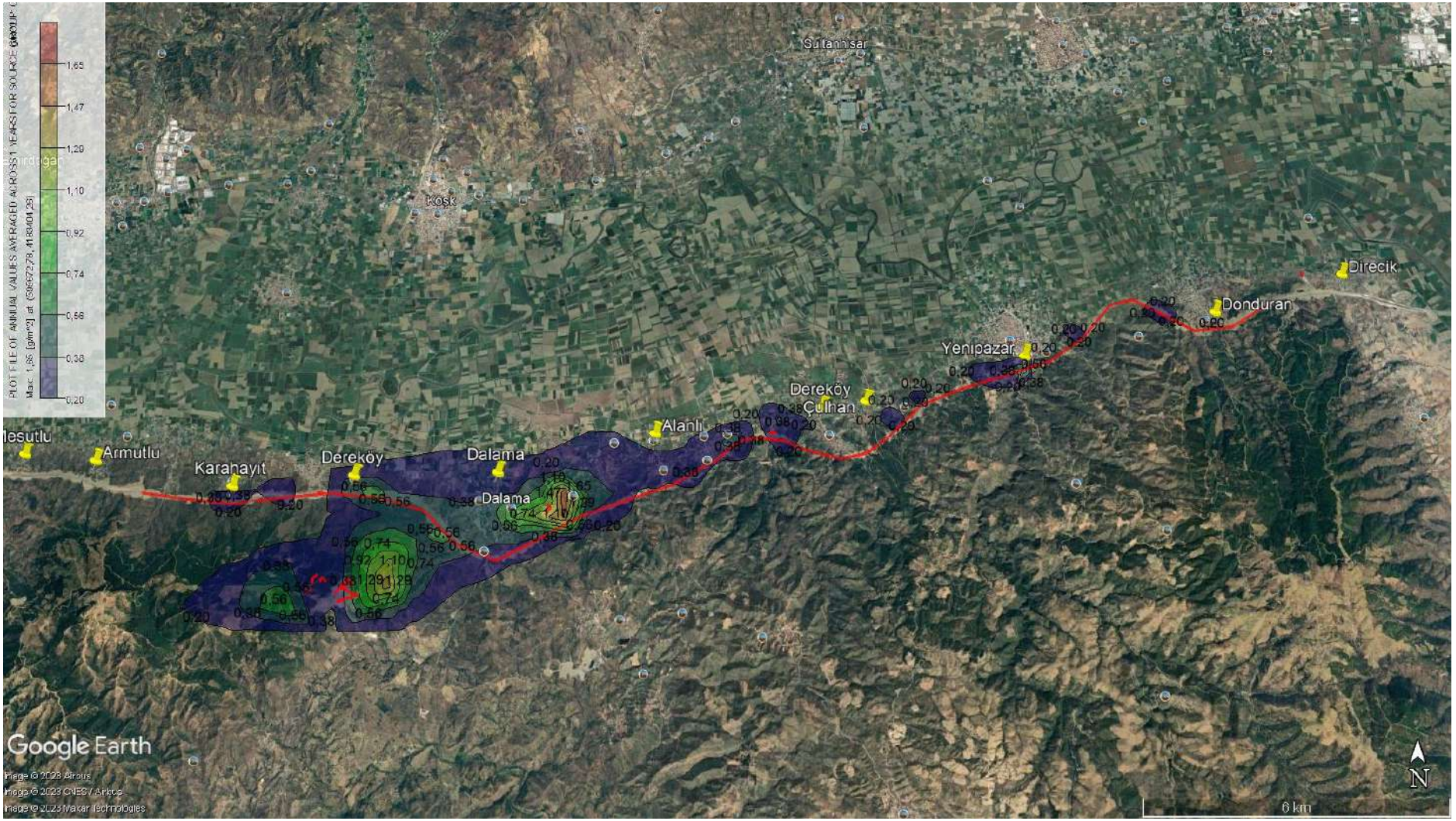

Figure 10. Maximum annual settled dust emission distribution ($\mu g/m^3$)

As a result, since the PM10 concentration values and the settled dust amounts to be formed around the project are lower than the limit values specified in the regulation, the settled dust and PM10 emissions from the project are not expected to have any adverse impact on the air quality of the region.

In addition, as mentioned before, background measurements representing the air quality in various areas in the region were carried out, and the total air quality contribution values of the project with these measurements were calculated in Table 8, Table 9. The model results calculated at the measurement points are below the limit values, as seen in Table 8 and Table 9. The effect of cumulative emissions of the project for the identified sensitive receptors are insignificant.

As seen in Table 8, the highest contribution of the project to air pollution for PM10 in these areas was calculated for Karahayıt with 50.4%. The contribution margin does not exceed 15% when all measurement points are considered, except for a few points. Since the project's construction phase will be completed in the short term, it is not expected that the air quality at these points will deteriorate in the long term. As seen in Table 9, the highest contribution of the project to air pollution for settled dust in these areas was calculated for Yenipazar with 5.15%. When all measurement points are considered, the contribution is low. Therefore, it is not expected that the air quality at these points will deteriorate in the long term.

Table 8. Cumulative Impact Assessment with Maximum PM10 GLC Values Measurement Points

MEASUREMENT POINTS	PM10 BACKGROUND MEASUREMENT RESULTS (µg/m^3)	SCENARIO 1 MAX DAILY RESULT (µg/m^3)	THE EFFECT OF THE PROJECT ON THE AIR QUALITY OF THE REGION (%)
Direcik	34.56	2.40	6.49
Alanlı	38.00	11.29	22.9
Dereköy	43.12	40.91	48.6
Yenipazar	26.98	11.60	30.1
Donduran	39.45	6.08	13.4
Karahayıt	19.79	20.11	50.4

Mesutlu	57.59	3.06	5.01
Armutlu	40.06	7.45	15.7
Dalama	62.15	22.27	26.4

Table 9. Cumulative Impact Assessment with Maximum settled dust GLC Values Measurement Points

MEASUREMENT POINTS	SETTLED DUST BACKGROUND MEASUREMENT RESULTS (mg/m^2day)	SCENARIO 1 MAX DAILY RESULT (mg/m^2day)	THE EFFECT OF THE PROJECT ON THE AIR QUALITY OF THE REGION (%)
Direcik	54.57	0.88	1.59
Donduran	61.01	1.05	1.69
Yenipazar	64.63	3.51	5.15
Çulhan	59.31	1.10	1.82
Alanlı	64.21	2.08	3.14
Dalama	57.29	2.95	4.90
Dereköy	70.83	1.53	2.11
Karahayıt	68.55	3.28	4.57
Armutlu	64.67	1.00	1.52
Mesutlu	61.27	0.78	1.26

5. CONCLUSIONS AND RECOMMENDATIONS

The report has been prepared by Hacettepe University Environmental Engineering Department to be used in the Environmental Impact Assessment Report prepared for Aydın-Denizli Motorway Project South Alternative:km 15+856 - 34+630.

The report has been prepared using the AERMOD distribution model to examine the distribution of the emissions of the Aydın-Denizli Motorway Project South Alternative:km 15+856 - 34+630 and the contribution values of the other facilities within the impact area to the regional air pollution and their distribution in the impact area of the project.

The modeling results obtained according to the emission amounts of the existing facilities in the impact area of the project, the emission amounts to be caused by the project, the hourly meteorological data observed, and the topography are summarized below:

- Daily and annual limit values for PM10 emissions in SKHKKY are 50 $\mu g/m^3$ and 40 $\mu g/m^3$, respectively. In all the scenarios studies, results comply with limit values. The cumulative daily 36th value and the annual highest value for PM10 is 10.53 $\mu g/m^3$ and 6.67 $\mu g/m^3$, which is considerably smaller than the limit values found in SKHHKY. In addition, it is stated in SKHHKY that limit values cannot be exceeded more than 35 times a year. This scenario complies with the regulation, with 2 exceedances occurring per year at the maximum daily concentration of 102.87 $\mu g/m^3$.
- The daily and annual settling dust limit values in SKHKKY were defined as 390 and 210 mg/m^2. day, respectively. In the scenario covering the south alternative of the project, the daily and annual settled dust amount is 27.02mg/m^2.day and 4.51 mg/m^2day, respectively, which is considerably smaller than the limit values found in SKHHKY.

Consequently, when all scenarios are examined, it is seen that the project does not make a difference for PM10 and settled dust emission in terms of annual air quality in the region.

REFERENCES

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ANNEXS

Control Pathway

Dispersion Options

Titles

C:\Users\DELL\Desktop\aydindenizli1\aydindenizli1.isc

Dispersion Options

☐ Regulatory Default ☒ Non-Default Options

☒ Flat & Elevated Terrain
☐ No Stack-Tip Downwash (NOSTD)
☐ Run in Screening Mode
☐ Conversion of NOx to NO2 (OLM or PVMRM)
☐ No Checks for Non-Sequential Met Data
☐ Fast All Sources (FASTALL)
☐ Fast Area Sources (FASTAREA)
☐ Optimized Area Source Plume Depletion
☐ Gas Deposition

BETA Options:

☐ Capped and Horizontal Stack Releases
☐ Adjusted Friction Velocity (u*) in AERMET (ADJ_U*)
☐ Low Wind Options

☐ SCIM (Sampled Chronological Input Model)
☐ Ignore Urban Night / Daytime Transition (NOURBTRAN)

Dispersion Coefficient

Rural

Output Type

☒ Concentration
☒ Total Deposition (Dry & Wet)
☐ Dry Deposition
☐ Wet Deposition

Plume Depletion

☐ Dry Removal
☐ Wet Removal

Output Warnings

☐ No Output Warnings
☐ Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

PM10

Averaging Time Options

Hours	1	2	3	4	6	8	12	24
	☐	☐	☐	☐	☐	☐	☐	☒

☐ Month ☐ Period ☒ Annual

Exponential Decay

☐ Yes ☒ No

Terrain Height Options

☐ Flat ☒ Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

☐ Yes ☒ No

Default Height = 0.00 m

Meteorology Pathway

Met Input Data

Surface Met Data

Filename: Aydin_2019.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: Aydin_2019.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 56,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2019			
Upper Air		2019			

Data Period

Data Period to Process

Start Date: 1.01.2019 Start Hour: 1 End Date: 31.12.2019 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Output Pathway

Tabular Printed Outputs

Short Term Averaging Period	RECTABLE Highest Values Table										MAXTABLE Maximum Values Table	DAYTABLE Daily Values Table
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		
24	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No

Threshold Violation Files (MAXIFILE)

Path for MAXIFILES: AYDINDENIZLI1.AD

Averaging Period	Source Group ID	Treshhold Value	File Unit (Optional)	File Name
24	cumulati	50,00		cumulative.MAX

Contour Plot Files (PLOTFILE)

Path for PLOTFILES: AYDINDENIZLI1.AD

Averaging Period	Source Group ID	High Value	File Name
24	cumulati	1st	24H1G001.PLT
24	cumulati	N/A	24H36G000.PLT
Annual	cumulati	N/A	AN00G000.PLT

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m (Optional)
1	612569.90	4188268.64		73.47	
2	597469.05	4184521.45		46.53	
3	591155.72	4183514.82		109.01	
4	605462.18	4186344.62		86.44	
5	609680.65	4187391.53		127.73	
6	588634.40	4183240.63		164.83	
7	583957.82	4183876.52		95.85	
8	585826.45	4183682.46		124.41	
9	594165.65	4183637.08		48.21	
10	612595.97	4188333.11		70.36	
11	609707.38	4187416.33		125.94	
12	605494.91	4186306.41		87.57	
13	602000.50	4185284.76		49.54	
14	597498.23	4184538.22		46.82	
15	594205.72	4183793.17		45.07	
16	601059.34	4185145.31		52.23	
17	588608.28	4183182.56		169.77	
18	585669.57	4183775.15		127.94	
19	584111.80	4183909.34		91.29	
20	588672.78	4179904.26	UCART1	424.90	
21	589172.78	4179904.26	UCART1	482.15	
22	589672.78	4179904.26	UCART1	437.29	
23	590172.78	4179904.26	UCART1	459.33	
24	590672.78	4179904.26	UCART1	340.24	
25	591172.78	4179904.26	UCART1	241.74	
26	591672.78	4179904.26	UCART1	218.94	
27	592172.78	4179904.26	UCART1	195.74	
28	592672.78	4179904.26	UCART1	183.99	
29	593172.78	4179904.26	UCART1	173.10	
30	588672.78	4180404.26	UCART1	605.88	
31	589172.78	4180404.26	UCART1	573.15	
32	589672.78	4180404.26	UCART1	552.74	
33	590172.78	4180404.26	UCART1	483.13	

Receptor Pathway

34	590672.78	4180404.26	UCART1	421.92
35	591172.78	4180404.26	UCART1	346.58
36	591672.78	4180404.26	UCART1	263.70
37	592172.78	4180404.26	UCART1	248.62
38	592672.78	4180404.26	UCART1	217.58
39	593172.78	4180404.26	UCART1	166.07
40	586672.78	4180904.26	UCART1	682.40
41	587172.78	4180904.26	UCART1	610.83
42	587672.78	4180904.26	UCART1	579.62
43	588172.78	4180904.26	UCART1	636.88
44	588672.78	4180904.26	UCART1	693.52
45	589172.78	4180904.26	UCART1	617.05
46	589672.78	4180904.26	UCART1	494.46
47	590172.78	4180904.26	UCART1	525.71
48	592172.78	4180904.26	UCART1	368.02
49	592672.78	4180904.26	UCART1	305.20
50	593172.78	4180904.26	UCART1	177.52
51	593672.78	4180904.26	UCART1	122.21
52	594172.78	4180904.26	UCART1	206.03
53	594672.78	4180904.26	UCART1	244.33
54	595172.78	4180904.26	UCART1	269.19
55	595672.78	4180904.26	UCART1	316.04
56	596172.78	4180904.26	UCART1	303.89
57	596672.78	4180904.26	UCART1	312.89
58	597172.78	4180904.26	UCART1	300.33
59	586672.78	4181404.26	UCART1	630.24
60	587172.78	4181404.26	UCART1	561.41
61	587672.78	4181404.26	UCART1	637.55
62	588172.78	4181404.26	UCART1	645.26
63	588672.78	4181404.26	UCART1	597.57
64	589172.78	4181404.26	UCART1	591.60
65	589672.78	4181404.26	UCART1	568.49
66	592172.78	4181404.26	UCART1	380.29
67	592672.78	4181404.26	UCART1	252.96
68	593172.78	4181404.26	UCART1	256.53
69	593672.78	4181404.26	UCART1	162.21
70	594172.78	4181404.26	UCART1	149.78
71	594672.78	4181404.26	UCART1	148.68
72	595172.78	4181404.26	UCART1	203.66
73	595672.78	4181404.26	UCART1	259.95
74	596172.78	4181404.26	UCART1	289.40

75	596672.78	4181404.26	UCART1	360.14
76	597172.78	4181404.26	UCART1	342.96
77	586672.78	4181904.26	UCART1	466.79
78	587172.78	4181904.26	UCART1	369.51
79	587672.78	4181904.26	UCART1	494.16
80	588172.78	4181904.26	UCART1	471.31
81	588672.78	4181904.26	UCART1	464.31
82	589172.78	4181904.26	UCART1	487.63
83	589672.78	4181904.26	UCART1	432.19
84	590172.78	4181904.26	UCART1	396.75
85	592172.78	4181904.26	UCART1	318.04
86	592672.78	4181904.26	UCART1	244.84
87	593172.78	4181904.26	UCART1	155.46
88	593672.78	4181904.26	UCART1	124.78
89	594672.78	4181904.26	UCART1	111.94
90	595172.78	4181904.26	UCART1	176.43
91	595672.78	4181904.26	UCART1	234.14
92	596172.78	4181904.26	UCART1	247.90
93	596672.78	4181904.26	UCART1	276.86
94	597172.78	4181904.26	UCART1	325.50
95	597672.78	4181904.26	UCART1	354.38
96	598172.78	4181904.26	UCART1	346.87
97	598672.78	4181904.26	UCART1	294.78
98	586672.78	4182404.26	UCART1	412.71
99	587172.78	4182404.26	UCART1	263.31
100	587672.78	4182404.26	UCART1	367.69
101	588172.78	4182404.26	UCART1	341.05
102	588672.78	4182404.26	UCART1	345.61
103	589172.78	4182404.26	UCART1	366.69
104	589672.78	4182404.26	UCART1	353.26
105	590172.78	4182404.26	UCART1	279.25
106	590672.78	4182404.26	UCART1	311.73
107	591172.78	4182404.26	UCART1	295.48
108	591672.78	4182404.26	UCART1	373.22
109	592172.78	4182404.26	UCART1	317.35
110	592672.78	4182404.26	UCART1	219.45
111	593172.78	4182404.26	UCART1	139.55
112	593672.78	4182404.26	UCART1	88.02
113	594172.78	4182404.26	UCART1	66.07
114	594672.78	4182404.26	UCART1	84.10
115	595672.78	4182404.26	UCART1	179.40

116	596172.78	4182404.26	UCART1	263.40
117	596672.78	4182404.26	UCART1	291.48
118	597172.78	4182404.26	UCART1	315.28
119	597672.78	4182404.26	UCART1	348.10
120	598172.78	4182404.26	UCART1	360.13
121	598672.78	4182404.26	UCART1	328.31
122	586672.78	4182904.26	UCART1	297.03
123	587172.78	4182904.26	UCART1	181.80
124	587672.78	4182904.26	UCART1	215.18
125	588172.78	4182904.26	UCART1	258.89
126	588672.78	4182904.26	UCART1	205.98
127	589172.78	4182904.26	UCART1	268.68
128	589672.78	4182904.26	UCART1	237.39
129	590172.78	4182904.26	UCART1	206.28
130	590672.78	4182904.26	UCART1	244.62
131	591172.78	4182904.26	UCART1	211.21
132	591672.78	4182904.26	UCART1	232.44
133	592172.78	4182904.26	UCART1	213.81
134	592672.78	4182904.26	UCART1	175.70
135	593172.78	4182904.26	UCART1	103.16
136	593672.78	4182904.26	UCART1	73.20
137	594172.78	4182904.26	UCART1	58.07
138	594672.78	4182904.26	UCART1	66.03
139	595672.78	4182904.26	UCART1	116.35
140	596672.78	4182904.26	UCART1	191.70
141	597172.78	4182904.26	UCART1	224.21
142	597672.78	4182904.26	UCART1	284.96
143	598172.78	4182904.26	UCART1	268.37
144	598672.78	4182904.26	UCART1	346.45
145	586672.78	4183404.26	UCART1	175.91
146	588172.78	4183404.26	UCART1	140.92
147	588672.78	4183404.26	UCART1	145.36
148	589172.78	4183404.26	UCART1	155.91
149	589672.78	4183404.26	UCART1	133.56
150	591672.78	4183404.26	UCART1	106.90
151	592172.78	4183404.26	UCART1	120.84
152	592672.78	4183404.26	UCART1	80.78
153	593172.78	4183404.26	UCART1	55.67
154	593672.78	4183404.26	UCART1	46.63
155	594172.78	4183404.26	UCART1	53.06
156	594672.78	4183404.26	UCART1	90.55

157	595172.78	4183404.26	UCART1	66.56
158	595672.78	4183404.26	UCART1	55.96
159	596172.78	4183404.26	UCART1	73.98
160	596672.78	4183404.26	UCART1	118.33
161	598172.78	4183404.26	UCART1	229.73
162	598672.78	4183404.26	UCART1	240.32
163	586672.78	4183904.26	UCART1	81.66
164	587172.78	4183904.26	UCART1	93.32
165	587672.78	4183904.26	UCART1	85.35
166	588172.78	4183904.26	UCART1	83.87
167	588672.78	4183904.26	UCART1	93.30
168	589172.78	4183904.26	UCART1	75.38
169	589672.78	4183904.26	UCART1	67.33
170	590172.78	4183904.26	UCART1	63.81
171	590672.78	4183904.26	UCART1	53.41
172	591172.78	4183904.26	UCART1	51.69
173	591672.78	4183904.26	UCART1	45.94
174	592172.78	4183904.26	UCART1	36.71
175	592672.78	4183904.26	UCART1	38.04
176	593172.78	4183904.26	UCART1	37.70
177	593672.78	4183904.26	UCART1	42.73
178	594172.78	4183904.26	UCART1	46.13
179	594672.78	4183904.26	UCART1	54.44
180	595172.78	4183904.26	UCART1	68.89
181	595672.78	4183904.26	UCART1	40.91
182	596172.78	4183904.26	UCART1	44.02
183	596672.78	4183904.26	UCART1	70.38
184	597172.78	4183904.26	UCART1	91.18
185	597672.78	4183904.26	UCART1	89.65
186	598172.78	4183904.26	UCART1	142.62
187	586672.78	4184404.26	UCART1	44.53
188	587172.78	4184404.26	UCART1	54.62
189	587672.78	4184404.26	UCART1	55.65
190	588172.78	4184404.26	UCART1	51.04
191	588672.78	4184404.26	UCART1	53.40
192	589172.78	4184404.26	UCART1	42.52
193	589672.78	4184404.26	UCART1	34.95
194	590172.78	4184404.26	UCART1	35.99
195	590672.78	4184404.26	UCART1	34.95
196	591172.78	4184404.26	UCART1	34.77
197	591672.78	4184404.26	UCART1	36.61

198	592172.78	4184404.26	UCART1	37.44
199	592672.78	4184404.26	UCART1	36.90
200	593172.78	4184404.26	UCART1	37.67
201	593672.78	4184404.26	UCART1	38.91
202	594172.78	4184404.26	UCART1	43.31
203	594672.78	4184404.26	UCART1	39.44
204	595172.78	4184404.26	UCART1	38.30
205	595672.78	4184404.26	UCART1	38.12
206	596172.78	4184404.26	UCART1	38.31
207	596672.78	4184404.26	UCART1	59.60
208	597172.78	4184404.26	UCART1	41.89
209	597672.78	4184404.26	UCART1	51.03
210	598172.78	4184404.26	UCART1	61.09
211	598672.78	4184404.26	UCART1	67.90
212	586672.78	4184904.26	UCART1	34.63
213	587172.78	4184904.26	UCART1	36.01
214	587672.78	4184904.26	UCART1	38.71
215	588172.78	4184904.26	UCART1	37.54
216	588672.78	4184904.26	UCART1	33.40
217	589172.78	4184904.26	UCART1	34.15
218	589672.78	4184904.26	UCART1	35.00
219	590172.78	4184904.26	UCART1	36.25
220	590672.78	4184904.26	UCART1	36.33
221	591172.78	4184904.26	UCART1	36.73
222	591672.78	4184904.26	UCART1	35.41
223	592172.78	4184904.26	UCART1	36.25
224	592672.78	4184904.26	UCART1	37.13
225	596172.78	4184904.26	UCART1	37.51
226	596672.78	4184904.26	UCART1	38.25
227	597172.78	4184904.26	UCART1	38.78
228	597672.78	4184904.26	UCART1	38.51
229	598172.78	4184904.26	UCART1	40.14
230	598672.78	4184904.26	UCART1	42.63
231	586672.78	4185404.26	UCART1	33.42
232	587172.78	4185404.26	UCART1	34.52
233	587672.78	4185404.26	UCART1	33.86
234	588172.78	4185404.26	UCART1	33.04
235	588672.78	4185404.26	UCART1	35.18
236	589172.78	4185404.26	UCART1	35.67
237	589672.78	4185404.26	UCART1	36.44
238	590172.78	4185404.26	UCART1	34.33

239	590672.78	4185404.26	UCART1	34.30
240	591172.78	4185404.26	UCART1	35.78
241	591672.78	4185404.26	UCART1	35.79
242	592172.78	4185404.26	UCART1	35.71
243	592672.78	4185404.26	UCART1	36.40
244	596172.78	4185404.26	UCART1	37.14
245	596672.78	4185404.26	UCART1	37.99
246	597172.78	4185404.26	UCART1	39.47
247	597672.78	4185404.26	UCART1	38.54
248	598172.78	4185404.26	UCART1	37.86
249	598672.78	4185404.26	UCART1	39.20
250	599183.43	4183100.76	UCART2	228.48
251	599683.43	4183100.76	UCART2	174.36
252	600183.43	4183100.76	UCART2	143.71
253	600683.43	4183100.76	UCART2	216.72
254	601183.43	4183100.76	UCART2	296.79
255	601683.43	4183100.76	UCART2	260.83
256	602183.43	4183100.76	UCART2	219.00
257	602683.43	4183100.76	UCART2	289.24
258	603183.43	4183100.76	UCART2	326.11
259	603683.43	4183100.76	UCART2	358.58
260	599183.43	4183600.76	UCART2	177.73
261	599683.43	4183600.76	UCART2	161.34
262	600183.43	4183600.76	UCART2	194.90
263	600683.43	4183600.76	UCART2	265.20
264	601183.43	4183600.76	UCART2	250.17
265	601683.43	4183600.76	UCART2	233.59
266	602183.43	4183600.76	UCART2	191.33
267	602683.43	4183600.76	UCART2	224.82
268	603183.43	4183600.76	UCART2	301.69
269	603683.43	4183600.76	UCART2	318.23
270	599183.43	4184100.76	UCART2	117.94
271	599683.43	4184100.76	UCART2	133.05
272	600183.43	4184100.76	UCART2	124.82
273	600683.43	4184100.76	UCART2	206.92
274	601183.43	4184100.76	UCART2	181.66
275	601683.43	4184100.76	UCART2	140.21
276	602183.43	4184100.76	UCART2	146.19
277	602683.43	4184100.76	UCART2	213.39
278	603183.43	4184100.76	UCART2	198.24
279	603683.43	4184100.76	UCART2	269.68

280	604183.43	4184100.76	UCART2	349.11
281	604683.43	4184100.76	UCART2	382.58
282	605183.43	4184100.76	UCART2	231.74
283	599183.43	4184600.76	UCART2	59.48
284	601183.43	4184600.76	UCART2	82.44
285	601683.43	4184600.76	UCART2	99.49
286	602683.43	4184600.76	UCART2	139.84
287	603183.43	4184600.76	UCART2	187.28
288	603683.43	4184600.76	UCART2	230.85
289	604183.43	4184600.76	UCART2	287.19
290	604683.43	4184600.76	UCART2	307.59
291	605183.43	4184600.76	UCART2	160.39
292	599183.43	4185100.76	UCART2	43.58
293	599683.43	4185100.76	UCART2	50.96
294	600183.43	4185100.76	UCART2	53.29
295	600683.43	4185100.76	UCART2	49.35
296	601183.43	4185100.76	UCART2	55.61
297	601683.43	4185100.76	UCART2	52.06
298	602183.43	4185100.76	UCART2	63.26
299	602683.43	4185100.76	UCART2	93.24
300	603183.43	4185100.76	UCART2	155.36
301	603683.43	4185100.76	UCART2	164.99
302	604183.43	4185100.76	UCART2	223.63
303	604683.43	4185100.76	UCART2	255.83
304	605183.43	4185100.76	UCART2	139.04
305	605683.43	4185100.76	UCART2	231.94
306	606183.43	4185100.76	UCART2	252.64
307	606683.43	4185100.76	UCART2	343.39
308	607183.43	4185100.76	UCART2	375.43
309	607683.43	4185100.76	UCART2	382.99
310	608183.43	4185100.76	UCART2	467.82
311	608683.43	4185100.76	UCART2	492.85
312	609183.43	4185100.76	UCART2	511.54
313	609683.43	4185100.76	UCART2	448.57
314	610183.43	4185100.76	UCART2	463.54
315	610683.43	4185100.76	UCART2	386.02
316	611183.43	4185100.76	UCART2	534.87
317	599183.43	4185600.76	UCART2	41.43
318	599683.43	4185600.76	UCART2	44.81
319	600183.43	4185600.76	UCART2	47.03
320	600683.43	4185600.76	UCART2	44.48

321	601183.43	4185600.76	UCART2	45.27
322	601683.43	4185600.76	UCART2	43.21
323	602183.43	4185600.76	UCART2	46.00
324	602683.43	4185600.76	UCART2	61.89
325	603183.43	4185600.76	UCART2	91.26
326	604183.43	4185600.76	UCART2	135.75
327	604683.43	4185600.76	UCART2	203.83
328	605183.43	4185600.76	UCART2	108.72
329	605683.43	4185600.76	UCART2	162.95
330	606183.43	4185600.76	UCART2	192.68
331	606683.43	4185600.76	UCART2	278.14
332	607183.43	4185600.76	UCART2	272.60
333	607683.43	4185600.76	UCART2	316.87
334	608183.43	4185600.76	UCART2	426.27
335	608683.43	4185600.76	UCART2	436.60
336	609183.43	4185600.76	UCART2	464.77
337	609683.43	4185600.76	UCART2	363.68
338	610183.43	4185600.76	UCART2	320.47
339	610683.43	4185600.76	UCART2	387.32
340	611183.43	4185600.76	UCART2	475.76
341	599183.43	4186100.76	UCART2	39.17
342	599683.43	4186100.76	UCART2	41.48
343	600183.43	4186100.76	UCART2	43.32
344	600683.43	4186100.76	UCART2	43.04
345	601183.43	4186100.76	UCART2	41.55
346	601683.43	4186100.76	UCART2	42.98
347	602183.43	4186100.76	UCART2	44.79
348	602683.43	4186100.76	UCART2	44.32
349	603183.43	4186100.76	UCART2	44.55
350	603683.43	4186100.76	UCART2	59.16
351	604183.43	4186100.76	UCART2	75.36
352	604683.43	4186100.76	UCART2	116.99
353	605683.43	4186100.76	UCART2	94.55
354	606183.43	4186100.76	UCART2	180.23
355	606683.43	4186100.76	UCART2	188.28
356	607183.43	4186100.76	UCART2	223.27
357	607683.43	4186100.76	UCART2	235.40
358	608183.43	4186100.76	UCART2	296.50
359	608683.43	4186100.76	UCART2	359.48
360	609183.43	4186100.76	UCART2	322.65
361	609683.43	4186100.76	UCART2	349.00

362	610183.43	4186100.76	UCART2	236.63
363	610683.43	4186100.76	UCART2	378.87
364	611183.43	4186100.76	UCART2	391.59
365	599183.43	4186600.76	UCART2	40.91
366	599683.43	4186600.76	UCART2	40.05
367	600183.43	4186600.76	UCART2	41.02
368	600683.43	4186600.76	UCART2	41.03
369	601183.43	4186600.76	UCART2	43.71
370	601683.43	4186600.76	UCART2	44.13
371	602183.43	4186600.76	UCART2	42.16
372	602683.43	4186600.76	UCART2	43.46
373	603183.43	4186600.76	UCART2	45.62
374	603683.43	4186600.76	UCART2	45.00
375	604183.43	4186600.76	UCART2	47.40
376	604683.43	4186600.76	UCART2	54.37
377	605183.43	4186600.76	UCART2	95.29
378	605683.43	4186600.76	UCART2	71.31
379	606683.43	4186600.76	UCART2	138.30
380	607183.43	4186600.76	UCART2	173.66
381	607683.43	4186600.76	UCART2	170.66
382	608183.43	4186600.76	UCART2	249.83
383	608683.43	4186600.76	UCART2	248.82
384	609183.43	4186600.76	UCART2	245.14
385	609683.43	4186600.76	UCART2	263.54
386	610183.43	4186600.76	UCART2	247.07
387	610683.43	4186600.76	UCART2	341.54
388	611183.43	4186600.76	UCART2	334.87
389	604683.43	4187100.76	UCART2	53.01
390	605183.43	4187100.76	UCART2	57.71
391	605683.43	4187100.76	UCART2	59.99
392	606183.43	4187100.76	UCART2	61.29
393	606683.43	4187100.76	UCART2	56.70
394	607183.43	4187100.76	UCART2	78.31
395	607683.43	4187100.76	UCART2	113.93
396	608183.43	4187100.76	UCART2	129.59
397	608683.43	4187100.76	UCART2	179.43
398	610183.43	4187100.76	UCART2	228.40
399	610683.43	4187100.76	UCART2	254.23
400	611183.43	4187100.76	UCART2	229.67
401	604683.43	4187600.76	UCART2	49.18
402	605183.43	4187600.76	UCART2	54.90

403	605683.43	4187600.76	UCART2	55.59	
404	606183.43	4187600.76	UCART2	50.86	
405	606683.43	4187600.76	UCART2	49.13	
406	607683.43	4187600.76	UCART2	56.28	
407	608183.43	4187600.76	UCART2	76.18	
408	608683.43	4187600.76	UCART2	84.65	
409	609183.43	4187600.76	UCART2	115.38	
410	609683.43	4187600.76	UCART2	122.89	
411	610183.43	4187600.76	UCART2	148.74	
412	611183.43	4187600.76	UCART2	177.69	
413	604683.43	4188100.76	UCART2	48.67	
414	605183.43	4188100.76	UCART2	50.62	
415	605683.43	4188100.76	UCART2	52.44	
416	606183.43	4188100.76	UCART2	48.98	
417	606683.43	4188100.76	UCART2	49.18	
418	607183.43	4188100.76	UCART2	47.25	
419	607683.43	4188100.76	UCART2	49.69	
420	608183.43	4188100.76	UCART2	55.86	
421	608683.43	4188100.76	UCART2	68.09	
422	609183.43	4188100.76	UCART2	78.45	
423	609683.43	4188100.76	UCART2	72.92	
424	610183.43	4188100.76	UCART2	119.86	
425	610683.43	4188100.76	UCART2	92.69	
426	611183.43	4188100.76	UCART2	96.83	
427	607183.43	4188600.76	UCART2	49.19	
428	607683.43	4188600.76	UCART2	48.36	
429	608183.43	4188600.76	UCART2	49.18	
430	608683.43	4188600.76	UCART2	54.95	
431	609183.43	4188600.76	UCART2	63.02	
432	609683.43	4188600.76	UCART2	59.51	
433	610183.43	4188600.76	UCART2	54.17	
434	610683.43	4188600.76	UCART2	51.97	
435	611183.43	4188600.76	UCART2	54.95	

Plant Boundary Receptors

Receptor Pathway

Receptor Groups

Record Number	Group ID	Group Description
1	UPOL1	
2	UCART1	Receptors generated from Uniform Cartesian Grid
3	UCART2	Receptors generated from Uniform Cartesian Grid
4	UCART3	Receptors generated from Uniform Cartesian Grid
5	UCART4	Receptors generated from Uniform Cartesian Grid
6	UCART5	Receptors generated from Uniform Cartesian Grid

Results Summary

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PM10 - Concentration - Source Group: CUMULATI

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	102.87110	ug/m^3	595672.78	4183404.26	55.96	0.00	469.00	26.12.2019, 24
24-HR	36TH	10.53239	ug/m^3	594672.78	4182904.26	66.03	0.00	707.00	17.10.2019, 24
ANNUAL		6.67668	ug/m^3	605494.91	4186306.41	87.57	0.00	1014.00	
24		2.00000	COUNT	590172.78	4181904.26	396.75	0.00	713.00	

PM10 - Deposition - Source Group: CUMULATI

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	0.02702	g/m^2	595672.78	4182904.26	116.35	0.00	380.00	
24-HR	36TH	0.01187	g/m^2	595672.78	4183404.26	55.96	0.00	469.00	
ANNUAL		1.64835	g/m^2	595672.78	4183404.26	55.96	0.00	469.00	

Source Pathway - Source Inputs

Source Pathway - Source Inputs

Area Sources

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Base Elevation (Optional)	Release Height [m]	Emission Rate [g/ (s-m^2)]	Length of X Side [m]	Length of Y Side [m]	Orientation Angle from North [deg]	Initial Vertical Dim. [m]
AREA	AREA1	591308.71	4181429.24	469.85	5.00	0,00005	209.11	209.11	0.00	
		Dalama3-Overburden+Ore excavate+Loading								
AREA	AREA3	591394.37	4181156.40	434.26	5.00	0,00005	203.91	203.91	20.00	
		Dalama7-Quarry- excavate+ loading of overburden + ore								
AREA	AREA7	590502.00	4183325.19	113.62	5.00	0,00021	50.00	45.00	0.00	
		Yenikoy-Mechanical Plant-discharging+ loading material								
AREA	AREA8	591351.13	4183322.45	118.11	5.00	0,00010	54.11	42.89	0.00	
		Dereköy-Crushing Plant- Loading,Discharge of Material								
AREA	AREA9	591349.81	4183315.52	118.72	5.00	0,00005	54.11	42.89	0.00	
		Dereköy-Crushing Plant-Primary,Secondary Crushing Operations								
AREA	AREA10	591406.27	4201852.47	638.96	5.00	0,00003	101.22	75.92	0.00	
		Akcakoy crushing plant loading + discharge of the material								
AREA	AREA11	591322.31	4201823.28	627.79	5.00	0,00006	35.37	47.83	0.00	
		Akcakoy crushing plant, primary secondary crushing operations								
AREA	AREA12	600101.85	4184775.52	59.38	5.00	0,00041	23.78	23.78	0.00	
		Hamzabali, Discharge of aggregate +loading the material								
AREA	AREA13	590609.21	4181203.09	541.31	5.00	0,00001	173.77	218.82	0.00	
		Cine mechanical plant, loading + discharge of the material								
AREA	AREA14	595287.95	4183013.44	81.20	5.00	0,00048	67.09	64.11	0.00	
		Dalama3 Quarry excavate + loading, overburden + ore								
AREA	AREA15	595284.98	4182916.75	88.44	5.00	0,00001	97.47	97.47	0.00	
		Dalama3 Quarry dicharge + storage of the overbuden								
AREA	AREA16	595377.72	4183075.74	79.40	5.00	0,00012	45.00	45.00	0.00	
		Dalama 3 Quarry, Discharge + loading of ore to crushing plant								
AREA	AREA17	595388.72	4183086.26	78.42	5.00	0,00025	21.04	20.56	0.00	
		Dalama 3 Quarry, primary + secondary crushing operations								

Source Pathway - Source Inputs

AERMOD

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Base Elevation (Optional)	Release Height [m]	Emission Rate [g/ (s-m^2)]	Length of X Side [m]	Length of Y Side [m]	Orientation Angle from North [deg]	Initial Vertical Dim. [m]
AREA	AREA18	590804.76	4181425.19	512.61	5.00	0,00013	40.00	40.00	0.00	
		Dalama asphalt plant Discharging of the Material into the Silo								
AREA	AREA19	590837.73	4181497.98	511.38	5.00	2.64E-6	44.72	44.72	0.00	
		Dalama Asphalt plant discharge + storage								
AREA	AREA20	590663.30	4181512.00	492.69	5.00	0,00028	32.71	24.92	0.00	
		Dalama concrete plant, loading of the material + discharge of aggreg								

Open Pit Sources

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Base Elevation (Optional)	Release Height [m]	Emission Rate [g/ (s-m^2)]	Length of X Side [m]	Length of Y Side [m]	Volume of Open Pit [m]	Orientation Angle from North [deg]
OPEN PIT	OPIT1	591430.27	4181525.05	450.45	0.00	0,48430	22.02	22.02	4850.00	0.00
		Dalama3-Blasting								
OPEN PIT	OPIT2	591507.53	4181174.30	431.85	0.00	0,48430	22.36	22.36	5000.00	0.00
		Dalama7 quary-blasting								
OPEN PIT	OPIT3	595295.13	4183030.26	79.51	0.00	0,48430	22.36	22.36	5000.00	0.00
		Dalama3 quary-blasting								

Source Pathway - Source Inputs

Polygon Area Sources

Source Type: AREA POLY

Source: PAREA2 (Dalama7 Quarry-Discharge+ Storage of overburden)

Base Elevation (Optional)	Release Height [m]	Emission Rate [g/ (s-m^2)]	Initial Vertical Dim. [m]	Number of Vertices (or sides)	X Coordinate for Vertices [m]	Y Coordinate for Vertices [m]
468.74	5.00	0,00001		7	591247.23	4181396.55
		0,00001			591286.30	4181416.27
		0,00001			591347.39	4181281.62
		0,00001			591301.52	4181242.08
		0,00001			591276.72	4181311.89
		0,00001			591255.79	4181304.45
		0,00001			591235.39	4181369.57

Source Type: AREA POLY

Source: PAREA7 (Dalama3quarry -discharge of overburden +storage)

Base Elevation (Optional)	Release Height [m]	Emission Rate [g/ (s-m^2)]	Initial Vertical Dim. [m]	Number of Vertices (or sides)	X Coordinate for Vertices [m]	Y Coordinate for Vertices [m]
468.74	5.00	0,00001		7	591247.23	4181396.55
		0,00001			591286.30	4181416.27
		0,00001			591347.39	4181281.62
		0,00001			591301.52	4181242.08
		0,00001			591276.72	4181311.89
		0,00001			591255.79	4181304.45
		0,00001			591235.39	4181369.57

Source Type: AREA POLY

Source: PAREA5 (Direcik-Discharge of aggregate into the Bunker+loading the material)

Base Elevation (Optional)	Release Height [m]	Emission Rate [g/ (s-m^2)]	Initial Vertical Dim. [m]	Number of Vertices (or sides)	X Coordinate for Vertices [m]	Y Coordinate for Vertices [m]
64.85	5.00	0,00004		4	611830.08	4188517.43
		0,00004			611857.07	4188444.46
		0,00004			611792.09	4188426.46
		0,00004			611759.11	4188506.43

Source Pathway - Source Inputs

Line Area Sources

Source Type: LINE AREA

Source: ARLN16 (Yeniköy-the Movements of the Vehicles)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00003	2.37	590471.82	4183368.66	105.48	2.55
			590572.22	4183374.97	121.31	2.55

Source Type: LINE AREA

Source: ARLN17 (Dalama3 Quarry-the movements of the vehicles inside the query:)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00050	2.37	591387.82	4181514.83	457.14	2.55
			591156.42	4181225.27	450.45	2.55

Source Type: LINE AREA

Source: ARLN18 (Hamzabali Transport of the Material to the Concrete Plant)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00013	2.37	600107.10	4184782.44	58.55	2.55
			600007.21	4184794.70	57.07	2.55

Source Type: LINE AREA

Source: ARLN19 (Hamzabali,Transport of the Material from the Concrete Plant)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00013	2.37	600010.38	4184807.54	57.09	2.55
			600109.95	4184793.95	59.46	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN2 (Dalama3-transportation of overburden to storage)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00013	2.37	591267.17	4181328.86	460.55	2.55
			591442.88	4181429.43	449.93	2.55
			591414.15	4181508.99	451.40	2.55

Source Type: LINE AREA

Source: ARLN20 (Cine mechanical plant,the Movements of the Vehicles)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00003	2.37	590579.93	4181233.99	545.61	2.55
			590667.88	4181281.70	525.30	2.55

Source Type: LINE AREA

Source: ARLN21 (Dalama 3 Quarry-transport of overburden to the storage area)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00013	2.37	595333.34	4183061.00	76.13	2.55
			595307.48	4182964.05	87.12	2.55

Source Type: LINE AREA

Source: ARLN22 (Dalama 3 Quarry, transport of the ore to the crushing plant)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00049	2.37	595336.31	4183064.89	76.24	2.55
			595380.41	4183088.77	79.69	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN23 (Dalama 3 Quarry ransportation of the material out of the area)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00049	2.37	595392.04	4183110.60	76.29	2.55
			595313.43	4183173.99	66.18	2.55

Source Type: LINE AREA

Source: ARLN24 (Dalama, Transport of the Material to the Asphalt Plant)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00027	2.37	590829.33	4181442.74	512.14	2.55
			590860.32	4181522.13	510.33	2.55

Source Type: LINE AREA

Source: ARLN25 (Dalama asphalt plant, the transportation of the final material)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00041	2.37	590865.77	4181529.91	510.35	2.55
			590942.86	4181466.06	496.21	2.55

Source Type: LINE AREA

Source: ARLN26 (Dalama Concrete the Transport of the Material to the Concrete Plant)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00013	2.37	590674.98	4181525.24	491.11	2.55
			590675.76	4181424.79	511.29	2.55

Source Type: LINE AREA

Source: ARLN27 (Dalama Concrete plant, Transport of the Material from the Plant)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00013	2.37	590674.20	4181525.24	490.90	2.55
			590754.41	4181585.98	483.42	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN28 (excavation-filling operations for roadworks)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	3.80E-6	2.37	586818.47	4183302.62	193.93	2.55
			587790.31	4183168.88	211.03	2.55
			588806.73	4183088.63	190.15	2.55
			589787.49	4183240.20	162.11	2.55
			590768.25	4183347.20	152.44	2.55
			591793.59	4183258.04	163.61	2.55
			592738.68	4183008.39	137.30	2.55
			593443.04	4182330.77	115.63	2.55
			594316.81	4181974.14	109.75	2.55
			595235.15	4182464.51	117.82	2.55
			596082.17	4182945.98	132.86	2.55
			596991.60	4183266.95	166.04	2.55
			597963.75	4183623.78	181.56	2.55
			598813.45	4184148.28	100.47	2.55
			599379.92	4184599.36	89.19	2.55
			599694.62	4184683.28	64.15	2.55
			600365.99	4184599.36	97.65	2.55
			600649.22	4184431.52	135.94	2.55
			601513.08	4184219.63	133.68	2.55
			602055.73	4184360.31	125.54	2.55
			602517.99	4184701.99	106.35	2.55
			603241.53	4185425.52	129.71	2.55
			604125.85	4185807.39	109.87	2.55
			605070.47	4186108.86	147.60	2.55
			606055.29	4186450.53	107.26	2.55
			606819.02	4186993.19	67.40	2.55
			607502.36	4187797.12	49.15	2.55
			608004.82	4187917.71	55.61	2.55
			609271.01	4187174.07	164.15	2.55
			610095.04	4187274.56	196.94	2.55
			611079.85	4187897.61	117.80	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN7 (Direcik Concrete Plant-Transport of the Material to plant+from plant)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00025	2.37	611794.20	4188514.89	66.92	2.55
			611781.71	4188614.38	60.86	2.55

Source Type: LINE AREA

Source: ARLN8 (Dalama7 Quarry-the transportation of overburden to storage area)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00013	2.37	591597.18	4181184.80	412.04	2.55
			591289.35	4181329.66	461.81	2.55

Source Type: LINE AREA

Source: ARLN9 (Dalama7 Quarry-the movements of the vehicles inside the query:)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00049	2.37	591589.34	4181203.37	413.11	2.55
			591394.13	4181125.97	428.88	2.55
			591203.56	4181050.41	423.61	2.55

Source Pathway - Source Inputs

Area Sources Generated from Line Sources

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN2	A0000453	591269.91	4181324.09	2.55	101.22	330.22	455.65	2.37
	A0000454	591357.76	4181374.37	2.55	101.22	330.22	465.06	2.37
	A0000455	591448.05	4181431.29	2.55	84.59	250.14	448.76	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN7	A0000463	611799.66	4188515.57	2.55	100.28	262.85	66.09	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN8	A0000464	591599.52	4181189.77	2.55	85.05	205.20	414.07	2.37
	A0000465	591522.56	4181225.99	2.55	85.05	205.20	429.51	2.37
	A0000466	591445.61	4181262.21	2.55	85.05	205.20	449.09	2.37
	A0000467	591368.65	4181298.42	2.55	85.05	205.20	457.20	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN9	A0000468	591587.31	4181208.48	2.55	105.00	158.37	415.87	2.37
	A0000469	591489.71	4181169.78	2.55	105.00	158.37	434.63	2.37
	A0000470	591392.10	4181131.08	2.55	102.50	158.37	429.54	2.37
	A0000471	591296.82	4181093.30	2.55	102.50	158.37	409.16	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000478	590472.17	4183363.17	2.55	100.60	356.40	107.17	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN17	A0000479	591383.52	4181518.27	2.55	92.67	128.63	456.70	2.37
	A0000480	591325.67	4181445.88	2.55	92.67	128.63	468.96	2.37
	A0000481	591267.82	4181373.49	2.55	92.67	128.63	465.85	2.37
	A0000482	591209.97	4181301.09	2.55	92.67	128.63	448.78	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN18	A0000483	600107.77	4184787.90	2.55	100.63	187.00	59.28	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN19	A0000484	600009.63	4184802.09	2.55	100.49	7.77	57.23	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN20	A0000485	590582.55	4181229.16	2.55	100.06	331.53	542.91	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000486	595328.02	4183062.41	2.55	100.34	104.93	77.63	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN22	A0000487	595338.93	4183060.06	2.55	50.15	331.57	78.63	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN23	A0000488	595395.49	4183114.88	2.55	100.98	218.88	74.16	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN24	A0000489	590834.46	4181440.74	2.55	85.22	291.32	512.12	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN25	A0000490	590862.26	4181525.68	2.55	100.10	39.63	509.58	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN26	A0000491	590669.48	4181525.20	2.55	100.46	89.56	490.74	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN27	A0000492	590677.52	4181520.86	2.55	100.61	322.86	493.09	2.37

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000493	586817.72	4183297.17	2.55	109.00	7.84	199.94	2.37
	A0000494	586925.70	4183282.31	2.55	109.00	7.84	209.42	2.37
	A0000495	587033.69	4183267.45	2.55	109.00	7.84	197.79	2.37
	A0000496	587141.67	4183252.59	2.55	109.00	7.84	165.22	2.37
	A0000497	587249.65	4183237.73	2.55	109.00	7.84	148.75	2.37
	A0000498	587357.63	4183222.87	2.55	109.00	7.84	150.85	2.37
	A0000499	587465.62	4183208.01	2.55	109.00	7.84	147.76	2.37
	A0000500	587573.60	4183193.15	2.55	109.00	7.84	160.17	2.37
	A0000501	587681.58	4183178.29	2.55	109.00	7.84	186.07	2.37
	A0000502	587789.88	4183163.39	2.55	101.96	4.51	212.41	2.37
	A0000503	587891.52	4183155.37	2.55	101.96	4.51	200.81	2.37
	A0000504	587993.16	4183147.34	2.55	101.96	4.51	198.66	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000505	588094.81	4183139.32	2.55	101.96	4.51	207.78	2.37
	A0000506	588196.45	4183131.30	2.55	101.96	4.51	201.53	2.37
	A0000507	588298.09	4183123.27	2.55	101.96	4.51	193.79	2.37
	A0000508	588399.73	4183115.25	2.55	101.96	4.51	184.00	2.37
	A0000509	588501.37	4183107.22	2.55	101.96	4.51	182.65	2.37
	A0000510	588603.02	4183099.20	2.55	101.96	4.51	180.62	2.37
	A0000511	588704.66	4183091.17	2.55	101.96	4.51	179.58	2.37
	A0000512	588807.57	4183083.20	2.55	99.24	351.21	192.60	2.37
	A0000513	588905.65	4183098.35	2.55	99.24	351.21	205.38	2.37
	A0000514	589003.72	4183113.51	2.55	99.24	351.21	214.93	2.37
	A0000515	589101.80	4183128.67	2.55	99.24	351.21	221.30	2.37
	A0000516	589199.88	4183143.83	2.55	99.24	351.21	210.59	2.37
	A0000517	589297.95	4183158.98	2.55	99.24	351.21	186.43	2.37
	A0000518	589396.03	4183174.14	2.55	99.24	351.21	180.09	2.37
	A0000519	589494.10	4183189.30	2.55	99.24	351.21	156.78	2.37
	A0000520	589592.18	4183204.45	2.55	99.24	351.21	164.45	2.37
	A0000521	589690.26	4183219.61	2.55	99.24	351.21	163.10	2.37
	A0000522	589788.09	4183234.74	2.55	109.62	353.77	162.36	2.37
	A0000523	589897.06	4183246.62	2.55	109.62	353.77	170.85	2.37
	A0000524	590006.03	4183258.51	2.55	109.62	353.77	169.12	2.37
	A0000525	590115.01	4183270.40	2.55	109.62	353.77	153.53	2.37
	A0000526	590223.98	4183282.29	2.55	109.62	353.77	132.59	2.37
	A0000527	590332.95	4183294.18	2.55	109.62	353.77	120.45	2.37
	A0000528	590441.93	4183306.06	2.55	109.62	353.77	112.67	2.37
	A0000529	590550.90	4183317.95	2.55	109.62	353.77	121.96	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000530	590659.87	4183329.84	2.55	109.62	353.77	149.49	2.37
	A0000531	590767.77	4183341.72	2.55	102.92	4.97	157.48	2.37
	A0000532	590870.31	4183332.80	2.55	102.92	4.97	166.49	2.37
	A0000533	590972.84	4183323.88	2.55	102.92	4.97	154.99	2.37
	A0000534	591075.37	4183314.97	2.55	102.92	4.97	143.05	2.37
	A0000535	591177.91	4183306.05	2.55	102.92	4.97	157.63	2.37
	A0000536	591280.44	4183297.14	2.55	102.92	4.97	143.71	2.37
	A0000537	591382.97	4183288.22	2.55	102.92	4.97	114.31	2.37
	A0000538	591485.51	4183279.30	2.55	102.92	4.97	116.71	2.37
	A0000539	591588.04	4183270.39	2.55	102.92	4.97	126.97	2.37
	A0000540	591690.58	4183261.47	2.55	102.92	4.97	143.42	2.37
	A0000541	591792.18	4183252.72	2.55	108.61	14.80	163.36	2.37
	A0000542	591897.19	4183224.98	2.55	108.61	14.80	177.61	2.37
	A0000543	592002.20	4183197.24	2.55	108.61	14.80	187.17	2.37
	A0000544	592107.21	4183169.50	2.55	108.61	14.80	178.06	2.37
	A0000545	592212.22	4183141.76	2.55	108.61	14.80	147.45	2.37
	A0000546	592317.23	4183114.03	2.55	108.61	14.80	135.18	2.37
	A0000547	592422.24	4183086.29	2.55	108.61	14.80	147.51	2.37
	A0000548	592527.25	4183058.55	2.55	108.61	14.80	147.13	2.37
	A0000549	592632.26	4183030.81	2.55	108.61	14.80	144.60	2.37
	A0000550	592734.87	4183004.43	2.55	108.60	43.89	143.84	2.37
	A0000551	592813.13	4182929.13	2.55	108.60	43.89	151.19	2.37
	A0000552	592891.39	4182853.84	2.55	108.60	43.89	154.46	2.37
	A0000553	592969.65	4182778.55	2.55	108.60	43.89	136.82	2.37
	A0000554	593047.92	4182703.26	2.55	108.60	43.89	129.36	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000555	593126.18	4182627.97	2.55	108.60	43.89	127.63	2.37
	A0000556	593204.44	4182552.68	2.55	108.60	43.89	129.64	2.37
	A0000557	593282.70	4182477.39	2.55	108.60	43.89	128.83	2.37
	A0000558	593360.97	4182402.10	2.55	108.60	43.89	121.52	2.37
	A0000559	593440.96	4182325.68	2.55	104.86	22.20	116.53	2.37
	A0000560	593538.05	4182286.06	2.55	104.86	22.20	102.12	2.37
	A0000561	593635.13	4182246.43	2.55	104.86	22.20	99.62	2.37
	A0000562	593732.22	4182206.80	2.55	104.86	22.20	96.51	2.37
	A0000563	593829.30	4182167.18	2.55	104.86	22.20	89.69	2.37
	A0000564	593926.39	4182127.55	2.55	104.86	22.20	89.90	2.37
	A0000565	594023.47	4182087.92	2.55	104.86	22.20	77.41	2.37
	A0000566	594120.56	4182048.30	2.55	104.86	22.20	76.81	2.37
	A0000567	594217.64	4182008.67	2.55	104.86	22.20	86.87	2.37
	A0000568	594319.40	4181969.28	2.55	104.11	331.90	107.48	2.37
	A0000569	594411.23	4182018.32	2.55	104.11	331.90	108.39	2.37
	A0000570	594503.07	4182067.36	2.55	104.11	331.90	108.70	2.37
	A0000571	594594.90	4182116.40	2.55	104.11	331.90	93.83	2.37
	A0000572	594686.74	4182165.44	2.55	104.11	331.90	94.58	2.37
	A0000573	594778.57	4182214.47	2.55	104.11	331.90	107.05	2.37
	A0000574	594870.40	4182263.51	2.55	104.11	331.90	123.27	2.37
	A0000575	594962.24	4182312.55	2.55	104.11	331.90	120.55	2.37
	A0000576	595054.07	4182361.59	2.55	104.11	331.90	122.27	2.37
	A0000577	595145.91	4182410.62	2.55	104.11	331.90	102.72	2.37
	A0000578	595237.87	4182459.73	2.55	108.25	330.39	117.19	2.37
	A0000579	595331.98	4182513.23	2.55	108.25	330.39	145.41	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000580	595426.10	4182566.72	2.55	108.25	330.39	160.30	2.37
	A0000581	595520.21	4182620.22	2.55	108.25	330.39	150.59	2.37
	A0000582	595614.32	4182673.72	2.55	108.25	330.39	155.78	2.37
	A0000583	595708.44	4182727.21	2.55	108.25	330.39	145.22	2.37
	A0000584	595802.55	4182780.71	2.55	108.25	330.39	157.62	2.37
	A0000585	595896.66	4182834.20	2.55	108.25	330.39	148.12	2.37
	A0000586	595990.77	4182887.70	2.55	108.25	330.39	134.42	2.37
	A0000587	596084.00	4182940.79	2.55	107.16	340.56	141.83	2.37
	A0000588	596185.05	4182976.45	2.55	107.16	340.56	152.23	2.37
	A0000589	596286.10	4183012.12	2.55	107.16	340.56	163.19	2.37
	A0000590	596387.14	4183047.78	2.55	107.16	340.56	158.15	2.37
	A0000591	596488.19	4183083.45	2.55	107.16	340.56	133.03	2.37
	A0000592	596589.24	4183119.11	2.55	107.16	340.56	125.12	2.37
	A0000593	596690.29	4183154.77	2.55	107.16	340.56	144.80	2.37
	A0000594	596791.33	4183190.44	2.55	107.16	340.56	153.71	2.37
	A0000595	596892.38	4183226.10	2.55	107.16	340.56	161.98	2.37
	A0000596	596993.49	4183261.79	2.55	103.56	339.84	166.59	2.37
	A0000597	597090.71	4183297.47	2.55	103.56	339.84	170.31	2.37
	A0000598	597187.93	4183333.15	2.55	103.56	339.84	169.07	2.37
	A0000599	597285.14	4183368.84	2.55	103.56	339.84	184.65	2.37
	A0000600	597382.36	4183404.52	2.55	103.56	339.84	178.37	2.37
	A0000601	597479.57	4183440.20	2.55	103.56	339.84	180.59	2.37
	A0000602	597576.79	4183475.89	2.55	103.56	339.84	182.28	2.37
	A0000603	597674.00	4183511.57	2.55	103.56	339.84	162.29	2.37
	A0000604	597771.22	4183547.25	2.55	103.56	339.84	143.49	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000605	597868.43	4183582.93	2.55	103.56	339.84	160.23	2.37
	A0000606	597966.64	4183619.10	2.55	99.85	328.31	174.99	2.37
	A0000607	598051.61	4183671.55	2.55	99.85	328.31	167.26	2.37
	A0000608	598136.58	4183724.00	2.55	99.85	328.31	163.31	2.37
	A0000609	598221.55	4183776.45	2.55	99.85	328.31	164.49	2.37
	A0000610	598306.52	4183828.90	2.55	99.85	328.31	165.97	2.37
	A0000611	598391.49	4183881.35	2.55	99.85	328.31	156.35	2.37
	A0000612	598476.46	4183933.80	2.55	99.85	328.31	154.46	2.37
	A0000613	598561.43	4183986.25	2.55	99.85	328.31	134.92	2.37
	A0000614	598646.40	4184038.70	2.55	99.85	328.31	123.65	2.37
	A0000615	598731.37	4184091.15	2.55	99.85	328.31	118.07	2.37
	A0000616	598816.88	4184143.98	2.55	103.45	321.47	99.78	2.37
	A0000617	598897.80	4184208.42	2.55	103.45	321.47	109.61	2.37
	A0000618	598978.73	4184272.86	2.55	103.45	321.47	113.50	2.37
	A0000619	599059.65	4184337.30	2.55	103.45	321.47	86.78	2.37
	A0000620	599140.57	4184401.74	2.55	103.45	321.47	77.54	2.37
	A0000621	599221.50	4184466.18	2.55	103.45	321.47	77.46	2.37
	A0000622	599302.42	4184530.62	2.55	103.45	321.47	84.10	2.37
	A0000623	599381.34	4184594.05	2.55	108.57	345.07	88.21	2.37
	A0000624	599486.24	4184622.02	2.55	108.57	345.07	76.30	2.37
	A0000625	599591.14	4184649.99	2.55	108.57	345.07	69.50	2.37
	A0000626	599693.94	4184677.82	2.55	96.66	7.13	66.13	2.37
	A0000627	599789.85	4184665.83	2.55	96.66	7.13	70.35	2.37
	A0000628	599885.76	4184653.85	2.55	96.66	7.13	71.22	2.37
	A0000629	599981.67	4184641.86	2.55	96.66	7.13	61.01	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000630	600077.58	4184629.87	2.55	96.66	7.13	62.05	2.37
	A0000631	600173.49	4184617.88	2.55	96.66	7.13	76.23	2.37
	A0000632	600269.40	4184605.89	2.55	96.66	7.13	94.83	2.37
	A0000633	600363.19	4184594.63	2.55	109.74	30.65	100.84	2.37
	A0000634	600457.60	4184538.68	2.55	109.74	30.65	124.57	2.37
	A0000635	600552.01	4184482.73	2.55	109.74	30.65	138.92	2.37
	A0000636	600647.91	4184426.18	2.55	98.83	13.78	136.66	2.37
	A0000637	600743.90	4184402.63	2.55	98.83	13.78	136.06	2.37
	A0000638	600839.88	4184379.09	2.55	98.83	13.78	153.16	2.37
	A0000639	600935.86	4184355.55	2.55	98.83	13.78	162.86	2.37
	A0000640	601031.85	4184332.00	2.55	98.83	13.78	149.18	2.37
	A0000641	601127.83	4184308.46	2.55	98.83	13.78	142.56	2.37
	A0000642	601223.82	4184284.92	2.55	98.83	13.78	144.50	2.37
	A0000643	601319.80	4184261.37	2.55	98.83	13.78	134.21	2.37
	A0000644	601415.78	4184237.83	2.55	98.83	13.78	127.03	2.37
	A0000645	601514.46	4184214.30	2.55	93.43	345.47	139.98	2.37
	A0000646	601604.90	4184237.75	2.55	93.43	345.47	134.78	2.37
	A0000647	601695.34	4184261.20	2.55	93.43	345.47	115.27	2.37
	A0000648	601785.79	4184284.65	2.55	93.43	345.47	99.01	2.37
	A0000649	601876.23	4184308.09	2.55	93.43	345.47	100.81	2.37
	A0000650	601966.67	4184331.54	2.55	93.43	345.47	114.36	2.37
	A0000651	602059.00	4184355.89	2.55	95.80	323.53	124.68	2.37
	A0000652	602136.04	4184412.84	2.55	95.80	323.53	107.30	2.37
	A0000653	602213.09	4184469.78	2.55	95.80	323.53	109.68	2.37
	A0000654	602290.13	4184526.73	2.55	95.80	323.53	136.71	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000655	602367.17	4184583.67	2.55	95.80	323.53	133.72	2.37
	A0000656	602444.22	4184640.62	2.55	95.80	323.53	124.92	2.37
	A0000657	602521.88	4184698.10	2.55	102.32	315.00	109.16	2.37
	A0000658	602594.24	4184770.45	2.55	102.32	315.00	105.96	2.37
	A0000659	602666.59	4184842.80	2.55	102.32	315.00	110.32	2.37
	A0000660	602738.94	4184915.16	2.55	102.32	315.00	106.21	2.37
	A0000661	602811.30	4184987.51	2.55	102.32	315.00	88.44	2.37
	A0000662	602883.65	4185059.87	2.55	102.32	315.00	83.33	2.37
	A0000663	602956.00	4185132.22	2.55	102.32	315.00	95.62	2.37
	A0000664	603028.36	4185204.57	2.55	102.32	315.00	118.95	2.37
	A0000665	603100.71	4185276.93	2.55	102.32	315.00	127.97	2.37
	A0000666	603173.07	4185349.28	2.55	102.32	315.00	138.85	2.37
	A0000667	603243.71	4185420.47	2.55	107.03	336.64	123.66	2.37
	A0000668	603341.97	4185462.90	2.55	107.03	336.64	106.32	2.37
	A0000669	603440.23	4185505.33	2.55	107.03	336.64	106.13	2.37
	A0000670	603538.48	4185547.76	2.55	107.03	336.64	100.15	2.37
	A0000671	603636.74	4185590.19	2.55	107.03	336.64	96.69	2.37
	A0000672	603735.00	4185632.62	2.55	107.03	336.64	103.26	2.37
	A0000673	603833.26	4185675.05	2.55	107.03	336.64	116.87	2.37
	A0000674	603931.52	4185717.48	2.55	107.03	336.64	134.29	2.37
	A0000675	604029.78	4185759.91	2.55	107.03	336.64	121.62	2.37
	A0000676	604127.53	4185802.15	2.55	99.16	342.30	114.61	2.37
	A0000677	604221.99	4185832.30	2.55	99.16	342.30	127.33	2.37
	A0000678	604316.45	4185862.45	2.55	99.16	342.30	121.67	2.37
	A0000679	604410.91	4185892.59	2.55	99.16	342.30	127.83	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000680	604505.37	4185922.74	2.55	99.16	342.30	130.21	2.37
	A0000681	604599.84	4185952.89	2.55	99.16	342.30	134.59	2.37
	A0000682	604694.30	4185983.03	2.55	99.16	342.30	133.60	2.37
	A0000683	604788.76	4186013.18	2.55	99.16	342.30	139.98	2.37
	A0000684	604883.22	4186043.33	2.55	99.16	342.30	153.68	2.37
	A0000685	604977.68	4186073.48	2.55	99.16	342.30	160.47	2.37
	A0000686	605072.28	4186103.67	2.55	104.24	340.87	148.59	2.37
	A0000687	605170.76	4186137.84	2.55	104.24	340.87	144.58	2.37
	A0000688	605269.24	4186172.00	2.55	104.24	340.87	130.09	2.37
	A0000689	605367.72	4186206.17	2.55	104.24	340.87	113.01	2.37
	A0000690	605466.20	4186240.34	2.55	104.24	340.87	100.75	2.37
	A0000691	605564.68	4186274.50	2.55	104.24	340.87	83.56	2.37
	A0000692	605663.16	4186308.67	2.55	104.24	340.87	91.51	2.37
	A0000693	605761.65	4186342.84	2.55	104.24	340.87	105.90	2.37
	A0000694	605860.13	4186377.00	2.55	104.24	340.87	109.64	2.37
	A0000695	605958.61	4186411.17	2.55	104.24	340.87	99.99	2.37
	A0000696	606058.47	4186446.05	2.55	104.10	324.61	105.55	2.37
	A0000697	606143.33	4186506.35	2.55	104.10	324.61	99.13	2.37
	A0000698	606228.19	4186566.64	2.55	104.10	324.61	104.86	2.37
	A0000699	606313.05	4186626.94	2.55	104.10	324.61	100.94	2.37
	A0000700	606397.91	4186687.23	2.55	104.10	324.61	89.56	2.37
	A0000701	606482.77	4186747.53	2.55	104.10	324.61	94.01	2.37
	A0000702	606567.63	4186807.82	2.55	104.10	324.61	88.99	2.37
	A0000703	606652.49	4186868.11	2.55	104.10	324.61	82.11	2.37
	A0000704	606737.35	4186928.41	2.55	104.10	324.61	74.93	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000705	606823.21	4186989.63	2.55	105.51	310.36	67.74	2.37
	A0000706	606891.55	4187070.02	2.55	105.51	310.36	66.89	2.37
	A0000707	606959.88	4187150.41	2.55	105.51	310.36	61.46	2.37
	A0000708	607028.21	4187230.81	2.55	105.51	310.36	58.05	2.37
	A0000709	607096.55	4187311.20	2.55	105.51	310.36	56.00	2.37
	A0000710	607164.88	4187391.59	2.55	105.51	310.36	55.63	2.37
	A0000711	607233.22	4187471.98	2.55	105.51	310.36	54.15	2.37
	A0000712	607301.55	4187552.38	2.55	105.51	310.36	55.31	2.37
	A0000713	607369.89	4187632.77	2.55	105.51	310.36	55.44	2.37
	A0000714	607438.22	4187713.16	2.55	105.51	310.36	51.49	2.37
	A0000715	607503.65	4187791.77	2.55	103.34	346.50	49.09	2.37
	A0000716	607604.14	4187815.89	2.55	103.34	346.50	50.43	2.37
	A0000717	607704.63	4187840.01	2.55	103.34	346.50	51.75	2.37
	A0000718	607805.12	4187864.12	2.55	103.34	346.50	51.97	2.37
	A0000719	607905.61	4187888.24	2.55	103.34	346.50	52.02	2.37
	A0000720	608002.03	4187912.97	2.55	104.89	30.43	55.47	2.37
	A0000721	608092.48	4187859.85	2.55	104.89	30.43	56.89	2.37
	A0000722	608182.92	4187806.73	2.55	104.89	30.43	58.88	2.37
	A0000723	608273.36	4187753.62	2.55	104.89	30.43	60.65	2.37
	A0000724	608363.80	4187700.50	2.55	104.89	30.43	66.82	2.37
	A0000725	608454.25	4187647.38	2.55	104.89	30.43	72.78	2.37
	A0000726	608544.69	4187594.26	2.55	104.89	30.43	80.15	2.37
	A0000727	608635.13	4187541.15	2.55	104.89	30.43	89.68	2.37
	A0000728	608725.57	4187488.03	2.55	104.89	30.43	106.06	2.37
	A0000729	608816.01	4187434.91	2.55	104.89	30.43	113.85	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN28	A0000730	608906.46	4187381.80	2.55	104.89	30.43	133.93	2.37
	A0000731	608996.90	4187328.68	2.55	104.89	30.43	136.67	2.37
	A0000732	609087.34	4187275.56	2.55	104.89	30.43	140.60	2.37
	A0000733	609177.78	4187222.45	2.55	104.89	30.43	140.06	2.37
	A0000734	609271.68	4187168.61	2.55	103.77	353.05	168.05	2.37
	A0000735	609374.68	4187181.17	2.55	103.77	353.05	171.65	2.37
	A0000736	609477.68	4187193.74	2.55	103.77	353.05	165.11	2.37
	A0000737	609580.69	4187206.30	2.55	103.77	353.05	159.11	2.37
	A0000738	609683.69	4187218.86	2.55	103.77	353.05	143.06	2.37
	A0000739	609786.69	4187231.42	2.55	103.77	353.05	147.09	2.37
	A0000740	609889.70	4187243.98	2.55	103.77	353.05	174.31	2.37
	A0000741	609992.70	4187256.54	2.55	103.77	353.05	183.33	2.37
	A0000742	610097.98	4187269.92	2.55	105.94	327.68	200.08	2.37
	A0000743	610187.51	4187326.56	2.55	105.94	327.68	203.33	2.37
	A0000744	610277.04	4187383.20	2.55	105.94	327.68	198.81	2.37
	A0000745	610366.57	4187439.84	2.55	105.94	327.68	192.85	2.37
	A0000746	610456.09	4187496.48	2.55	105.94	327.68	181.21	2.37
	A0000747	610545.62	4187553.12	2.55	105.94	327.68	177.37	2.37
	A0000748	610635.15	4187609.76	2.55	105.94	327.68	178.40	2.37
	A0000749	610724.68	4187666.40	2.55	105.94	327.68	173.90	2.37
	A0000750	610814.21	4187723.04	2.55	105.94	327.68	160.17	2.37
	A0000751	610903.74	4187779.68	2.55	105.94	327.68	151.25	2.37
	A0000752	610993.27	4187836.32	2.55	105.94	327.68	142.82	2.37

AYDIN-DENİZLİ MOTORWAY PROJECT'S OPERATIONAL PHASE

AIR QUALITY MODELING REPORT

HACETTEPE UNIVERSITY

DEPARTMENT OF ENVIRONMENTAL ENGINEERING

Prof. Dr. GÜLEN GÜLLÜ

OCTOBER 2023

TABLE OF CONTENTS

TABLE LISTS

FIGURE LISTS

LIST OF SYMBOLS AND ABBREVIATIONS

EU	European Union
HKDYY	• Air Quality Assessment and Management Regulation
HKKD	Contribution to Air Pollution
HV	Heavy Vehicle
LHV	Light Commercial Vehicle
LV	Light Vehicle
KVS	Short Term Limit
SKHKKY	Industrial Air Pollution Control Regulation
UVS	Long Term Limit
GLC	Ground Level Concentration
VOC	Volatile Organic Compounds
t	Ton
TVOC	Total Volatile Organic Compounds

1. INTRODUCTION

The report has been prepared by Hacettepe University Environmental Engineering Department to be used in the Environmental Impact Assessment Report prepared for Aydın-Denizli Motorway Project's operational phase.

The report has been prepared using the AERMOD distribution model to examine the distribution of the emissions of the Aydın-Denizli Motorway Project's operational phase.

With the air quality modeling study, the air pollution contribution value (HKKK) and air quality values within the facility's impact area were calculated and compared with the relevant limit values. The results obtained from the modeling studies were evaluated in accordance with the Industrial Air Pollution Control Regulation (SKHKKY), which entered into force on 03.07.2009.

The following part of the report gives information about the national legislation that determines the limit values of the emissions arising from the project's construction phase in the external environment. Emission data obtained from the environmental impact assessment reports of the facilities in the project's impact area are summarized in the following sections. The method and model inputs used in the modeling are given in Chapter 3 of the report. Chapter 4 includes the results of the modeling studies within the specified framework of the Industrial Air Pollution Control Regulation (SKHKKY) (Official Gazette, Industrial Air Pollution Control Regulation, 2009) and an overall assessment of their possible effects on local air quality.

1.1 Legal Status

Improvements in air management policies in Turkey gained momentum with Turkey's acceptance of the European Union (EU) Integrated Environment Strategy. Accordingly, Turkey's legislation has fully complied with the EU Air Quality Framework Directive (and related directives).

The regulations in force in Turkey regarding emissions and air quality from highway projects and mining facilities are listed below:

- Air Quality Assessment and Management Regulation (HKDYY), published in the Official Gazette dated 06 June 2008 and numbered 26898;
- Industrial Air Pollution Control Regulation (SKHKKY) published in the Official Gazette No. 27277 dated 03 July 2009 (Official Gazette, Industrial Air Pollution Control Regulation, 2009); (SKHKKY)

As a result of the Air Quality Assessment and Management Regulation (HKDYY) being published in the Official Gazette No. 26898 on 06.06.2008, the Air Quality Protection Regulation (HKKY) was repealed. The HKDYY aims to improve the ambient air quality gradually and provide the limit value determined on a targeted date. Therefore, the regulation defines two types of limit values: transition period limit values and target limit values for gaseous pollutants and particulate matter. The values used in the evaluation study and the dates they were put into practice are shown in Table 1.

With SKHKKY, to control the emissions in the form of soot, smoke, dust, gas, steam, and aerosol emitted into the atmosphere as a result of the activities of industry and power generation facilities; to protect people and their environment from the dangers arising from pollution in the air-receiving environment; to eliminate the adverse effects that cause significant damage to the public and neighborhood relations due to air pollution in the background and to determine the procedures and principles to prevent the emergence of these effects are aimed.

NO_X, VOC, and CO are primary pollutants emissions released into the atmosphere caused by traffic. Limit values to be provided in outdoor air are defined in Table 2.2 of SKHKKY Annex-2; these limit values are given in Table 1.

Table 1. Limit Values Specified in the Industrial Air Pollution Control Regulation

Pollutant	Average Duration	Limit Value (µg/m^3)	Date to Reach Limit Value
SO_2	Hourly (for the protection of human health)	350 (cannot be exceeded more than 24 times in a year)	1.1.2019
	24 hour (for the protection of human health)	125 (cannot be exceeded more than 3 times in a year)	1.1.2019
	UVS	60	1.1.2014
	Annual and winter period (for the protection of the ecosystem)	20	1.1.2014
NO_2	Hourly (for the protection of human health)	200 (cannot be exceeded more than 18 times in a year)	1.1.2024
	Yearly (for the protection of human health)	40	1.1.2024
NO_x	Yearly (for the preservation of vegetation)	30	1.1.2014
PM_{10}	24 hour (for the protection of human health)	50 (cannot be exceeded more than 35 times in a year)	1.1.2019
	Yearly (for the protection of human health)	40	1.1.2019
CO	Maximum daily 8-hour average (for the protection of human health)	10,000	1.1.2017
Precipitated Dust **	KVS (mg/m^2-day)	390	
	UVS (mg/m^2-day)	210	

2. DATA USED IN THE STUDY

In this section, the data used in the modeling study are defined.

2.1 Meteorological Data Set

The long-term meteorological data required for modeling studies are obtained from the existing meteorological stations in the region. For the AERMOD model, hourly surface station data is measured at air conditioning, synoptic or automatic type stations, and sounding meteorological data is measured at rawinsonde stations where the vertical profile of the atmosphere is determined.

In this study, hourly meteorological data sets required according to the Project region were obtained from the closest synoptic ground observation station Aydın (17234) and rawinsonde station Izmir (17220) for the first part of the planned project. For the second part of the planned Project, hourly meteorological data were obtained from the closest synoptic ground observation station Denizli (17237) and rawinsonde station Isparta (17240). While selecting the meteorological data set, the wind speed and wind direction data of the Aydın (17234) and Denizli (17237) Meteorology Stations measured data between 1960-2019 were used to extract the wind profile of the regions.

The wind profile for the years 1960-2019 is shown in Figure 1 and Figure 2. As shown in Table 2. As shown in Table 3, there is no exact year matching with the years 1960-2019 from the data of the last 10 years. For this reason, the total estimation of the previous ten years was taken into account, and it was seen that the 2019 data matched precisely as shown in Table 2. The total wind blow numbers for the last ten years are shown in Figure 3, and the total wind blow numbers for 2019 are shown in Figure 5. For this reason, 2019 was deemed appropriate to represent Aydın meteorological station.

As shown in Table 3, there is no exact year matching with the years 1960-2019 from the data of the last 10 years. For this reason, the total estimation of the previous ten years was taken into account, and it was seen that the 2014 data matched precisely as shown in Table 3. The total wind blow numbers for the last ten years are shown in Figure 4, and the total wind blow numbers for 2014 are shown in Figure 6. For this reason, 2014 was deemed appropriate to represent Denizli meteorological station.

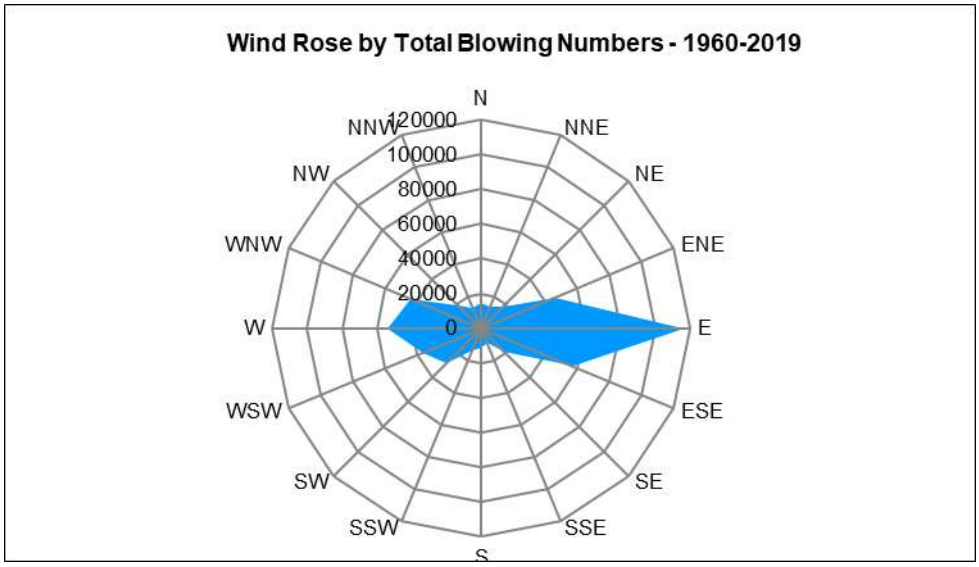

Figure 1. Aydın Meteorology Station 1960-2019 Wind Diagram

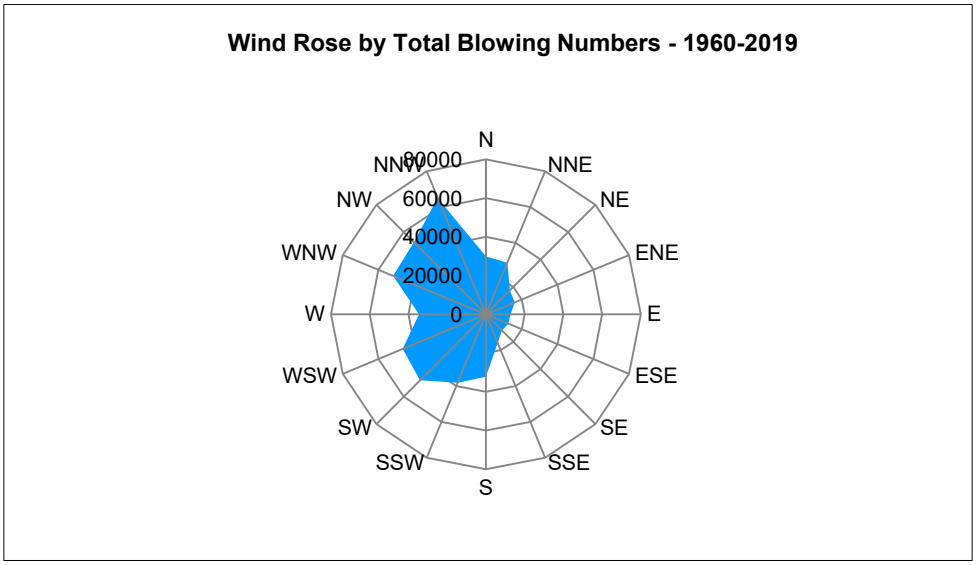

Figure 2. Denizli Meteorology Station 1960-2019 Wind Diagram

Table 2 Aydın Meteorology Station 1960-2019, Last 10 Years and Last 10 Years Total Wind Direction

Direction/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Last ten years	1960-2019
N	418	211	198	146	223	223	232	232	207	432	2522	14344
NNE	1043	176	173	128	165	161	158	218	165	277	2664	13453
NE	1425	193	193	140	231	173	225	296	292	413	3581	17670
ENE	1535	640	718	674	834	711	1431	1666	1539	1790	11538	45872
E	813	2612	2680	2491	2502	2223	2094	1841	1977	1036	20269	116644
ESE	250	628	751	607	602	559	362	386	283	160	4588	57016
SE	232	299	311	276	239	289	256	232	194	99	2427	19002
SSW	228	246	217	240	224	242	216	223	164	121	2121	9068
S	328	256	224	265	281	311	353	339	345	300	3002	11161
SSW	561	377	347	374	376	473	597	624	517	635	4881	13757
SW	518	622	595	646	648	710	990	965	706	910	7310	28583
WSW	337	970	858	1043	846	908	663	745	648	708	7726	36317
W	318	724	747	759	648	761	455	436	628	283	5759	53975
WNW	218	415	340	452	341	412	147	187	225	115	2852	43865
NW	195	238	212	222	156	197	94	109	120	133	1676	18048
NNW	260	161	145	96	111	136	117	147	103	190	1466	12742

Highest
Second Highest
Third Highest

Table 3 Denizli Meteorology Station 1960-2019, Last 10 Years and Last 10 Years Total Wind Direction

Direction/Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Last ten years	1960-2019
N	481	595	666	610	615	539	769	441	742	936	6394	30011
NNE	361	487	467	471	491	446	190	388	410	585	4296	28860
NE	389	442	376	431	435	387	156	378	354	398	3746	17482
ENE	424	405	332	350	345	307	128	315	377	244	3227	16179
E	391	347	335	335	378	288	150	382	378	207	3191	12775
ESE	335	368	345	335	326	288	151	335	326	159	2968	12527
SE	344	320	262	237	220	207	125	288	243	117	2363	11788
SSW	447	237	212	225	180	234	369	287	242	94	2527	15848
S	718	311	366	272	253	529	3027	519	295	144	6434	32174
SSW	655	514	508	419	387	669	750	1139	344	221	5606	38176
SW	1335	1228	1300	1232	1181	1308	684	1123	902	919	11212	48025
WSW	902	738	719	976	995	688	407	588	1055	929	7997	46408
W	457	443	474	517	546	472	260	663	554	464	4850	34574
WNW	376	656	562	591	712	594	288	812	655	525	5771	51854
NW	499	852	880	839	845	869	469	627	810	806	7496	52675
NNW	563	796	874	833	832	846	430	448	776	867	7265	65022

Highest
Second Highest
Third Highest

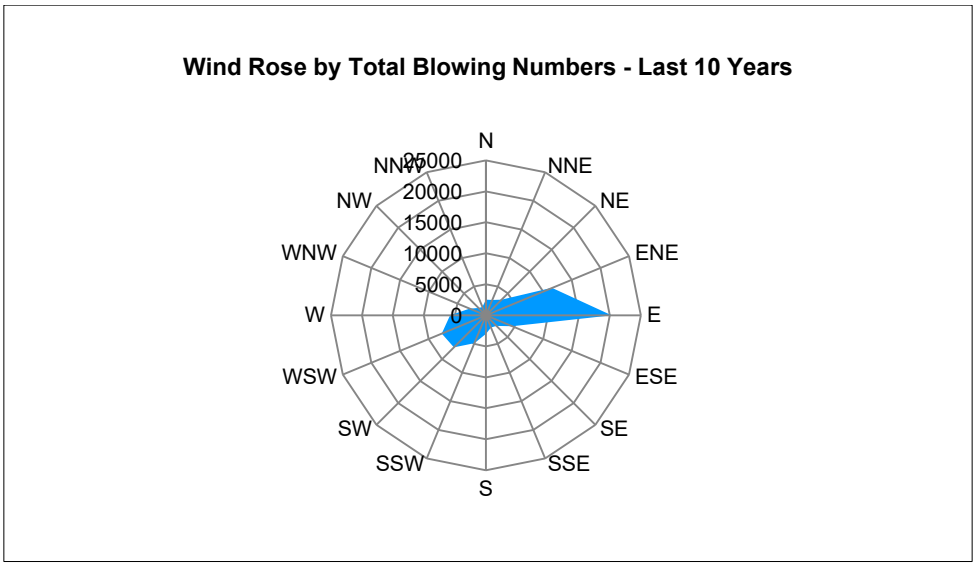

Figure 3. Aydın Meteorology Station Total Number of Winds, Wind Diagram for the Last 10 Years

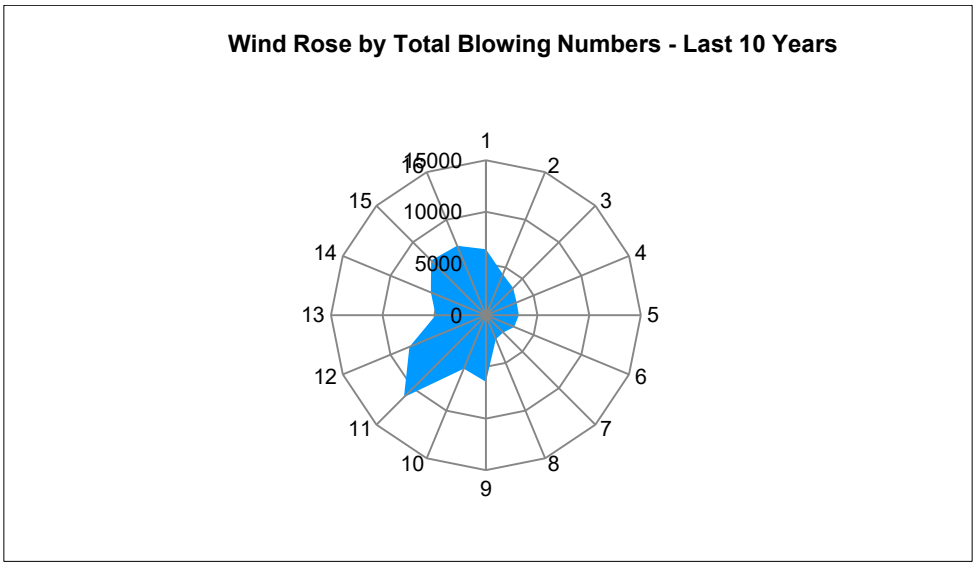

Figure 4. Denizli Meteorology Station Total Number of Winds, Wind Diagram for the Last 10 Years

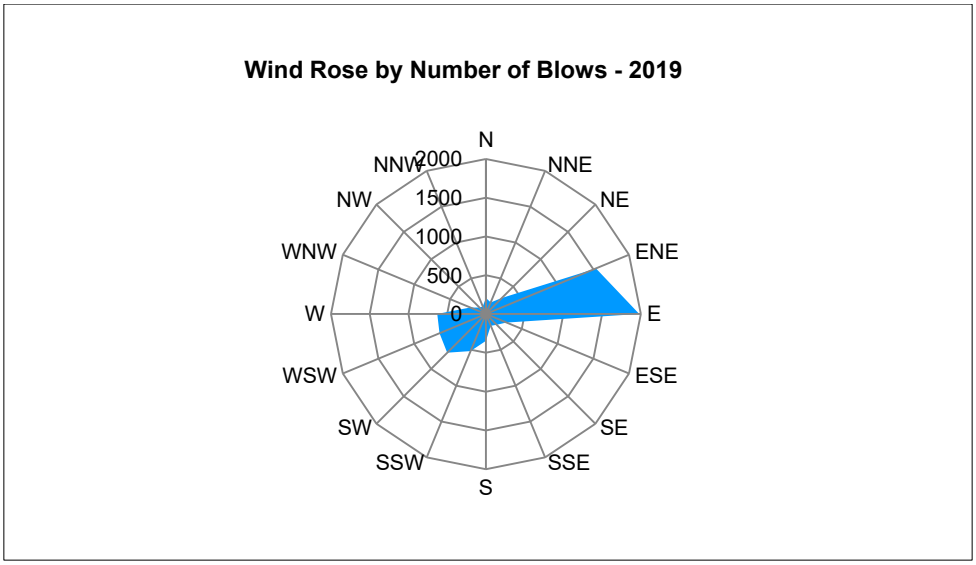

Figure 5. Aydın Meteorology Station Total Winds in 2019 Wind Diagram

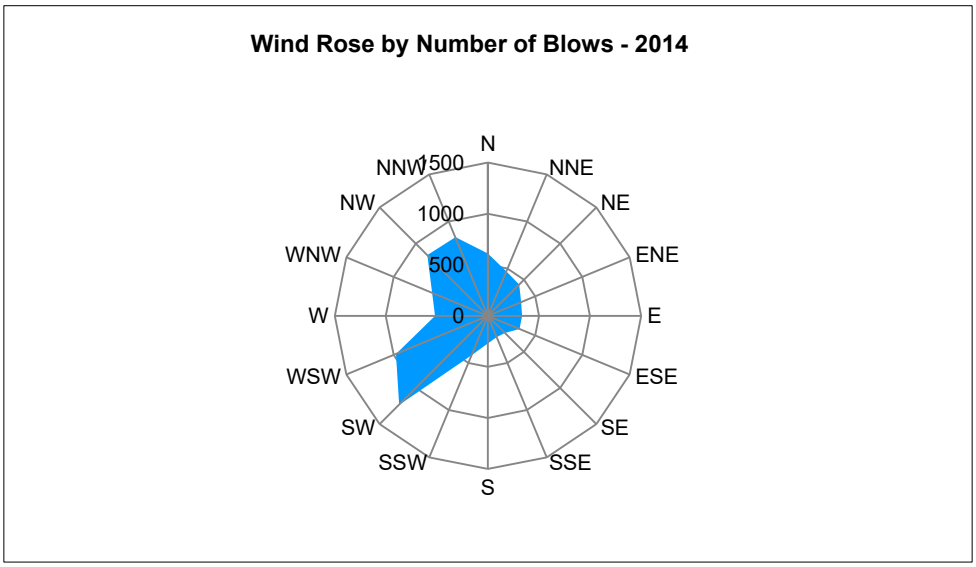

Figure 6. Denizli Meteorology Station Total Winds in 2014 Wind Diagram

2.2 Emissions

In this section, the emissions that will arise from the operational phase of the planned project the measures to be taken to keep these emissions to a minimum are summarized. The AERMOD modeling program works with a maximum radius of 50 km. Since the project exceeds these limits, it has been modeled as two parts. In the remainder of the report, these parts are called section1 and section2.

NO_2, CO, PM_{10}, and TVOC emissions will occur due to the traffic on the motorway. These emissions are calculated according to the emissions taken from the EMEP/EEA1.A.3.b.i-iv Road transport guidebook and given in between Table 4 and Table 9 for various types of vehicles. The number of vehicles expected to pass through the motorway is given in according to the vehicle types. Considering the worst-case scenario, the data of 2047, where the number of vehicles was the highest, was used in the model study. Dust emissions are not modeled in this section as they are considerably lower than the construction phase.

Emissions are calculated according to the number of vehicles and vehicle types, using the emission as mentioned above factors in the next section.

Table 4. Traffic Projection for Aydın-Denizli Motorway Project (Annual Average Daily Traffic)

Year	Class Category; (LV: Light Vehicle), (HV: Heavy Vehicle)					Total
	Car+Moto (LV)	Light Commercial Vehicle (HV)	Bus (HV)	Truck (HV)	Truck&Trailer (HV)	
Section 1 (Aydın-Kuyucak)						
2023	404	53	13	40	48	558
2024	5,718	736	180	555	669	7,858
2025	6,748	857	204	646	778	9,233
2026	7,832	984	229	742	894	10,681
2027	8,170	1,018	231	767	924	11,110
2028	8,511	1,052	234	793	956	11,545
2029	8,854	1,088	236	820	988	11,987
2030	9,200	1,125	238	848	1,022	12,434
2031	9,559	1,163	241	877	1,056	12,896
2032	9,933	1,202	243	906	1,092	13,375
2033	10,321	1,242	245	936	1,128	13,872

2034	10,724	1,282	248	967	1,164	14,385
2035	11,143	1,324	250	998	1,202	14,917
2036	11,578	1,366	253	1,030	1,241	15,467
2037	12,030	1,410	255	1,063	1,280	16,037
2038	12,500	1,454	258	1,096	1,320	16,627
2039	12,988	1,499	260	1,130	1,361	17,238
2040	13,496	1,545	263	1,165	1,403	17,870
2041	14,023	1,592	265	1,200	1,445	18,525
Section 2 (Kuyucak-Denizli)						
2023	265	34	10	33	57	399
2024	3,754	478	142	453	786	5,613
2025	4,430	557	161	526	915	6,589
2026	5,142	639	181	605	1,051	7,618
2027	5,364	661	182	625	1,087	7,920
2028	5,588	684	184	647	1,124	8,226
2029	5,813	707	186	669	1,162	8,537
2030	6,040	731	188	692	1,202	8,852
2031	6,276	756	190	715	1,242	9,178
2032	6,521	781	191	739	1,284	9,516
2033	6,776	807	193	763	1,326	9,865
2034	7,041	833	195	788	1,369	10,227
2035	7,316	860	197	814	1,414	10,600
2036	7,601	888	199	840	1,459	10,987
2037	7,898	916	201	866	1,505	11,387
2038	8,207	945	203	894	1,552	11,800
2039	8,527	974	205	921	1,600	12,228
2040	8,860	1,004	207	949	1,650	12,670
2041	9,207	1,034	209	978	1,700	13,127

Table 5 Emission Factors for Car-Moto[1]

Pollutant /Fuel Type	Emission Factor- Car+Moto (LV) (g/km)						
	Petrol Small	Petrol Medium	Petrol Large	Diesel Small	Diesel Medium	Diesel Large	LPG
CO	1.6025	1.36	1.1538	0.0522	0.1962	0.1962	2.3617
NO2	0.1281	0.1428	0.1369	1.9513	4.6739	4.9949	0.4589
NMVOC	0.1253	0.1531	0.1193	0.0108	0.0341	0.0458	0.3621
PM10[2]	0.0016	0.0016	0.0016	0.0076	0.0486	0.0486	0.0018
TVOC[3]	0.3003	0.3281	0.2943	0.0325	0.0558	0.0675	0.6121

1-EMEP/EEA Road Transport Table 3-17– Average of all technologies

2- EMEP/EEA Road Transport Table 3-18– Average of all technologies

3-TVOC=NMVOC+Methane emissions

Table 6 Emission Factors for Light Commercial Vehicle[1]

Pollutant /Fuel Type	Emission Factor- Light Commercial Vehicle (LHV) (g/km)	
	Petrol	Diesel
CO	5.83	0.4047
NO2	0.4813	0.9794
NMVOC	0.5621	0.0769
PM10[2]	0.0026	0.0792
TVOC[3]	0.5838	0.3269

1-EMEP/EEA Road Transport Table 3-19 – Average of all technologies

2- EMEP/EEA Road Transport Table 3-20 – Average of all technologies

3-TVOC=NMVOC+Methane emissions

Table 7 Emission Factors for Buses[1]

Pollutant	Emission Factor- Buses (g/km)
	Urban Buses Standard
CO	1.8028
NO2	7.048
NMVOC	0.9488
PM10[2]	0.2132
TVOC[3]	1.6488

1-EMEP/EEA Road Transport Table 3-23 – Average of all technologies

2- EMEP/EEA Road Transport Table 3-24 – Average of all technologies

3-TVOC=NMVOC+Methane emissions

Table 8 Emission Factors for Trucks[1]

Pollutant /Fuel Type	Emission Factor- Trucks (HHV) (g/km)		
	Petrol >3.5 t	Diesel <=7.5 t	Diesel 7.5 - 16 t
CO	59.5	0.477	0.6635
NO2	6.60	2.1404	3.5965
NMVOC	5.25	0.1901	0.1913
PM10[2]	0.000	0.0753	0.0952
TVOC[3]	5.2717	0.3901	0.3913

1-EMEP/EEA Road Transport Table 3-21 – Average of all technologies

2- EMEP/EEA Road Transport Table 3-22 – Average of all technologies

3-TVOC=NMVOC+Methane emissions

Table 9 Emission Factors for Trucks-Trailer[1]

Pollutant /Fuel Type	Emission Factor- Trucks-Trailer (HHV) (g/km)	
	Diesel 16 - 32 t	Diesel >32 t
CO	0.8463	1.0143
NO_2	4.9068	5.8605
NMVOC	0.1929	0.2158
PM10[2]	0.1313	0.1563
TVOC[3]	0.8929	0.8563

1-EMEP/EEA Road Transport Table 3-21 – Average of all technologies

2- EMEP/EEA Road Transport Table 3-22 – Average of all technologies

3-TVOC=NMVOC+Methane emissions

Table 10 Methane Emission Factors[1]

Vehicle Type	Fuel	Emission Factor (mg/km)	Emission Factor (g/km)
Passenger cars	Petrol	17.5	0.175
	Diesel	2.1667	0.0217
	LPG	25	0.25
Light commercial vehicles	Petrol	2.1667	0.0217
	Diesel	25	0.25
Heavy- duty vehicles and buses	Petrol	70	0.7
	Diesel- < 16t	20	0.2
	Diesel > 16t	70	0.7
	Urban Buses	70	0.7

1-EMEP/EEA Road Transport Table 3-47 – Average of all technologies

2.2.1 Emissions of Car and Moto type vehicles

It is assumed that 30% of the car+moto will consume diesel, 40% will consume petrol, and 30% will consume LPG. The number of vehicles calculated according to the assumptions made is shown in Table 11 for the first and second sections.

Table 12 gives the emission values calculated according to the number of vehicles and different fuel types.

Table 11. Daily Total Vehicle Count- Car+Moto

Section	Daily Total Vehicle Count - Car+Moto						
	Petrol Small (%20)	Petrol Medium (%10)	Petrol Large (%10)	Diesel Small (%10)	Diesel Medium (%10)	Diesel Large (%10)	LPG (%30)
1	2804	1402	1402	1402	1402	1402	4206
2	1842	921	921	921	921	921	2763

Table 12. Emission Rate for Car+Moto

Pollutant	Section	Car+Moto -Emission Rate (g/s-km)- Emission Factor (g/km) x Daily Total Vehicle Count x (day/86400 s)						
		Petrol Small	Petrol Medium	Petrol Large	Diesel Small	Diesel Medium	Diesel Large	LPG
CO	1	0.0520	0.0221	0.0187	0.0008	0.0032	0.0032	0.1150
	2	0.0342	0.0145	0.0123	0.0006	0.0021	0.0021	0.0755
NO2	1	0.0042	0.0023	0.0022	0.0317	0.0758	0.0811	0.0223
	2	0.0027	0.0015	0.0015	0.0208	0.0498	0.0532	0.0147
PM10	1	0.00005	0.00003	0.00003	0.00012	0.00079	0.00079	0.00009
	2	0.00003	0.00002	0.00002	0.00008	0.00052	0.00052	0.00006
TVOC	1	0.00975	0.00532	0.00478	0.00053	0.00091	0.00110	0.02980
	2	0.00640	0.00350	0.00314	0.00035	0.00059	0.00072	0.01957

2.2.2 Emissions of Light Commercial Vehicles

It is assumed that 50% of the LHV will consume diesel, 50% will consume petrol as fuel. The number of vehicles calculated according to the assumptions made is shown in Table 13 for the first and second sections.

Table 14 gives the emission values calculated according to the number of vehicles and different fuel types.

Table 13. Daily Total Vehicle Count- LHV

Section	Daily Total Vehicle Count- LHV	
	Petrol (%50)	Diesel (%50)
1	796	796
2	517	517

Table 14. Emission Rate for LHV

Pollutant	Section	LHV -Emission Rate (g/s-km)- Emission Factor (g/km) x Daily Total Vehicle Count x (day/86400 s)	
		Petrol	Diesel
CO	1	0.0537	0.0037
	2	0.0349	0.0024
NO2	1	0.0044	0.0090
	2	0.0029	0.0059
PM10	1	0.00002	0.0007
	2	0.00002	0.0005
TVOC	1	0.0054	0.0030
	2	0.0035	0.0020

2.2.3 Emissions of Buses

The number of vehicles is shown in Table 15 for the first and second sections.

Table 16 gives the emission values calculated according to the number of vehicles and different fuel types.

Table 15. Daily **Total Vehicle Count - Buses**

Section	Daily Total Vehicle Count - Buses
1	265
2	209

Table 16. Emission Rate for Buses

Pollutant	Section	Buses-Emission Rate (g/s-km)- Emission Factor (g/km) x Daily Total Vehicle Count x (day/86400 s)
		Urban Buses Standard
CO	1	0.0055
	2	0.0044
NO2	1	0.0216
	2	0.0170
PM10	1	0.0007
	2	0.0005
TVOC	1	0.0051
	2	0.0040

2.2.4 Emissions Of Trucks

It is assumed that 80% of the LHV will consume diesel, 20% will consume petrol as fuel. Half of the diesel vehicles will be lighter than 7.5 tons, and the rest will weight between 7.5 and 16 tons. The number of vehicles calculated according to the assumptions made is shown in Table 17 for the first and second sections.

Table 18 gives the emission values calculated according to the number of vehicles and different fuel types.

Table 17. Daily Total Vehicle Count - Trucks

Section	Daily Total Vehicle Count - Trucks		
	Petrol >3.5 t (%20)	Diesel <=7.5 t (%40)	Diesel 7.5 - 16 t (%40)
1	240	480	480
2	196	391	391

Table 18. Emission Rate for Trucks

Pollutant	Section	Trucks -Emission Rate (g/s-km)- Emission Factor (g/km) x Daily Total Vehicle Count x (day/86400 s)-		
		Petrol >3.5 t	Diesel <=7.5 t	Diesel 7.5 - 16 t
CO	1	0.1653	0.0027	0.0037
	2	0.1350	0.0022	0.0030
NO2	1	0.0183	0.0119	0.0200
	2	0.0150	0.0097	0.0163
PM10	1	0.0000	0.0004	0.0005
	2	0.0000	0.0003	0.0004
TVOC	1	0.0146	0.0022	0.0022
	2	0.0120	0.0018	0.0018

2.2.5 Emissions of Trucks-Trailer

It is assumed that half of the diesel vehicle will be heavier than 32 tons, and the rest will weight between 16 and 32 tons. The number of vehicles calculated according to the assumptions made is shown in Table 19 for the first and second sections. Table 20 gives the emission values calculated according to the number of vehicles and different fuel types.

Table 19. Daily Total Vehicle Count Trucks-Trailer

Section	Total Vehicle Count Daily- Trucks-Trailer	
	Diesel 16 - 32 t (%50)	Diesel >32 t
1	723	723
2	850	850

Table 20. Emission Rate for Trucks-Trailer

Pollutant	Section	Trucks-Trailer-Emission Rate (g/s-km)- Emission Factor (g/km) x Daily Total Vehicle Count x (day/86400 s)-	
		Diesel 16 - 32 t	Diesel >32 t
CO	1	0.0071	0.0085
	2	0.0083	0.0100
NO2	1	0.0411	0.0490
	2	0.0483	0.0577
PM10	1	0.0011	0.0013
	2	0.0013	0.0015
TVOC	1	0.0075	0.0072
	2	0.0088	0.0084

3. METHOD

3.1 Methods Used in Modeling Studies

The latest AERMOD dispersion model (version 19191) published by the US-EPA was used in the modeling studies. The AERMOD model is internationally accepted and is used by many researchers, inspection, and authority bodies around the world to estimate pollutant concentrations. (Langner and Kleemm, 2011).

The BREEZE (Trinity Consultants, version 7.7) graphical modeling interface was used to organize the modeling work. The model is one of the most advanced computer models that can predict hourly, daily and annual Ground Level Concentration (GLC) values based on real-time data that changes over time. The model includes many different emission model calculations ranging from isolated chimneys to fugitive pollutants (point, volume, area), and also takes into account aerodynamic waves, turbulence, and similar events that can be experienced by pollutants from sources in any industrial area.

The AERMOD model works in a mesh system defined by the user, and the calculations are made for the corner points of each receiving environment element that makes up the mesh system. The network system in which the AERMOD model is used can be defined as polar or cartesian, and more detailed calculations can be made at these points by determining discrete receiving points outside the network system. "Atmospheric Boundary Layer" is used as a stability model in diffusion calculations. The model also considers rough terrain. The AERMOD model uses the following four different data types:

- Hourly meteorological data of the nearest ground observation station such as wind direction, wind speed, temperature, cloud cover, and height,
- Meteorological sounding dataset representing upper atmosphere conditions including the wind profile exponent and the potential vertical temperature difference observed at every 10 mb pressure change from ground level to 6000 m altitude.
- The coordinates and height and land use classes of each element in the network system defined as the receiving environment, as well as the Bowen ratio, roughness coefficient, and albedo value,
- Source data including source coordinates, source height, diameter, pollutant velocity, temperature, and flow rate determined by a user-defined starting point.

The model outputs are in a structure that will allow the preparation of distribution maps for the entire study area. Thus, it is possible to evaluate the air quality of the region under different scenarios (eg different treatment conditions, different sulfur contents, different pollutant sources, or changing seasonal conditions).

The modeling study, which enables the estimation of the concentrations of gaseous and dusty pollutants in the ambient air through mathematical calculations, consists of the following steps:

- The “Distribution Region” of the resources is determined.
- This distribution area is divided into 1000 m × 1000 m squares; latitude, longitude, and altitude information are provided. The vertices of the squares are the vertices.
- Coordinates and height information of sensitive receptors in the distribution region is defined in the model.
- Hourly ground and upper atmosphere meteorological data for a representative year are provided.

By running the modeling program after transferring the processes listed above to the program, hourly, Daily, and annual ground level concentration values of pollutants in the ambient air can be estimated. The model inputs used in this study are given in Chapter 2.

Using the EPA AERMET computer program (AERMOD Meteorological Pre-Processor) AERMET, the surface meteorological data taken from the stations determined as the most suitable year and the upper layers weather data taken from the rawinsonde stations were combined as a surface and upper air entry file to be used in AERMOD. The AERMET program is used as the meteorological preprocessor for AERMOD. AERMET is designed to combine surface and atmospheric weather data from field measurements, and from the National Meteorological Service for use in the AERMOD program. For example, site-specific parameters such as surface roughness coefficient, Bowen ratio, and albedo are defined at this stage. The wind rose obtained from the surface meteorological measurements carried out in the field of the selected years is given in Figure 7 and Figure 8.

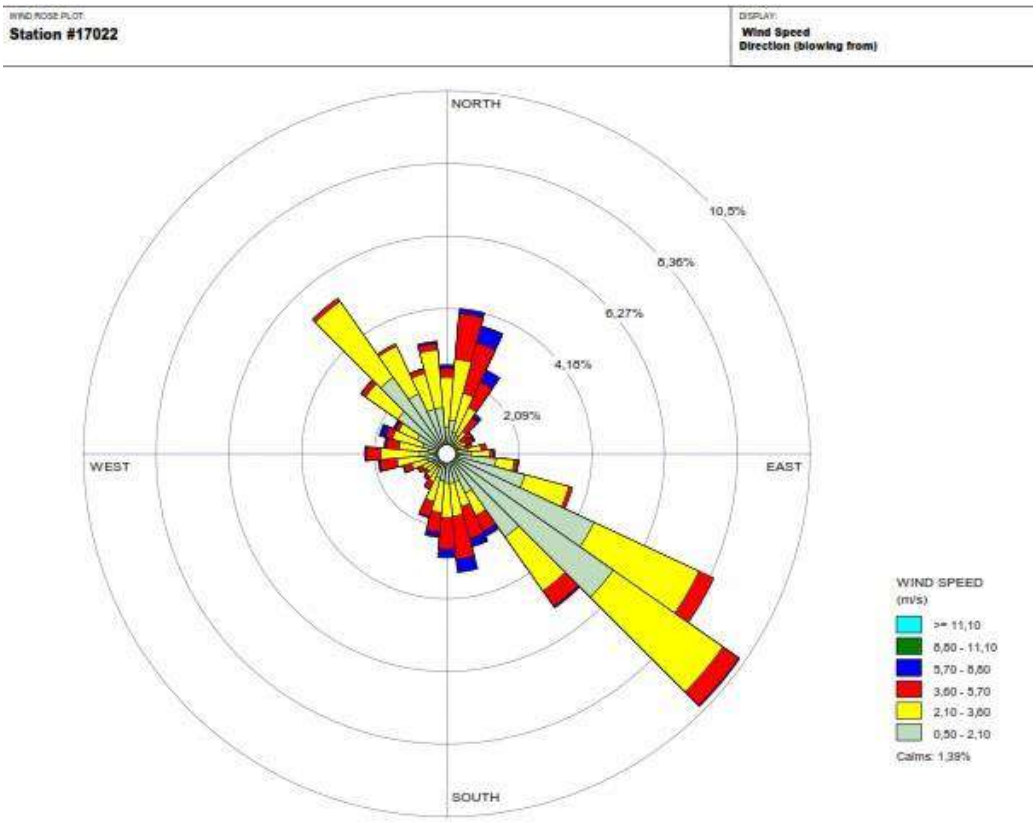

Figure 7 Wind Rose of Aydın Meteorology Station-2019

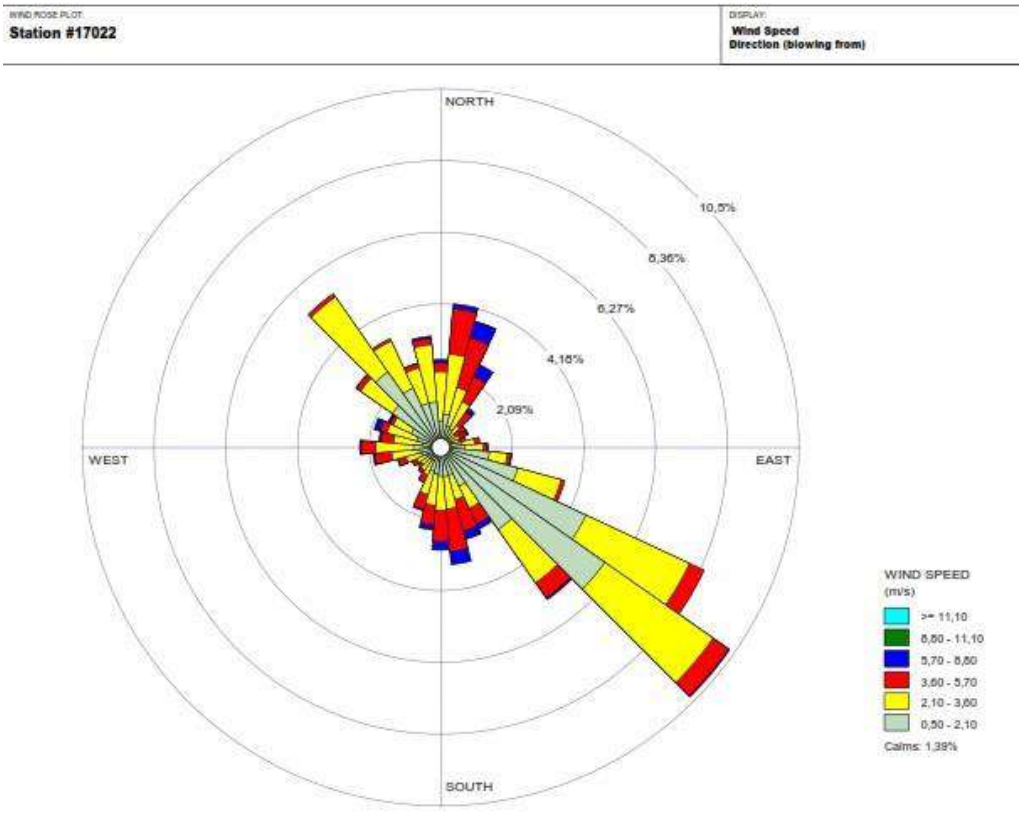

Figure 8 Wind Rose of Denizli Meteorology Station-2014

3.2 Receiving Environment System

As mentioned above, for the AERMOD model, the working area must be defined and this area must be separated into the receiving environment elements.

The grid area defined as the study area for this study was determined by reference to the domain defined in SKHKKY for the modeling study. In the model study, the grid system is shown in Figure 9 and Figure 10, which covers the impact area of all facilities at 1000 m intervals, was used. In addition, measurements were made in areas with high population density which is shown in Figure 11, and receptor points were defined within these areas. The coordinates and measurement results of points are given in Table 21 and Table 22.

For all pollutants modeled with the help of the model, the GLC values formed at the corner points of each receiving environment element in the impact area were calculated daily and annually. GLC values were calculated for each receiving environment point and these values were compared with the limit values specified in the regulation for the relevant parameter.

Figure 9. Grid System Used in Model Study-Section 1

Figure 10. Grid System Used in Model Study-Section 2

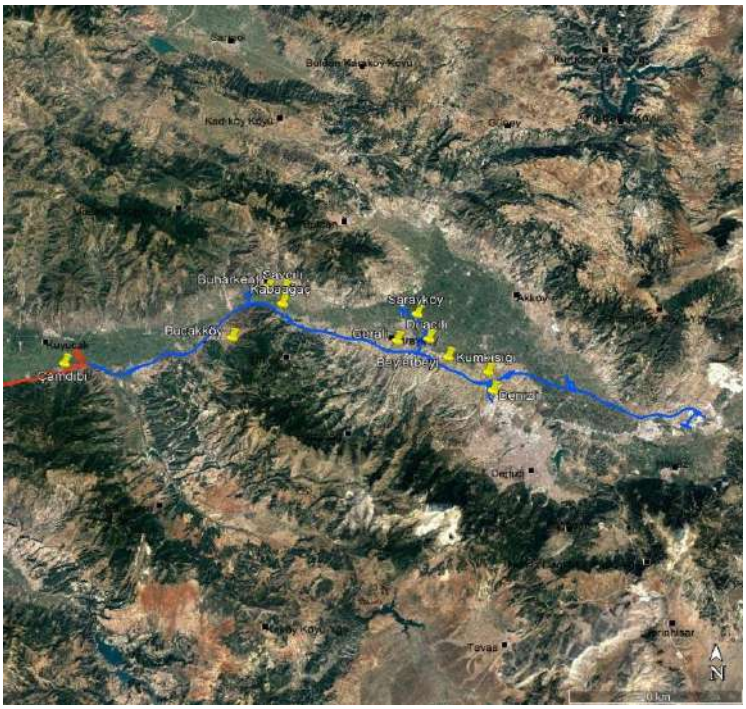

Figure 11. Measurement Points Locations

Table 21. Passive Sampling Results of NO_2 in Residential Areas

Location Name	Coordinates		NO_2 Result Concentration (µg/m³)
	X	Y	
Kumkısığı	678649.78	4192618.37	18.15
Denizli	679266.78	4190333.38	19.32
Beylerbeyi	673980.81	4194344.35	19.24
Duacılı	671710.82	4196559.34	20.13
Sarayköy	670284.83	4199643.32	21.05
Gerali	668090.84	4196224.34	20.17
Kabaağaç	654746.92	4200510.30	19.63
Savcılı	654966.67	4202308.00	19.38
Buharkent	653098.75	4202601.41	20.10
Bucakköy	649097.53	4196063.00	18.88
Çamdibi	629900.10	4192275.22	19.42

Table 22. Passive Sampling Results of VOC in Residential Areas

Location Name	Coordinates		VOC Result Concentration (µg/m³)
	X	Y	
Kumkısığı	678649.78	4192618.37	0.221
Denizli	679266.78	4190333.38	0.17
Beylerbeyi	673980.81	4194344.35	0.579
Duacılı	671710.82	4196559.34	0.236
Sarayköy	670284.83	4199643.32	0.314
Gerali	668090.84	4196224.34	0.21
Kabaağaç	654746.92	4200510.30	0.213

Savcılı	654966.67	4202308.00	0.491
Buharkent	653098.75	4202601.41	0.307
Bucakköy	649097.53	4196063.00	0.428
Çamdibi	629900.10	4192275.22	0.307

3.3 Modeling Studies

Modeling studies were carried out in different scenarios, taking into account different pollutants.

- **Scenario 1:** NO_2 emission to be released from the 1st section during the operation phase.
- **Scenario 2:** CO emission to be released from the 1st section during the operation phase.
- **Scenario 3:** TVOC emission to be released from the 1st section during the operation phase.
- **Scenario 4:** NO_2 emission to be released from the 2nd section during the operation phase.
- **Scenario 5:** CO emission to be released from the 2nd section during the operation phase.
- **Scenario 6:** TVOC emission to be released from the 2nd section during the operation phase.

3.4 Information Entered in the Modeling Study

Emission inputs and other parameters determined according to different scenarios in modeling studies are summarized in Table 23.

Table 23 Information Entered in Modeling Study

Scenarios	Source Abbreviations	Source Type	Example Source Abbreviations	Mass Flow (g/sec)	Annual Working Area (m)	Mass Flow Rate Entered into the Model (g/sec,m^2)
Scenario-1	Highway	Line Area	ARLN16	24.52	62093.7 m	0,00003589883
Scenario-2	Highway	Line Area	ARLN16	28.89	62093.7 m	0.00004229678
Scenario-3	Highway	Line Area	ARLN16	6.2094	62093.7 m	0.00000909095
Scenario-4	highway	Line Area	ARLN21	31.58	80317.4 m	0.00002457437
Scenario-5	highway	Line Area	ARLN21	27.428	80317.4 m	0.00002134344
Scenario-6	highway	Line Area	ARLN21	6.1499	80317.4 m	0.00000478562

4. RESULTS

Modeling studies were carried out for NO2, TVOC, CO parameters, and each pollutant under 2 different scenarios (section 1, section 2) and the possible effects of pollutant sources on local air quality were examined in accordance with each scenario. The values obtained as a result of the modeling are given below for each pollutant.

Detailed emission model entries are given in Table 23, and the results of the modeling study are shown in Annex-1. This section presents and discusses summaries of modeling study results and explanatory findings.

4.1 NO_2 Concentrations at Ground Level

The GLC values of NO_2 for the determined scenarios are shown in Table 24. NO_2 distributions according to the determined scenarios are shown between Figure 12 and Figure 15.

According to Table 24, the hourly 19th value and the annual highest value for NO_2 covering the first section of the project are 190.29 $\mu g/m^3$ and 34.93 $\mu g/m^3$, respectively, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 15 exceedances occur per year and this scenario complies with the regulation.

The hourly 19th value and the annual highest value for NO_2 covering the second section of the project are 183.29 $\mu g/m^3$ and 17.33 $\mu g/m^3$, respectively, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 7 exceedances occur per year and this scenario complies with the regulation.

As a result, since the NO_2 concentration values to be formed around the project are lower than the limit values specified in the regulation, NO_2 emissions are not expected to have any adverse impact on the environment.

Table 24. Results of ground-level NO_2 concentrations observed in different scenarios

Scenario	Highest Results NO_2		
	Maximum Hourly Concentration (19th value) ($\mu g/m^3$)	**Number of Overruns**	**Maximum Annually Concentration ($\mu g/m^3$)**
Scenario 1	190.29 (580726, 4183808)	15	34.93 (606772, 4186731)
Scenario 4	183.29 (636529, 4191779)	7	17.33 (654800, 4200475)
Limit Value	200	Not exceeded more than 18 times in a year	40

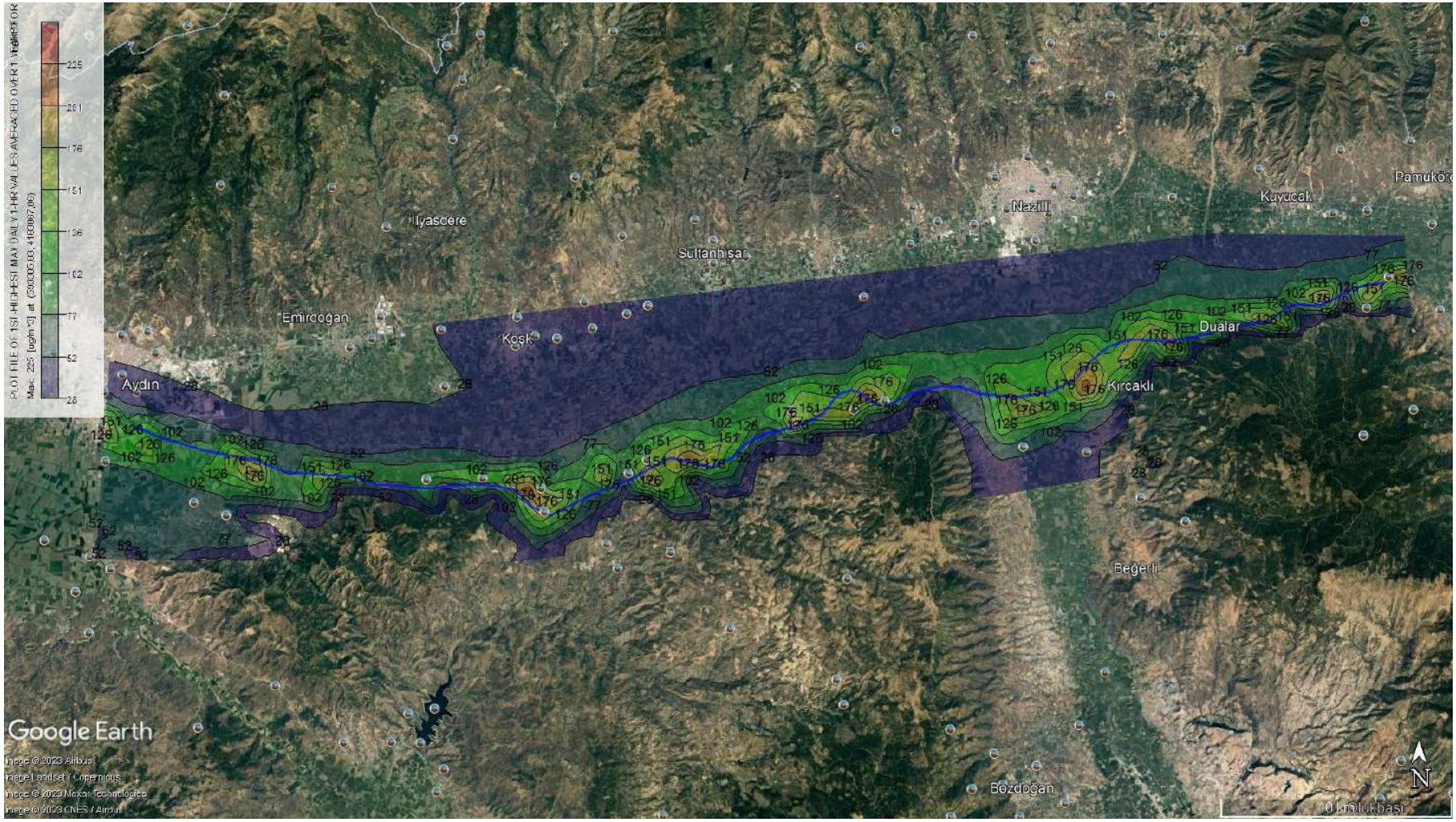

Figure 12. Maximum hourly NO_2 emission distribution Section 1 ($\mu g/m^3$)

Figure 13. Maximum annual NO_2 emission distribution Section 2 ($\mu g/m^3$)

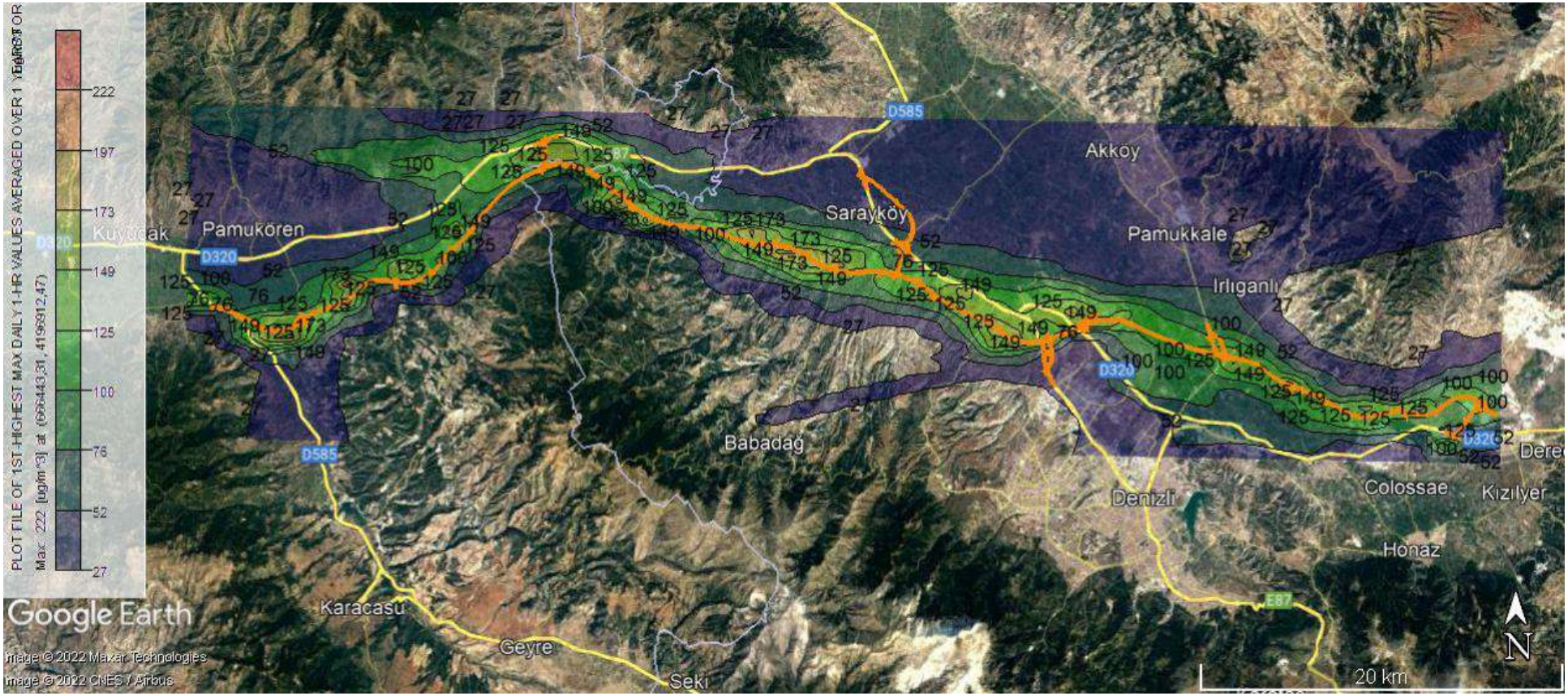

Figure 14. Maximum hourly NO_2 emission distribution Section 2 ($\mu g/m^3$)

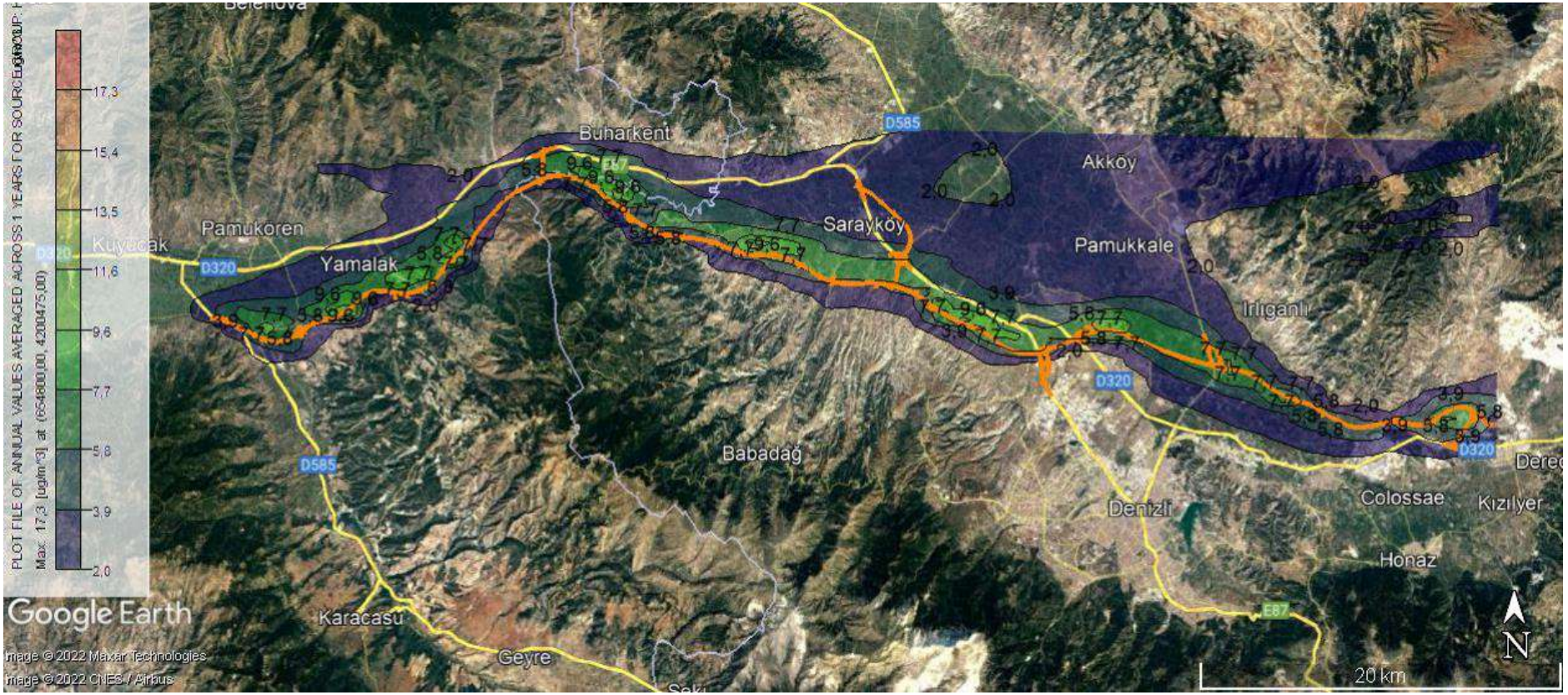

Figure 15. Maximum annual NO_2 emission distribution Section 2 ($\mu g/m^3$)

In addition, as mentioned before, background measurements representing the air quality in various areas in the region were carried out, and the total air quality contribution values of the project with these measurements were calculated in Table 25. As seen in Table 25, the project remains below the limit value at the measurement points and there are no points except Gerali where the hourly limit value is exceeded. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In Dalama-2, 18 exceedances occur per year and this scenario complies with the regulation. Consequently, the effect of the project ‘s emissions for the identified sensitive receptors is insignificant.

Table 25. Impact Assessment with Maximum NO_2 GLC Values-Measurement Points

MEASUREMENT POINTS	NO_2 BACKGROUND MEASUREMENT RESULTS (µg/m^3)	SCENARIO 1-4 MAX HOURLY RESULT(µg/m^3)	EFFECT OF THE PROJECT ON THE AIR QUALITY OF THE REGION SCENARIO 1-4 TOTAL POLLUTION VALUES(µg/m^3)	NUMBER OF OVERRUNS
Dalama-2	25.17	225.44	250.61	18
Yenipazar	18.61	196.76	215.37	7
Kumkısığı	18.15	122.81	140.96	0
Denizli	19.32	28.78	48.10	0
Beylerbeyi	19.24	100.28	119.25	0
Duacılı	20.13	63.39	83.25	0
Sarayköy	21.05	40.85	61.90	0
Gerali	20.17	214.36	234.53	13
Kabaağaç	19.63	167.14	186.77	0
Savcılı	19.38	90.58	109.96	0
Buharkent	20.10	151.67	171.77	0
Bucakköy	18.88	26.75	45.63	0
Çamdibi	19.42	62.24	81.66	0

4.2 Ground Level CO Concentrations

The GLC values of CO for the determined scenarios are shown in Table 26. CO distributions according to the determined scenarios are shown in Figure 16 and Figure 17.

According to Table 26, the 8-hour average value for CO covering the first section of the project is 175.33 µg/m3, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded the limit value. In this scenario, there are no exceedances that occur per year and this scenario complies with the regulation.

According to Table 26, the 8-hour average value for CO covering the second section of the project is 136.18 µg/m3, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded the limit value. In this scenario, there are no exceedances per year and this scenario complies with the regulation.

Table 26. Results of ground-level CO concentrations observed in different scenarios

Scenario	**Coordinates**		**CO**
	X	**Y**	**Highest Daily 8-Hour Average (µg/m^3)**
Scenario 2	588608	4183182	175.33
Scenario 5	637966	4193040	136.18
Limit Values			10000

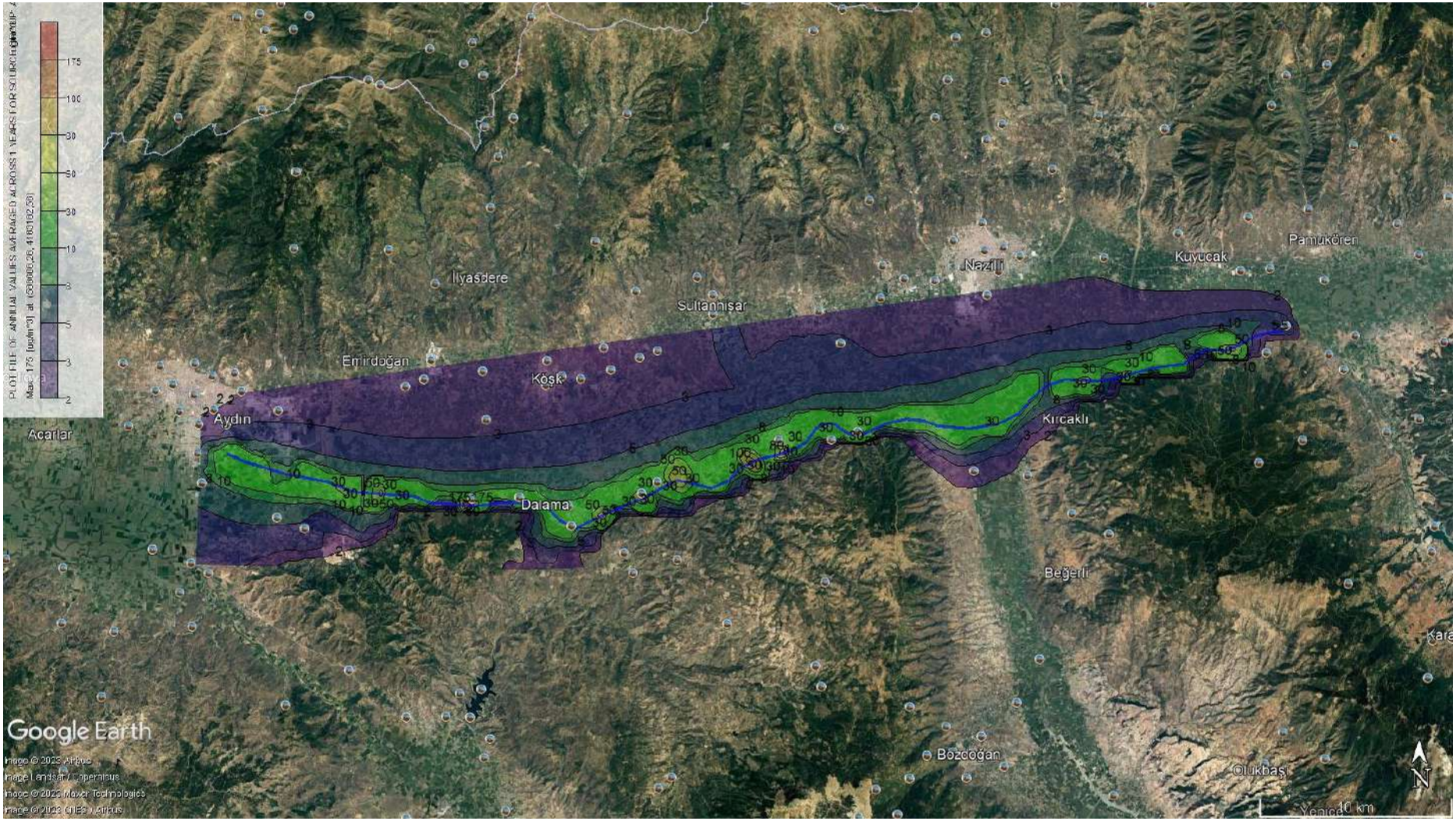

Figure 16. Maximum 8-hour CO emission distribution Section 1 ($\mu g/m^3$)

Figure 17. Maximum 8-hour CO emission distribution Section 2 ($\mu g/m^3$)

4.3 Ground Level TVOC Concentrations

The GLC values of TVOC for the determined scenarios are shown in Table 27. TVOC distributions according to the determined scenarios are shown between Figure 18 and Figure 21.

According to Table 27, the hourly maximum value and the daily highest value for TVOC covering the first section of the project are 68.36 μg/m^3 and 27.27 μg/m^3, respectively, which is considerably smaller than the limit values found in SKHHKY.

The hourly maximum value and the daily highest value for TVOC covering the first section of the project are 80.20 μg/m^3 and 16.22 μg/m^3, respectively, which is considerably smaller than the limit values found in SKHHKY. As a result, since the TVOC concentration values to be formed around the project are lower than the limit values specified in the regulation, TVOC emissions are not expected to have any adverse impact on the environment.

Table 27. Ground-level TVOC concentration results observed in different scenarios

Scenario	**Highest Results TVOC**	
	Maximum Hourly Concentration (μg/m^3)	**Maximum Daily Concentration (μg/m^3)**
Scenario 3	68.36 (606772, 4186731)	27.27 (609680, 4187391)
Scenario 6	80.20 (637852, 4192943)	16.22 (683802, 4193520)
Limit Values	280	70

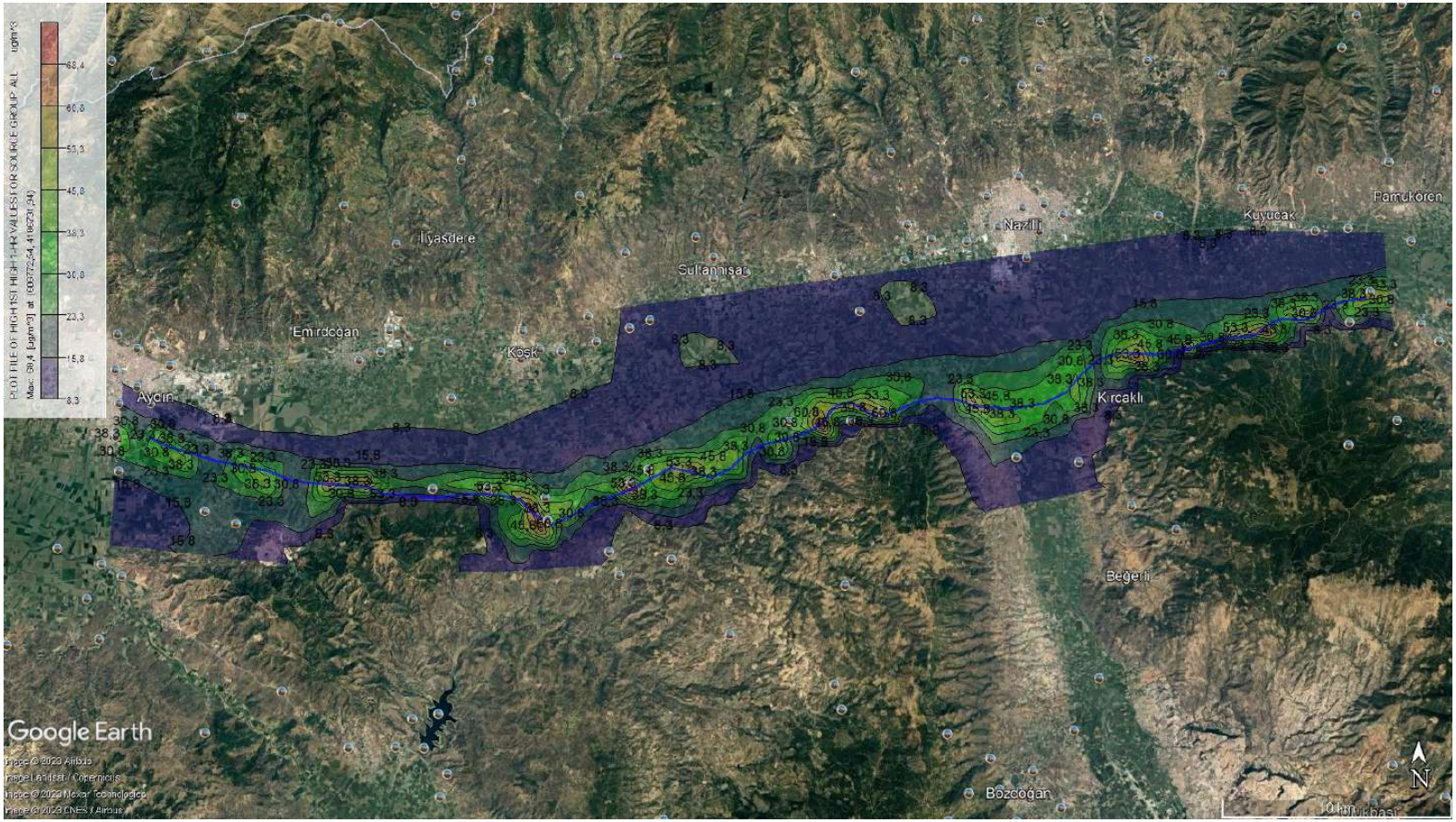

Figure 18. Maximum hourly TVOC emission distribution Section 1 ($\mu g/m^3$)

Figure 19. Maximum daily TVOC emission distribution Section 1($\mu g/m^3$)

Figure 20. Maximum hourly TVOC emission distribution Section 2 (µg/m^3)

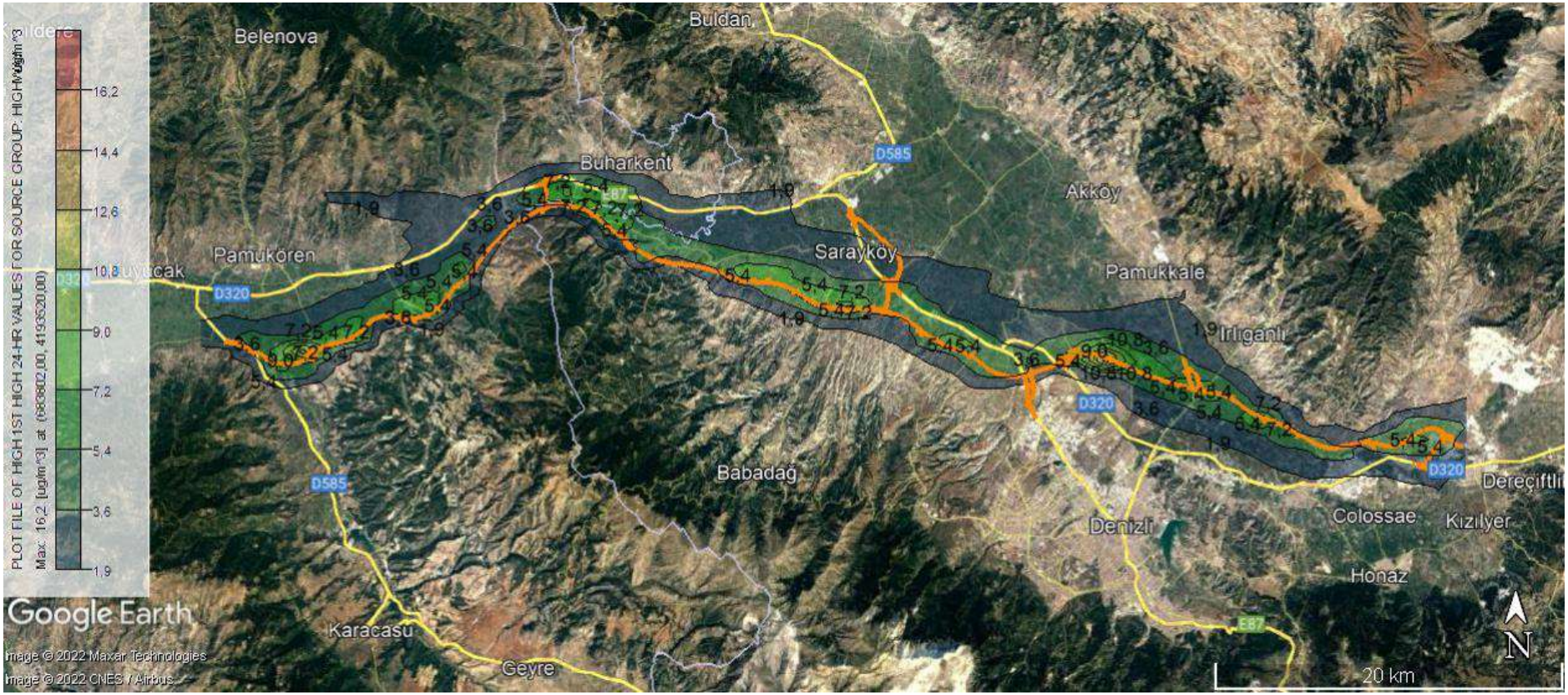

Figure 21. Maximum daily TVOC emission distribution Section 2(µg/m^3)

In addition, as mentioned before, background measurements representing the air quality in various areas in the region were carried out, and the total air quality contribution values of the project with these measurements were calculated in Table 28. As seen in Table 28, the project remains below the limit value at the measurement points and there are no points where the hourly limit value is exceeded. Consequently, the effect of the project's TVOC emissions for the identified sensitive receptors is insignificant.

Table 28. Impact Assessment with Maximum TVOC GLC Values-Measurement Points

MEASUREMENT POINTS	TVOC BACKGROUND MEASUREMENT RESULTS (µg/m3)	SCENARIO 3-6 MAX HOURLY RESULT(µg/m^3)	EFFECT OF THE PROJECT ON THE AIR QUALITY OF THE REGION SCENARIO 1 TOTAL POLLUTION VALUES (µg/m^3)	NUMBER OF OVERRUNS
Yenipazar	0.16	1.64	1.80	0
Dalama2	0.16	38.35	38.51	0
Kumkısığı	0.221	27.27	27.491	0
Denizli	0.17	5.50	5.67	0
Beylerbeyi	0.579	27.66	28.239	0
Duacılı	0.236	13.90	14.136	0
Sarayköy	0.314	8.21	8.524	0
Gerali	0.21	49.74	49.95	0
Kabaağaç	0.213	33.47	33.683	0
Savcılı	0.491	18.15	18.641	0
Buharkent	0.307	30.60	30.907	0
Bucakköy	0.428	4.74	5.168	0
Çamdibi	0.307	10.43	10.737	0

5. CONCLUSIONS

The report has been prepared by Hacettepe University Environmental Engineering Department to be used in the Environmental Impact Assessment Report prepared for Aydın-Denizli Motorway Project.

The report has been prepared using the AERMOD distribution model to examine the distribution of the emissions of the Aydın-Denizli Motorway Project operational phase and their distribution in the impact area of the project.

The modeling results obtained according to the emission amounts to be caused by the project, the hourly meteorological data observed, and the topography are summarized below:

- Hourly and annual limit values for NO_2 emissions in SKHKKY are 200 μg/m3 and 40 μg/m3, respectively. In all the scenarios studies, results comply with limit values. The hourly 19h value and the annual highest value for NO_2 covering the first section of the project are 190.29 $\mu g/m^3$ and 34.93 $\mu g/m^3$, respectively, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 15 exceedances occur per year and this scenario complies with the regulation. The hourly 19h value and the annual highest value for NO_2 covering the second section of the project are 183.29 $\mu g/m^3$ and 17.33 $\mu g/m^3$, respectively, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded more than 18 times in a year. In this scenario, 7 exceedances occur per year and this scenario complies with the regulation.

- The 8-hour average CO limit values in SKHKKY are defined as 10000 $\mu g/m^3$. The 8-hour average value for CO covering the first section of the project is 175.33 μg/m3, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded the limit value. The 8-hour average value for CO covering the second section of the project is 136.18 μg/m3, which is considerably smaller than the limit values found in SKHHKY. As stated in the SKHHKY Limit Value, the hourly limit value cannot be exceeded the limit value. In both scenarios, there are no exceedances per year and this scenario complies with the regulation.

- Hourly and daily limit values for TVOC emissions in SKHKKY are 280 μg/m3 and 70 $\mu g/m^3$, respectively. In all the scenarios studies, results comply with limit values. The hourly maximum value and the daily highest value for TVOC covering the first section of the project are 68.36 $\mu g/m^3$ and 27.27 $\mu g/m^3$, respectively, which is considerably smaller than the limit values found in SKHHKY.

The hourly maximum value and the daily highest value for TVOC covering the second section of the project are 80.20 μg/m^3 and 16.22 μg/m^3, respectively, which is considerably smaller than the limit values found in SKHHKY. As a result, since the TVOC concentration values to be formed around the project are lower than the limit values specified in the regulation, TVOC emissions are not expected to have any adverse impact on the environment.

Consequently, when all scenarios and measurement points are examined, it is seen that the project does not make a difference for NO_2, CO, and TVOC emissions in terms of air quality in the region.

REFERENCES

Langner C., Klemm O., A comparison of model performance between AERMOD and AUSTAL2000. J Air Waste Manag Assoc 2011 Jun; 61(6) 640-6.

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Resmi Gazete. (2009, Temmuz 7). Sanayi Kaynaklı Hava Kirliliği Kontrolü Yönetmeliği. Received from http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.13184&sourceXmlSearch=&MevzuatIliski=0

European Environment Agency, "EMEP/EEA air pollutant emission inventory guidebook 2019 (Passenger cars, light commercial trucks, heavy-duty vehicles including buses and motorcycles)",2021.

ANNEX

Control Pathway

Dispersion Options

Titles

C:\Users\DELL\Desktop\aydindenizli1-CO\aydindenizli1-CO.isc

Dispersion Options

☑ Regulatory Default ☐ Non-Default Options

Dispersion Coefficient

Rural

Output Type

☑ Concentration
☐ Total Deposition (Dry & Wet)
☐ Dry Deposition
☐ Wet Deposition

Plume Depletion

☐ Dry Removal
☐ Wet Removal

Output Warnings

☐ No Output Warnings
☐ Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

CO

Averaging Time Options

Hours

1	2	3	4	6	8	12	24
☐	☐	☐	☐	☐	☑	☐	☐

☐ Month ☐ Period ☑ Annual

Exponential Decay

Option not available

Terrain Height Options

☐ Flat ☑ Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

☐ Yes ☑ No

Default Height = 0.00 m

Meteorology Pathway

Met Input Data

Surface Met Data

Filename: Aydin_2019.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: Aydin_2019.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 56,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2019			
Upper Air		2019			

Data Period

Data Period to Process

Start Date: 1.01.2019 Start Hour: 1 End Date: 31.12.2019 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Output Pathway

Tabular Printed Outputs

Short Term Averaging Period	RECTABLE Highest Values Table										MAXTABLE Maximum Values Table	DAYTABLE Daily Values Table
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		
8	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No

Threshold Violation Files (MAXIFILE)

Path for MAXIFILES: AYDINDENIZLI1-CO.AD

Averaging Period	Source Group ID	Treshhold Value	File Unit (Optional)	File Name
8	ALL	10.000,00		highway.MAX

Contour Plot Files (PLOTFILE)

Path for PLOTFILES: AYDINDENIZLI1-CO.AD

Averaging Period	Source Group ID	High Value	File Name
8	ALL	1st	08H1GALL.PLT
Annual	ALL	N/A	AN00GALL.PLT

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m (Optional)
1	621937.10	4190248.33		194.64	
2	612569.90	4188268.64		125.40	
3	624193.43	4190606.42		275.65	
4	626175.13	4191351.30		245.92	
5	629713.14	4192249.21		209.65	
6	597469.05	4184521.45		104.82	
7	591155.72	4183514.82		209.02	
8	605473.44	4186324.22		164.48	
9	609680.65	4187391.53		227.40	
10	588634.40	4183240.63		272.04	
11	581318.90	4184033.22		85.38	
12	576522.48	4186209.06		29.41	
13	583957.82	4183876.52		158.93	
14	585826.45	4183682.46		231.57	
15	594165.65	4183637.08		66.46	
16	629900.11	4192275.00		212.40	
17	626199.12	4191394.61		241.70	
18	624039.05	4190762.16		213.47	
19	621938.24	4190297.18		193.82	
20	612595.97	4188333.11		114.02	
21	609707.38	4187416.33		222.09	
22	605506.17	4186286.01		166.16	
23	602000.50	4185284.76		109.15	
24	597498.23	4184538.22		104.54	
25	594205.72	4183793.17		67.07	
26	601059.34	4185145.31		87.34	
27	588608.28	4183182.56		305.77	
28	585669.57	4183775.15		233.27	
29	584111.80	4183909.34		166.37	
30	581392.25	4184033.93		85.52	
31	576345.41	4186168.74		29.00	
32	573726.51	4179808.96	UCART1	44.91	
33	574726.51	4179808.96	UCART1	81.20	

Receptor Pathway

34	575726.51	4179808.96	UCART1	137.59
35	576726.51	4179808.96	UCART1	213.68
36	577726.51	4179808.96	UCART1	276.85
37	578726.51	4179808.96	UCART1	334.94
38	579726.51	4179808.96	UCART1	394.65
39	580726.51	4179808.96	UCART1	396.08
40	581726.51	4179808.96	UCART1	425.87
41	582726.51	4179808.96	UCART1	405.01
42	573726.51	4180808.96	UCART1	50.72
43	574726.51	4180808.96	UCART1	102.67
44	575726.51	4180808.96	UCART1	138.07
45	576726.51	4180808.96	UCART1	156.55
46	577726.51	4180808.96	UCART1	200.15
47	578726.51	4180808.96	UCART1	263.44
48	579726.51	4180808.96	UCART1	263.42
49	580726.51	4180808.96	UCART1	287.99
50	581726.51	4180808.96	UCART1	317.26
51	582726.51	4180808.96	UCART1	326.61
52	573726.51	4181808.96	UCART1	32.21
53	574726.51	4181808.96	UCART1	43.46
54	575726.51	4181808.96	UCART1	50.78
55	576726.51	4181808.96	UCART1	63.81
56	577726.51	4181808.96	UCART1	96.28
57	578726.51	4181808.96	UCART1	159.27
58	579726.51	4181808.96	UCART1	223.44
59	580726.51	4181808.96	UCART1	296.93
60	581726.51	4181808.96	UCART1	294.45
61	582726.51	4181808.96	UCART1	252.50
62	573726.51	4182808.96	UCART1	27.00
63	574726.51	4182808.96	UCART1	27.00
64	575726.51	4182808.96	UCART1	28.00
65	576726.51	4182808.96	UCART1	31.21
66	577726.51	4182808.96	UCART1	50.78
67	578726.51	4182808.96	UCART1	90.58
68	579726.51	4182808.96	UCART1	164.72
69	580726.51	4182808.96	UCART1	238.02
70	581726.51	4182808.96	UCART1	209.86
71	582726.51	4182808.96	UCART1	186.68
72	573726.51	4183808.96	UCART1	27.00
73	574726.51	4183808.96	UCART1	27.00
74	575726.51	4183808.96	UCART1	28.00

75	576726.51	4183808.96	UCART1	29.00
76	577726.51	4183808.96	UCART1	30.98
77	578726.51	4183808.96	UCART1	35.91
78	579726.51	4183808.96	UCART1	60.89
79	580726.51	4183808.96	UCART1	96.57
80	581726.51	4183808.96	UCART1	95.25
81	573726.51	4184808.96	UCART1	27.00
82	574726.51	4184808.96	UCART1	28.00
83	575726.51	4184808.96	UCART1	28.00
84	576726.51	4184808.96	UCART1	28.00
85	579726.51	4184808.96	UCART1	31.48
86	580726.51	4184808.96	UCART1	38.43
87	581726.51	4184808.96	UCART1	47.59
88	582726.51	4184808.96	UCART1	57.66
89	573726.51	4185808.96	UCART1	29.00
90	574726.51	4185808.96	UCART1	29.00
91	575726.51	4185808.96	UCART1	29.00
92	576726.51	4185808.96	UCART1	28.00
93	577726.51	4185808.96	UCART1	28.00
94	578726.51	4185808.96	UCART1	29.00
95	579726.51	4185808.96	UCART1	30.00
96	580726.51	4185808.96	UCART1	30.60
97	581726.51	4185808.96	UCART1	33.00
98	582726.51	4185808.96	UCART1	35.10
99	573726.51	4186808.96	UCART1	37.47
100	574726.51	4186808.96	UCART1	34.53
101	575726.51	4186808.96	UCART1	32.95
102	576726.51	4186808.96	UCART1	30.56
103	577726.51	4186808.96	UCART1	29.00
104	578726.51	4186808.96	UCART1	29.00
105	579726.51	4186808.96	UCART1	30.00
106	580726.51	4186808.96	UCART1	31.00
107	581726.51	4186808.96	UCART1	31.00
108	582726.51	4186808.96	UCART1	32.00
109	573726.51	4187808.96	UCART1	44.00
110	574726.51	4187808.96	UCART1	43.00
111	575726.51	4187808.96	UCART1	37.31
112	576726.51	4187808.96	UCART1	32.80
113	577726.51	4187808.96	UCART1	31.00
114	578726.51	4187808.96	UCART1	30.00
115	579726.51	4187808.96	UCART1	31.00

116	580726.51	4187808.96	UCART1	31.00
117	581726.51	4187808.96	UCART1	31.51
118	582726.51	4187808.96	UCART1	33.00
119	573726.51	4188808.96	UCART1	55.00
120	574726.51	4188808.96	UCART1	52.82
121	575726.51	4188808.96	UCART1	40.37
122	576726.51	4188808.96	UCART1	36.00
123	577726.51	4188808.96	UCART1	36.00
124	578726.51	4188808.96	UCART1	33.27
125	579726.51	4188808.96	UCART1	33.00
126	580726.51	4188808.96	UCART1	32.00
127	581726.51	4188808.96	UCART1	34.00
128	582726.51	4188808.96	UCART1	37.00
129	582768.64	4179791.46	UCART2	405.02
130	583768.64	4179791.46	UCART2	436.14
131	584768.64	4179791.46	UCART2	486.87
132	585768.64	4179791.46	UCART2	463.66
133	586768.64	4179791.46	UCART2	414.29
134	587768.64	4179791.46	UCART2	413.10
135	588768.64	4179791.46	UCART2	399.50
136	589768.64	4179791.46	UCART2	338.01
137	590768.64	4179791.46	UCART2	251.82
138	591768.64	4179791.46	UCART2	248.57
139	582768.64	4180791.46	UCART2	330.01
140	583768.64	4180791.46	UCART2	406.64
141	584768.64	4180791.46	UCART2	501.09
142	585768.64	4180791.46	UCART2	544.58
143	586768.64	4180791.46	UCART2	551.32
144	587768.64	4180791.46	UCART2	527.90
145	588768.64	4180791.46	UCART2	500.36
146	589768.64	4180791.46	UCART2	454.46
147	582768.64	4181791.46	UCART2	253.03
148	583768.64	4181791.46	UCART2	315.59
149	584768.64	4181791.46	UCART2	439.49
150	585768.64	4181791.46	UCART2	564.67
151	586768.64	4181791.46	UCART2	540.82
152	587768.64	4181791.46	UCART2	558.52
153	588768.64	4181791.46	UCART2	543.50
154	589768.64	4181791.46	UCART2	475.24
155	590768.64	4181791.46	UCART2	420.17
156	582768.64	4182791.46	UCART2	186.55

Receptor Pathway

157	583768.64	4182791.46	UCART2	245.50
158	584768.64	4182791.46	UCART2	353.94
159	585768.64	4182791.46	UCART2	414.00
160	586768.64	4182791.46	UCART2	372.85
161	587768.64	4182791.46	UCART2	381.32
162	588768.64	4182791.46	UCART2	389.81
163	589768.64	4182791.46	UCART2	354.34
164	590768.64	4182791.46	UCART2	340.88
165	591768.64	4182791.46	UCART2	295.55
166	583768.64	4183791.46	UCART2	165.52
167	584768.64	4183791.46	UCART2	231.14
168	585768.64	4183791.46	UCART2	232.89
169	586768.64	4183791.46	UCART2	170.03
170	587768.64	4183791.46	UCART2	167.27
171	588768.64	4183791.46	UCART2	170.53
172	589768.64	4183791.46	UCART2	158.63
173	590768.64	4183791.46	UCART2	152.84
174	591768.64	4183791.46	UCART2	150.88
175	582768.64	4184791.46	UCART2	57.78
176	583768.64	4184791.46	UCART2	57.86
177	584768.64	4184791.46	UCART2	62.23
178	585768.64	4184791.46	UCART2	61.26
179	586768.64	4184791.46	UCART2	66.69
180	587768.64	4184791.46	UCART2	64.19
181	588768.64	4184791.46	UCART2	58.72
182	589768.64	4184791.46	UCART2	50.27
183	590768.64	4184791.46	UCART2	46.73
184	591768.64	4184791.46	UCART2	44.92
185	582768.64	4185791.46	UCART2	35.03
186	583768.64	4185791.46	UCART2	35.00
187	584768.64	4185791.46	UCART2	35.00
188	585768.64	4185791.46	UCART2	35.00
189	586768.64	4185791.46	UCART2	36.00
190	587768.64	4185791.46	UCART2	37.00
191	588768.64	4185791.46	UCART2	36.00
192	589768.64	4185791.46	UCART2	35.00
193	590768.64	4185791.46	UCART2	36.00
194	591768.64	4185791.46	UCART2	36.00
195	582768.64	4186791.46	UCART2	32.00
196	583768.64	4186791.46	UCART2	32.00
197	584768.64	4186791.46	UCART2	33.00

198	585768.64	4186791.46	UCART2	33.00
199	586768.64	4186791.46	UCART2	33.03
200	587768.64	4186791.46	UCART2	35.00
201	588768.64	4186791.46	UCART2	36.00
202	589768.64	4186791.46	UCART2	36.00
203	590768.64	4186791.46	UCART2	38.83
204	591768.64	4186791.46	UCART2	37.71
205	582768.64	4187791.46	UCART2	33.00
206	583768.64	4187791.46	UCART2	32.00
207	584768.64	4187791.46	UCART2	33.00
208	585768.64	4187791.46	UCART2	34.00
209	586768.64	4187791.46	UCART2	36.00
210	587768.64	4187791.46	UCART2	37.00
211	588768.64	4187791.46	UCART2	39.00
212	589768.64	4187791.46	UCART2	41.80
213	590768.64	4187791.46	UCART2	43.93
214	591768.64	4187791.46	UCART2	43.00
215	582768.64	4188791.46	UCART2	37.00
216	583768.64	4188791.46	UCART2	36.00
217	584768.64	4188791.46	UCART2	38.00
218	585768.64	4188791.46	UCART2	39.00
219	586768.64	4188791.46	UCART2	39.40
220	587768.64	4188791.46	UCART2	41.00
221	588768.64	4188791.46	UCART2	43.00
222	589768.64	4188791.46	UCART2	46.00
223	590768.64	4188791.46	UCART2	49.95
224	591768.64	4188791.46	UCART2	51.00
225	592772.54	4180731.94	UCART3	191.16
226	593772.54	4180731.94	UCART3	249.03
227	594772.54	4180731.94	UCART3	264.72
228	595772.54	4180731.94	UCART3	264.62
229	596772.54	4180731.94	UCART3	274.00
230	597772.54	4180731.94	UCART3	333.82
231	598772.54	4180731.94	UCART3	421.54
232	599772.54	4180731.94	UCART3	474.88
233	600772.54	4180731.94	UCART3	486.68
234	601772.54	4180731.94	UCART3	560.87
235	602772.54	4180731.94	UCART3	631.68
236	603772.54	4180731.94	UCART3	625.20
237	604772.54	4180731.94	UCART3	590.51
238	605772.54	4180731.94	UCART3	657.08

239	606772.54	4180731.94	UCART3	633.01
240	607772.54	4180731.94	UCART3	664.74
241	608772.54	4180731.94	UCART3	769.97
242	609772.54	4180731.94	UCART3	841.38
243	610772.54	4180731.94	UCART3	858.40
244	592772.54	4181731.94	UCART3	199.26
245	593772.54	4181731.94	UCART3	176.30
246	594772.54	4181731.94	UCART3	222.02
247	595772.54	4181731.94	UCART3	287.94
248	596772.54	4181731.94	UCART3	307.88
249	597772.54	4181731.94	UCART3	333.48
250	598772.54	4181731.94	UCART3	353.32
251	599772.54	4181731.94	UCART3	379.75
252	600772.54	4181731.94	UCART3	352.82
253	601772.54	4181731.94	UCART3	456.56
254	602772.54	4181731.94	UCART3	523.60
255	603772.54	4181731.94	UCART3	542.01
256	604772.54	4181731.94	UCART3	501.16
257	605772.54	4181731.94	UCART3	568.47
258	606772.54	4181731.94	UCART3	628.78
259	607772.54	4181731.94	UCART3	726.61
260	608772.54	4181731.94	UCART3	820.65
261	609772.54	4181731.94	UCART3	908.18
262	610772.54	4181731.94	UCART3	914.80
263	591772.54	4182731.94	UCART3	296.49
264	592772.54	4182731.94	UCART3	160.20
265	593772.54	4182731.94	UCART3	93.00
266	594772.54	4182731.94	UCART3	133.60
267	595772.54	4182731.94	UCART3	219.41
268	596772.54	4182731.94	UCART3	291.81
269	597772.54	4182731.94	UCART3	321.00
270	598772.54	4182731.94	UCART3	273.48
271	599772.54	4182731.94	UCART3	260.06
272	600772.54	4182731.94	UCART3	276.35
273	601772.54	4182731.94	UCART3	352.28
274	602772.54	4182731.94	UCART3	408.67
275	603772.54	4182731.94	UCART3	427.94
276	604772.54	4182731.94	UCART3	450.26
277	605772.54	4182731.94	UCART3	553.90
278	606772.54	4182731.94	UCART3	643.78
279	607772.54	4182731.94	UCART3	727.42

280	608772.54	4182731.94	UCART3	841.74
281	609772.54	4182731.94	UCART3	905.57
282	610772.54	4182731.94	UCART3	891.81
283	591772.54	4183731.94	UCART3	163.08
284	593772.54	4183731.94	UCART3	60.30
285	594772.54	4183731.94	UCART3	85.22
286	595772.54	4183731.94	UCART3	129.86
287	596772.54	4183731.94	UCART3	194.90
288	597772.54	4183731.94	UCART3	241.43
289	598772.54	4183731.94	UCART3	223.50
290	599772.54	4183731.94	UCART3	182.39
291	600772.54	4183731.94	UCART3	245.01
292	601772.54	4183731.94	UCART3	249.54
293	602772.54	4183731.94	UCART3	312.48
294	603772.54	4183731.94	UCART3	362.31
295	604772.54	4183731.94	UCART3	390.25
296	605772.54	4183731.94	UCART3	492.19
297	606772.54	4183731.94	UCART3	586.77
298	607772.54	4183731.94	UCART3	685.32
299	608772.54	4183731.94	UCART3	804.32
300	609772.54	4183731.94	UCART3	802.28
301	610772.54	4183731.94	UCART3	757.02
302	591772.54	4184731.94	UCART3	51.75
303	592772.54	4184731.94	UCART3	40.68
304	593772.54	4184731.94	UCART3	42.81
305	594772.54	4184731.94	UCART3	49.86
306	595772.54	4184731.94	UCART3	48.92
307	596772.54	4184731.94	UCART3	71.33
308	597772.54	4184731.94	UCART3	93.40
309	598772.54	4184731.94	UCART3	114.81
310	599772.54	4184731.94	UCART3	123.32
311	600772.54	4184731.94	UCART3	141.22
312	601772.54	4184731.94	UCART3	138.23
313	602772.54	4184731.94	UCART3	211.62
314	603772.54	4184731.94	UCART3	285.53
315	604772.54	4184731.94	UCART3	263.49
316	605772.54	4184731.94	UCART3	363.68
317	606772.54	4184731.94	UCART3	475.88
318	607772.54	4184731.94	UCART3	563.30
319	608772.54	4184731.94	UCART3	649.19
320	609772.54	4184731.94	UCART3	603.22

321	610772.54	4184731.94	UCART3	588.13
322	591772.54	4185731.94	UCART3	36.00
323	592772.54	4185731.94	UCART3	36.00
324	593772.54	4185731.94	UCART3	38.00
325	594772.54	4185731.94	UCART3	37.00
326	595772.54	4185731.94	UCART3	38.00
327	596772.54	4185731.94	UCART3	39.37
328	597772.54	4185731.94	UCART3	42.47
329	598772.54	4185731.94	UCART3	51.17
330	600772.54	4185731.94	UCART3	62.00
331	601772.54	4185731.94	UCART3	70.94
332	602772.54	4185731.94	UCART3	119.57
333	603772.54	4185731.94	UCART3	182.66
334	604772.54	4185731.94	UCART3	180.80
335	605772.54	4185731.94	UCART3	257.70
336	606772.54	4185731.94	UCART3	337.34
337	607772.54	4185731.94	UCART3	438.47
338	608772.54	4185731.94	UCART3	478.68
339	609772.54	4185731.94	UCART3	416.00
340	610772.54	4185731.94	UCART3	473.80
341	591772.54	4186731.94	UCART3	37.06
342	592772.54	4186731.94	UCART3	37.00
343	593772.54	4186731.94	UCART3	37.00
344	594772.54	4186731.94	UCART3	37.00
345	595772.54	4186731.94	UCART3	37.85
346	596772.54	4186731.94	UCART3	38.00
347	597772.54	4186731.94	UCART3	39.00
348	598772.54	4186731.94	UCART3	40.00
349	599772.54	4186731.94	UCART3	42.94
350	600772.54	4186731.94	UCART3	43.00
351	601772.54	4186731.94	UCART3	45.00
352	602772.54	4186731.94	UCART3	60.00
353	603772.54	4186731.94	UCART3	87.43
354	604772.54	4186731.94	UCART3	113.26
355	605772.54	4186731.94	UCART3	145.84
356	606772.54	4186731.94	UCART3	206.98
357	607772.54	4186731.94	UCART3	293.71
358	608772.54	4186731.94	UCART3	321.84
359	609772.54	4186731.94	UCART3	302.68
360	610772.54	4186731.94	UCART3	374.13
361	591772.54	4187731.94	UCART3	42.76

362	592772.54	4187731.94	UCART3	40.65
363	593772.54	4187731.94	UCART3	37.00
364	594772.54	4187731.94	UCART3	37.51
365	595772.54	4187731.94	UCART3	38.00
366	596772.54	4187731.94	UCART3	38.00
367	597772.54	4187731.94	UCART3	39.00
368	598772.54	4187731.94	UCART3	40.00
369	599772.54	4187731.94	UCART3	41.00
370	600772.54	4187731.94	UCART3	42.00
371	601772.54	4187731.94	UCART3	43.00
372	602772.54	4187731.94	UCART3	44.00
373	603772.54	4187731.94	UCART3	48.66
374	604772.54	4187731.94	UCART3	58.74
375	605772.54	4187731.94	UCART3	65.86
376	606772.54	4187731.94	UCART3	78.85
377	607772.54	4187731.94	UCART3	127.08
378	608772.54	4187731.94	UCART3	160.12
379	609772.54	4187731.94	UCART3	198.11
380	591772.54	4188731.94	UCART3	51.00
381	592772.54	4188731.94	UCART3	46.48
382	593772.54	4188731.94	UCART3	38.60
383	594772.54	4188731.94	UCART3	38.00
384	595772.54	4188731.94	UCART3	38.17
385	596772.54	4188731.94	UCART3	39.00
386	597772.54	4188731.94	UCART3	39.00
387	598772.54	4188731.94	UCART3	40.00
388	599772.54	4188731.94	UCART3	41.00
389	600772.54	4188731.94	UCART3	42.00
390	601772.54	4188731.94	UCART3	44.00
391	602772.54	4188731.94	UCART3	45.00
392	603772.54	4188731.94	UCART3	46.00
393	604772.54	4188731.94	UCART3	49.00
394	605772.54	4188731.94	UCART3	49.00
395	606772.54	4188731.94	UCART3	49.00
396	607772.54	4188731.94	UCART3	58.20
397	608772.54	4188731.94	UCART3	74.55
398	609772.54	4188731.94	UCART3	89.18
399	610772.54	4188731.94	UCART3	101.99
400	591772.54	4189731.94	UCART3	61.49
401	592772.54	4189731.94	UCART3	55.17
402	593772.54	4189731.94	UCART3	44.49

403	594772.54	4189731.94	UCART3	40.18
404	595772.54	4189731.94	UCART3	39.01
405	596772.54	4189731.94	UCART3	39.00
406	597772.54	4189731.94	UCART3	39.00
407	598772.54	4189731.94	UCART3	41.00
408	599772.54	4189731.94	UCART3	41.00
409	600772.54	4189731.94	UCART3	43.00
410	601772.54	4189731.94	UCART3	44.00
411	602772.54	4189731.94	UCART3	44.00
412	603772.54	4189731.94	UCART3	46.00
413	604772.54	4189731.94	UCART3	47.00
414	605772.54	4189731.94	UCART3	47.00
415	606772.54	4189731.94	UCART3	47.00
416	607772.54	4189731.94	UCART3	49.97
417	608772.54	4189731.94	UCART3	53.68
418	609772.54	4189731.94	UCART3	54.86
419	610772.54	4189731.94	UCART3	55.88
420	610821.14	4184138.72	UCART4	689.67
421	611821.14	4184138.72	UCART4	617.26
422	612821.14	4184138.72	UCART4	376.95
423	613821.14	4184138.72	UCART4	187.67
424	614821.14	4184138.72	UCART4	98.41
425	615821.14	4184138.72	UCART4	65.61
426	616821.14	4184138.72	UCART4	61.41
427	617821.14	4184138.72	UCART4	69.91
428	618821.14	4184138.72	UCART4	140.37
429	619821.14	4184138.72	UCART4	223.10
430	620821.14	4184138.72	UCART4	262.90
431	621821.14	4184138.72	UCART4	368.25
432	622821.14	4184138.72	UCART4	514.01
433	623821.14	4184138.72	UCART4	667.64
434	624821.14	4184138.72	UCART4	840.82
435	610821.14	4185138.72	UCART4	542.24
436	611821.14	4185138.72	UCART4	500.93
437	612821.14	4185138.72	UCART4	311.07
438	613821.14	4185138.72	UCART4	153.12
439	614821.14	4185138.72	UCART4	88.23
440	615821.14	4185138.72	UCART4	64.00
441	616821.14	4185138.72	UCART4	61.00
442	617821.14	4185138.72	UCART4	73.00
443	618821.14	4185138.72	UCART4	177.94

444	619821.14	4185138.72	UCART4	277.78
445	620821.14	4185138.72	UCART4	307.50
446	621821.14	4185138.72	UCART4	423.08
447	622821.14	4185138.72	UCART4	534.94
448	623821.14	4185138.72	UCART4	750.68
449	624821.14	4185138.72	UCART4	940.25
450	610821.14	4186138.72	UCART4	448.27
451	611821.14	4186138.72	UCART4	394.42
452	612821.14	4186138.72	UCART4	243.99
453	613821.14	4186138.72	UCART4	127.40
454	614821.14	4186138.72	UCART4	79.31
455	615821.14	4186138.72	UCART4	61.35
456	616821.14	4186138.72	UCART4	60.00
457	617821.14	4186138.72	UCART4	67.16
458	618821.14	4186138.72	UCART4	138.53
459	619821.14	4186138.72	UCART4	244.47
460	620821.14	4186138.72	UCART4	316.82
461	621821.14	4186138.72	UCART4	441.09
462	622821.14	4186138.72	UCART4	549.47
463	623821.14	4186138.72	UCART4	743.43
464	624821.14	4186138.72	UCART4	915.68
465	610821.14	4187138.72	UCART4	312.38
466	611821.14	4187138.72	UCART4	279.08
467	612821.14	4187138.72	UCART4	178.42
468	613821.14	4187138.72	UCART4	100.46
469	614821.14	4187138.72	UCART4	64.94
470	615821.14	4187138.72	UCART4	58.00
471	616821.14	4187138.72	UCART4	59.00
472	617821.14	4187138.72	UCART4	62.06
473	618821.14	4187138.72	UCART4	122.37
474	619821.14	4187138.72	UCART4	208.72
475	620821.14	4187138.72	UCART4	312.62
476	621821.14	4187138.72	UCART4	412.38
477	622821.14	4187138.72	UCART4	547.81
478	623821.14	4187138.72	UCART4	734.47
479	624821.14	4187138.72	UCART4	881.92
480	610821.14	4188138.72	UCART4	173.31
481	613821.14	4188138.72	UCART4	75.53
482	614821.14	4188138.72	UCART4	57.00
483	615821.14	4188138.72	UCART4	58.00
484	616821.14	4188138.72	UCART4	57.00

485	618821.14	4188138.72	UCART4	88.76
486	619821.14	4188138.72	UCART4	162.73
487	620821.14	4188138.72	UCART4	291.54
488	621821.14	4188138.72	UCART4	431.62
489	622821.14	4188138.72	UCART4	536.57
490	623821.14	4188138.72	UCART4	694.39
491	624821.14	4188138.72	UCART4	843.46
492	610821.14	4189138.72	UCART4	71.12
493	611821.14	4189138.72	UCART4	74.41
494	612821.14	4189138.72	UCART4	72.21
495	613821.14	4189138.72	UCART4	58.14
496	614821.14	4189138.72	UCART4	55.00
497	615821.14	4189138.72	UCART4	56.00
498	616821.14	4189138.72	UCART4	56.00
499	617821.14	4189138.72	UCART4	57.00
500	619821.14	4189138.72	UCART4	114.76
501	620821.14	4189138.72	UCART4	237.79
502	621821.14	4189138.72	UCART4	360.19
503	622821.14	4189138.72	UCART4	449.62
504	623821.14	4189138.72	UCART4	590.59
505	624821.14	4189138.72	UCART4	710.71
506	610821.14	4190138.72	UCART4	51.00
507	611821.14	4190138.72	UCART4	52.00
508	612821.14	4190138.72	UCART4	53.00
509	613821.14	4190138.72	UCART4	53.04
510	614821.14	4190138.72	UCART4	54.00
511	615821.14	4190138.72	UCART4	55.00
512	616821.14	4190138.72	UCART4	56.00
513	617821.14	4190138.72	UCART4	57.00
514	618821.14	4190138.72	UCART4	60.00
515	620821.14	4190138.72	UCART4	143.15
516	621821.14	4190138.72	UCART4	196.55
517	622821.14	4190138.72	UCART4	294.06
518	623821.14	4190138.72	UCART4	340.12
519	624821.14	4190138.72	UCART4	439.43
520	610821.14	4191138.72	UCART4	52.00
521	611821.14	4191138.72	UCART4	53.00
522	612821.14	4191138.72	UCART4	53.00
523	613821.14	4191138.72	UCART4	53.00
524	614821.14	4191138.72	UCART4	54.00
525	615821.14	4191138.72	UCART4	55.00

526	616821.14	4191138.72	UCART4	55.64
527	617821.14	4191138.72	UCART4	57.00
528	618821.14	4191138.72	UCART4	58.00
529	619821.14	4191138.72	UCART4	60.66
530	620821.14	4191138.72	UCART4	71.41
531	621821.14	4191138.72	UCART4	87.25
532	622821.14	4191138.72	UCART4	104.88
533	623821.14	4191138.72	UCART4	133.61
534	624821.14	4191138.72	UCART4	200.16
535	610821.14	4192138.72	UCART4	51.00
536	611821.14	4192138.72	UCART4	52.00
537	612821.14	4192138.72	UCART4	53.00
538	613821.14	4192138.72	UCART4	53.91
539	614821.14	4192138.72	UCART4	54.00
540	615821.14	4192138.72	UCART4	55.05
541	616821.14	4192138.72	UCART4	56.85
542	617821.14	4192138.72	UCART4	57.00
543	618821.14	4192138.72	UCART4	58.00
544	619821.14	4192138.72	UCART4	60.00
545	620821.14	4192138.72	UCART4	62.00
546	621821.14	4192138.72	UCART4	63.00
547	622821.14	4192138.72	UCART4	64.00
548	623821.14	4192138.72	UCART4	65.98
549	624821.14	4192138.72	UCART4	75.72
550	610821.14	4193138.72	UCART4	51.80
551	611821.14	4193138.72	UCART4	51.66
552	612821.14	4193138.72	UCART4	53.00
553	613821.14	4193138.72	UCART4	55.00
554	614821.14	4193138.72	UCART4	55.00
555	615821.14	4193138.72	UCART4	56.00
556	616821.14	4193138.72	UCART4	57.03
557	617821.14	4193138.72	UCART4	59.00
558	618821.14	4193138.72	UCART4	59.59
559	619821.14	4193138.72	UCART4	60.97
560	620821.14	4193138.72	UCART4	62.00
561	621821.14	4193138.72	UCART4	63.00
562	622821.14	4193138.72	UCART4	64.00
563	623821.14	4193138.72	UCART4	64.00
564	624821.14	4193138.72	UCART4	65.37
565	624856.81	4187506.02	UCART5	876.47
566	625856.81	4187506.02	UCART5	970.61

567	626856.81	4187506.02	UCART5	1035.73
568	627856.81	4187506.02	UCART5	1081.81
569	628856.81	4187506.02	UCART5	1125.84
570	629856.81	4187506.02	UCART5	1215.29
571	630856.81	4187506.02	UCART5	1189.04
572	631856.81	4187506.02	UCART5	996.46
573	632856.81	4187506.02	UCART5	799.04
574	633856.81	4187506.02	UCART5	664.33
575	624856.81	4188506.02	UCART5	812.11
576	625856.81	4188506.02	UCART5	896.38
577	626856.81	4188506.02	UCART5	939.14
578	627856.81	4188506.02	UCART5	928.91
579	628856.81	4188506.02	UCART5	863.08
580	629856.81	4188506.02	UCART5	1017.07
581	630856.81	4188506.02	UCART5	1078.98
582	631856.81	4188506.02	UCART5	998.79
583	632856.81	4188506.02	UCART5	857.23
584	633856.81	4188506.02	UCART5	674.47
585	624856.81	4189506.02	UCART5	626.05
586	625856.81	4189506.02	UCART5	752.67
587	626856.81	4189506.02	UCART5	724.49
588	627856.81	4189506.02	UCART5	752.73
589	628856.81	4189506.02	UCART5	620.78
590	629856.81	4189506.02	UCART5	815.64
591	630856.81	4189506.02	UCART5	833.76
592	631856.81	4189506.02	UCART5	904.52
593	632856.81	4189506.02	UCART5	767.36
594	633856.81	4189506.02	UCART5	583.63
595	624856.81	4190506.02	UCART5	352.59
596	625856.81	4190506.02	UCART5	444.68
597	626856.81	4190506.02	UCART5	454.46
598	627856.81	4190506.02	UCART5	539.03
599	628856.81	4190506.02	UCART5	437.99
600	629856.81	4190506.02	UCART5	562.27
601	630856.81	4190506.02	UCART5	583.58
602	631856.81	4190506.02	UCART5	641.82
603	632856.81	4190506.02	UCART5	633.92
604	633856.81	4190506.02	UCART5	472.75
605	624856.81	4191506.02	UCART5	161.23
606	625856.81	4191506.02	UCART5	232.83
607	626856.81	4191506.02	UCART5	244.50

608	627856.81	4191506.02	UCART5	307.39
609	628856.81	4191506.02	UCART5	307.25
610	629856.81	4191506.02	UCART5	360.88
611	630856.81	4191506.02	UCART5	405.54
612	631856.81	4191506.02	UCART5	424.42
613	632856.81	4191506.02	UCART5	485.12
614	633856.81	4191506.02	UCART5	339.78
615	624856.81	4192506.02	UCART5	69.65
616	625856.81	4192506.02	UCART5	94.65
617	626856.81	4192506.02	UCART5	99.24
618	627856.81	4192506.02	UCART5	128.84
619	628856.81	4192506.02	UCART5	181.42
620	629856.81	4192506.02	UCART5	178.58
621	630856.81	4192506.02	UCART5	222.18
622	631856.81	4192506.02	UCART5	243.76
623	632856.81	4192506.02	UCART5	290.37
624	633856.81	4192506.02	UCART5	207.14
625	624856.81	4193506.02	UCART5	65.00
626	625856.81	4193506.02	UCART5	68.57
627	626856.81	4193506.02	UCART5	69.00
628	627856.81	4193506.02	UCART5	73.97
629	628856.81	4193506.02	UCART5	93.17
630	629856.81	4193506.02	UCART5	98.49
631	630856.81	4193506.02	UCART5	118.15
632	631843.65	4193748.62	UCART5	103.81
633	632856.81	4193506.02	UCART5	125.25
634	633856.81	4193506.02	UCART5	111.96
635	624856.81	4194506.02	UCART5	66.00
636	625856.81	4194506.02	UCART5	67.00
637	626856.81	4194506.02	UCART5	68.00
638	627856.81	4194506.02	UCART5	69.00
639	628856.81	4194506.02	UCART5	73.00
640	629856.81	4194506.02	UCART5	75.08
641	630856.81	4194506.02	UCART5	80.00
642	631856.81	4194506.02	UCART5	83.00
643	632856.81	4194506.02	UCART5	79.12
644	633856.81	4194506.02	UCART5	80.00
645	624856.81	4195506.02	UCART5	69.44
646	625856.81	4195506.02	UCART5	69.00
647	626856.81	4195506.02	UCART5	68.00
648	627856.81	4195506.02	UCART5	69.05

649	628856.81	4195506.02	UCART5	70.87
650	629856.81	4195506.02	UCART5	72.00
651	630856.81	4195506.02	UCART5	73.00
652	631856.81	4195506.02	UCART5	75.00
653	632856.81	4195506.02	UCART5	77.00
654	633856.81	4195506.02	UCART5	79.69
655	624856.81	4196506.02	UCART5	81.02
656	625856.81	4196506.02	UCART5	77.01
657	626856.81	4196506.02	UCART5	76.00
658	627856.81	4196506.02	UCART5	73.72
659	628856.81	4196506.02	UCART5	72.00
660	629856.81	4196506.02	UCART5	74.00
661	630856.81	4196506.02	UCART5	78.22
662	631856.81	4196506.02	UCART5	81.98
663	632856.81	4196506.02	UCART5	86.00
664	633856.81	4196506.02	UCART5	90.66

Plant Boundary Receptors

Receptor Groups

Record Number	Group ID	Group Description
1	UPOL1	
2	UCART1	Receptors generated from Uniform Cartesian Grid
3	UCART2	Receptors generated from Uniform Cartesian Grid
4	UCART3	Receptors generated from Uniform Cartesian Grid
5	UCART4	Receptors generated from Uniform Cartesian Grid
6	UCART5	Receptors generated from Uniform Cartesian Grid

Results Summary

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CO - Concentration - Source Group: _____

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
__		1.00000	COUNT	0.00	0.00	0.00	0.00	0.00	

CO - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
8-HR	1ST	651.11249	ug/m^3	588608.28	4183182.56	305.77	0.00	619.00	19.09.2019, 8
ANNUAL		175.32934	ug/m^3	588608.28	4183182.56	305.77	0.00	619.00	

Source Pathway - Source Inputs

Source Pathway - Source Inputs

Line Area Sources

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00004	2.37	575203.95	4185846.54	29.34	2.55
			576133.71	4185423.92	28.53	2.55
			577158.57	4185128.09	28.15	2.55
			578331.34	4184789.99	29.00	2.55
			579662.59	4184557.55	35.99	2.55
			580877.62	4184346.24	64.52	2.55
			582134.91	4183849.67	87.42	2.55
			583674.21	4183750.35	164.33	2.55
			584780.60	4183688.20	234.17	2.55
			585451.90	4183675.77	233.59	2.55
			586384.25	4183315.26	264.67	2.55
			586918.80	4183302.83	253.82	2.55
			587903.83	4183213.08	263.45	2.55
			588836.28	4183163.35	313.60	2.55
			589818.46	4183312.54	232.95	2.55
			590824.08	4183393.53	225.32	2.55
			591816.16	4183332.79	223.73	2.55
			592747.49	4183130.33	147.84	2.55
			593456.12	4182421.71	120.45	2.55
			594356.22	4182028.54	167.98	2.55
			595332.94	4182528.81	210.25	2.55
			596166.72	4182957.62	231.64	2.55
			597167.26	4183386.42	251.97	2.55
			598024.86	4183719.93	251.08	2.55
			598882.47	4184244.02	163.29	2.55
			599741.48	4184714.66	112.21	2.55
			600674.72	4184517.24	180.23	2.55
			601625.89	4184283.93	189.69	2.55
			602505.28	4184696.71	209.65	2.55
			603223.15	4185414.58	174.99	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00004	2.37	604120.49	4185863.25	201.76	2.55
			605057.54	4186101.11	159.95	2.55
			606020.27	4186413.37	204.36	2.55
			606681.68	4186799.19	210.25	2.55
			606847.03	4186986.59	166.84	2.55
			607276.94	4187581.86	124.20	2.55
			607497.41	4187769.26	101.59	2.55
			607971.42	4187890.52	120.32	2.55
			608291.10	4187846.42	128.26	2.55
			608445.43	4187747.21	143.99	2.55
			608919.43	4187383.44	226.24	2.55
			609287.26	4187254.92	231.84	2.55
			609663.41	4187241.95	252.03	2.55
			610260.04	4187514.33	239.93	2.55
			611129.06	4187929.38	226.51	2.55
			612166.70	4188149.88	135.41	2.55
			613126.51	4188085.03	107.91	2.55
			613891.76	4187812.65	80.13	2.55
			615611.61	4187691.44	57.97	2.55
			617173.63	4187960.76	57.01	2.55
			618268.83	4188499.38	64.19	2.55
			619040.86	4189397.09	73.00	2.55
			619884.71	4190097.30	87.08	2.55
			620871.42	4190431.47	116.67	2.55
			622596.14	4190370.42	238.61	2.55
			623832.44	4190568.84	249.43	2.55
			624992.43	4190935.15	290.97	2.55
			625954.00	4191179.36	286.03	2.55
			627266.62	4191331.99	275.17	2.55
			628130.23	4191979.15	194.12	2.55
			628612.04	4192170.21	217.28	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00004	2.37	629600.59	4192120.37	233.85	2.55
			630024.26	4192253.28	231.74	2.55
			631223.80	4192922.57	172.68	2.55
			631427.89	4192982.59	171.40	2.55
			631966.26	4193134.48	149.90	2.55
			632600.60	4193209.21	155.61	2.55
			632768.99	4193265.34	157.03	2.55

Source Pathway - Source Inputs

Area Sources Generated from Line Sources

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000001	575201.68	4185841.54	2.55	102.13	24.44	29.25	2.37
	A0000002	575294.65	4185799.27	2.55	102.13	24.44	29.00	2.37
	A0000003	575387.63	4185757.01	2.55	102.13	24.44	29.00	2.37
	A0000004	575480.60	4185714.75	2.55	102.13	24.44	29.87	2.37
	A0000005	575573.58	4185672.49	2.55	102.13	24.44	29.79	2.37
	A0000006	575666.56	4185630.23	2.55	102.13	24.44	29.00	2.37
	A0000007	575759.53	4185587.96	2.55	102.13	24.44	29.00	2.37
	A0000008	575852.51	4185545.70	2.55	102.13	24.44	29.00	2.37
	A0000009	575945.49	4185503.44	2.55	102.13	24.44	29.00	2.37
	A0000010	576038.46	4185461.18	2.55	102.13	24.44	29.00	2.37
	A0000011	576132.19	4185418.64	2.55	106.67	16.10	29.00	2.37
	A0000012	576234.67	4185389.06	2.55	106.67	16.10	28.92	2.37
	A0000013	576337.16	4185359.47	2.55	106.67	16.10	28.34	2.37
	A0000014	576439.64	4185329.89	2.55	106.67	16.10	28.40	2.37
	A0000015	576542.13	4185300.31	2.55	106.67	16.10	28.37	2.37
	A0000016	576644.62	4185270.72	2.55	106.67	16.10	28.00	2.37
	A0000017	576747.10	4185241.14	2.55	106.67	16.10	28.00	2.37
	A0000018	576849.59	4185211.56	2.55	106.67	16.10	28.00	2.37
	A0000019	576952.07	4185181.97	2.55	106.67	16.10	28.00	2.37
	A0000020	577054.56	4185152.39	2.55	106.67	16.10	28.00	2.37
	A0000021	577157.04	4185122.81	2.55	101.71	16.08	28.00	2.37
	A0000022	577254.77	4185094.63	2.55	101.71	16.08	28.00	2.37
	A0000023	577352.50	4185066.46	2.55	101.71	16.08	28.00	2.37
	A0000024	577450.24	4185038.28	2.55	101.71	16.08	28.00	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000025	577547.97	4185010.11	2.55	101.71	16.08	29.00	2.37
	A0000026	577645.70	4184981.93	2.55	101.71	16.08	29.00	2.37
	A0000027	577743.43	4184953.76	2.55	101.71	16.08	29.00	2.37
	A0000028	577841.16	4184925.58	2.55	101.71	16.08	29.00	2.37
	A0000029	577938.89	4184897.41	2.55	101.71	16.08	29.00	2.37
	A0000030	578036.62	4184869.23	2.55	101.71	16.08	29.00	2.37
	A0000031	578134.35	4184841.06	2.55	101.71	16.08	29.00	2.37
	A0000032	578232.08	4184812.88	2.55	101.71	16.08	29.00	2.37
	A0000033	578330.39	4184784.58	2.55	103.95	9.90	29.00	2.37
	A0000034	578432.79	4184766.70	2.55	103.95	9.90	29.00	2.37
	A0000035	578535.20	4184748.82	2.55	103.95	9.90	29.00	2.37
	A0000036	578637.60	4184730.94	2.55	103.95	9.90	29.00	2.37
	A0000037	578740.01	4184713.06	2.55	103.95	9.90	29.00	2.37
	A0000038	578842.41	4184695.18	2.55	103.95	9.90	29.00	2.37
	A0000039	578944.81	4184677.30	2.55	103.95	9.90	29.12	2.37
	A0000040	579047.22	4184659.42	2.55	103.95	9.90	29.92	2.37
	A0000041	579149.62	4184641.54	2.55	103.95	9.90	29.88	2.37
	A0000042	579252.03	4184623.66	2.55	103.95	9.90	30.46	2.37
	A0000043	579354.43	4184605.78	2.55	103.95	9.90	31.88	2.37
	A0000044	579456.83	4184587.90	2.55	103.95	9.90	32.13	2.37
	A0000045	579559.24	4184570.02	2.55	103.95	9.90	33.53	2.37
	A0000046	579661.64	4184552.14	2.55	102.77	9.87	35.84	2.37
	A0000047	579762.90	4184534.53	2.55	102.77	9.87	36.35	2.37
	A0000048	579864.15	4184516.92	2.55	102.77	9.87	37.22	2.37
	A0000049	579965.40	4184499.31	2.55	102.77	9.87	40.04	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000050	580066.65	4184481.70	2.55	102.77	9.87	40.95	2.37
	A0000051	580167.91	4184464.09	2.55	102.77	9.87	43.15	2.37
	A0000052	580269.16	4184446.48	2.55	102.77	9.87	48.22	2.37
	A0000053	580370.41	4184428.87	2.55	102.77	9.87	50.83	2.37
	A0000054	580471.67	4184411.26	2.55	102.77	9.87	54.22	2.37
	A0000055	580572.92	4184393.65	2.55	102.77	9.87	60.45	2.37
	A0000056	580674.17	4184376.04	2.55	102.77	9.87	61.59	2.37
	A0000057	580775.42	4184358.43	2.55	102.77	9.87	62.80	2.37
	A0000058	580875.60	4184341.13	2.55	103.98	21.55	64.45	2.37
	A0000059	580972.31	4184302.93	2.55	103.98	21.55	64.02	2.37
	A0000060	581069.03	4184264.73	2.55	103.98	21.55	66.09	2.37
	A0000061	581165.74	4184226.53	2.55	103.98	21.55	67.51	2.37
	A0000062	581262.46	4184188.34	2.55	103.98	21.55	67.99	2.37
	A0000063	581359.17	4184150.14	2.55	103.98	21.55	70.35	2.37
	A0000064	581455.89	4184111.94	2.55	103.98	21.55	73.61	2.37
	A0000065	581552.60	4184073.74	2.55	103.98	21.55	79.73	2.37
	A0000066	581649.32	4184035.54	2.55	103.98	21.55	85.24	2.37
	A0000067	581746.03	4183997.34	2.55	103.98	21.55	85.65	2.37
	A0000068	581842.75	4183959.15	2.55	103.98	21.55	84.21	2.37
	A0000069	581939.46	4183920.95	2.55	103.98	21.55	86.21	2.37
	A0000070	582036.18	4183882.75	2.55	103.98	21.55	87.01	2.37
	A0000071	582134.56	4183844.18	2.55	102.83	3.69	88.44	2.37
	A0000072	582237.18	4183837.56	2.55	102.83	3.69	92.03	2.37
	A0000073	582339.80	4183830.94	2.55	102.83	3.69	100.53	2.37
	A0000074	582442.42	4183824.32	2.55	102.83	3.69	103.08	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000075	582545.04	4183817.69	2.55	102.83	3.69	108.55	2.37
	A0000076	582647.66	4183811.07	2.55	102.83	3.69	117.96	2.37
	A0000077	582750.28	4183804.45	2.55	102.83	3.69	120.75	2.37
	A0000078	582852.90	4183797.83	2.55	102.83	3.69	127.14	2.37
	A0000079	582955.52	4183791.21	2.55	102.83	3.69	135.30	2.37
	A0000080	583058.14	4183784.59	2.55	102.83	3.69	138.03	2.37
	A0000081	583160.76	4183777.97	2.55	102.83	3.69	141.72	2.37
	A0000082	583263.38	4183771.35	2.55	102.83	3.69	149.98	2.37
	A0000083	583366.00	4183764.73	2.55	102.83	3.69	152.23	2.37
	A0000084	583468.62	4183758.11	2.55	102.83	3.69	154.31	2.37
	A0000085	583571.24	4183751.49	2.55	102.83	3.69	163.08	2.37
	A0000086	583673.91	4183744.86	2.55	100.74	3.22	164.53	2.37
	A0000087	583774.49	4183739.21	2.55	100.74	3.22	169.90	2.37
	A0000088	583875.07	4183733.56	2.55	100.74	3.22	183.95	2.37
	A0000089	583975.65	4183727.91	2.55	100.74	3.22	186.38	2.37
	A0000090	584076.23	4183722.26	2.55	100.74	3.22	193.83	2.37
	A0000091	584176.81	4183716.61	2.55	100.74	3.22	211.82	2.37
	A0000092	584277.39	4183710.96	2.55	100.74	3.22	215.64	2.37
	A0000093	584377.97	4183705.31	2.55	100.74	3.22	219.76	2.37
	A0000094	584478.55	4183699.66	2.55	100.74	3.22	228.05	2.37
	A0000095	584579.13	4183694.01	2.55	100.74	3.22	228.09	2.37
	A0000096	584679.71	4183688.36	2.55	100.74	3.22	231.83	2.37
	A0000097	584780.50	4183682.70	2.55	95.92	1.06	234.52	2.37
	A0000098	584876.40	4183680.92	2.55	95.92	1.06	234.11	2.37
	A0000099	584972.30	4183679.15	2.55	95.92	1.06	237.68	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000100	585068.20	4183677.37	2.55	95.92	1.06	238.31	2.37
	A0000101	585164.10	4183675.60	2.55	95.92	1.06	237.22	2.37
	A0000102	585260.00	4183673.82	2.55	95.92	1.06	239.29	2.37
	A0000103	585355.90	4183672.04	2.55	95.92	1.06	236.51	2.37
	A0000104	585449.91	4183670.64	2.55	99.96	21.14	235.00	2.37
	A0000105	585543.15	4183634.59	2.55	99.96	21.14	237.30	2.37
	A0000106	585636.38	4183598.53	2.55	99.96	21.14	236.45	2.37
	A0000107	585729.62	4183562.48	2.55	99.96	21.14	239.81	2.37
	A0000108	585822.85	4183526.43	2.55	99.96	21.14	244.34	2.37
	A0000109	585916.09	4183490.38	2.55	99.96	21.14	253.79	2.37
	A0000110	586009.33	4183454.33	2.55	99.96	21.14	271.75	2.37
	A0000111	586102.56	4183418.28	2.55	99.96	21.14	283.91	2.37
	A0000112	586195.80	4183382.23	2.55	99.96	21.14	272.91	2.37
	A0000113	586289.03	4183346.18	2.55	99.96	21.14	263.27	2.37
	A0000114	586384.12	4183309.76	2.55	106.94	1.33	265.99	2.37
	A0000115	586491.03	4183307.27	2.55	106.94	1.33	259.38	2.37
	A0000116	586597.94	4183304.79	2.55	106.94	1.33	251.26	2.37
	A0000117	586704.85	4183302.30	2.55	106.94	1.33	252.06	2.37
	A0000118	586811.76	4183299.81	2.55	106.94	1.33	255.91	2.37
	A0000119	586918.30	4183297.35	2.55	109.90	5.21	256.27	2.37
	A0000120	587027.75	4183287.38	2.55	109.90	5.21	256.44	2.37
	A0000121	587137.19	4183277.41	2.55	109.90	5.21	261.92	2.37
	A0000122	587246.64	4183267.43	2.55	109.90	5.21	262.93	2.37
	A0000123	587356.09	4183257.46	2.55	109.90	5.21	264.51	2.37
	A0000124	587465.54	4183247.49	2.55	109.90	5.21	266.97	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000125	587574.98	4183237.52	2.55	109.90	5.21	270.16	2.37
	A0000126	587684.43	4183227.55	2.55	109.90	5.21	275.64	2.37
	A0000127	587793.88	4183217.58	2.55	109.90	5.21	274.79	2.37
	A0000128	587903.53	4183207.59	2.55	103.75	3.05	279.31	2.37
	A0000129	588007.14	4183202.06	2.55	103.75	3.05	282.13	2.37
	A0000130	588110.74	4183196.54	2.55	103.75	3.05	282.44	2.37
	A0000131	588214.35	4183191.01	2.55	103.75	3.05	286.64	2.37
	A0000132	588317.95	4183185.49	2.55	103.75	3.05	293.56	2.37
	A0000133	588421.56	4183179.96	2.55	103.75	3.05	297.57	2.37
	A0000134	588525.17	4183174.44	2.55	103.75	3.05	303.07	2.37
	A0000135	588628.77	4183168.91	2.55	103.75	3.05	310.72	2.37
	A0000136	588732.38	4183163.39	2.55	103.75	3.05	313.19	2.37
	A0000137	588837.10	4183157.91	2.55	99.34	351.36	313.95	2.37
	A0000138	588935.32	4183172.83	2.55	99.34	351.36	310.78	2.37
	A0000139	589033.54	4183187.75	2.55	99.34	351.36	305.56	2.37
	A0000140	589131.76	4183202.67	2.55	99.34	351.36	295.45	2.37
	A0000141	589229.97	4183217.59	2.55	99.34	351.36	281.17	2.37
	A0000142	589328.19	4183232.51	2.55	99.34	351.36	269.91	2.37
	A0000143	589426.41	4183247.43	2.55	99.34	351.36	261.09	2.37
	A0000144	589524.63	4183262.35	2.55	99.34	351.36	248.16	2.37
	A0000145	589622.85	4183277.27	2.55	99.34	351.36	237.11	2.37
	A0000146	589721.06	4183292.19	2.55	99.34	351.36	235.98	2.37
	A0000147	589818.90	4183307.06	2.55	100.89	355.40	233.85	2.37
	A0000148	589919.46	4183315.16	2.55	100.89	355.40	229.17	2.37
	A0000149	590020.02	4183323.26	2.55	100.89	355.40	229.36	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000150	590120.59	4183331.36	2.55	100.89	355.40	229.46	2.37
	A0000151	590221.15	4183339.46	2.55	100.89	355.40	224.95	2.37
	A0000152	590321.71	4183347.56	2.55	100.89	355.40	223.25	2.37
	A0000153	590422.28	4183355.66	2.55	100.89	355.40	225.42	2.37
	A0000154	590522.84	4183363.75	2.55	100.89	355.40	222.71	2.37
	A0000155	590623.40	4183371.85	2.55	100.89	355.40	222.10	2.37
	A0000156	590723.96	4183379.95	2.55	100.89	355.40	225.69	2.37
	A0000157	590823.75	4183388.04	2.55	99.39	3.50	225.15	2.37
	A0000158	590922.96	4183381.97	2.55	99.39	3.50	225.77	2.37
	A0000159	591022.16	4183375.90	2.55	99.39	3.50	228.27	2.37
	A0000160	591121.37	4183369.82	2.55	99.39	3.50	226.36	2.37
	A0000161	591220.58	4183363.75	2.55	99.39	3.50	227.74	2.37
	A0000162	591319.79	4183357.67	2.55	99.39	3.50	230.37	2.37
	A0000163	591418.99	4183351.60	2.55	99.39	3.50	229.46	2.37
	A0000164	591518.20	4183345.53	2.55	99.39	3.50	230.04	2.37
	A0000165	591617.41	4183339.45	2.55	99.39	3.50	228.44	2.37
	A0000166	591716.62	4183333.38	2.55	99.39	3.50	224.99	2.37
	A0000167	591814.99	4183327.42	2.55	105.90	12.26	222.76	2.37
	A0000168	591918.47	4183304.92	2.55	105.90	12.26	204.34	2.37
	A0000169	592021.95	4183282.43	2.55	105.90	12.26	195.39	2.37
	A0000170	592125.44	4183259.93	2.55	105.90	12.26	193.48	2.37
	A0000171	592228.92	4183237.44	2.55	105.90	12.26	169.64	2.37
	A0000172	592332.40	4183214.94	2.55	105.90	12.26	166.03	2.37
	A0000173	592435.88	4183192.44	2.55	105.90	12.26	166.37	2.37
	A0000174	592539.36	4183169.95	2.55	105.90	12.26	149.99	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000175	592642.84	4183147.45	2.55	105.90	12.26	150.00	2.37
	A0000176	592743.60	4183126.44	2.55	100.21	45.00	147.97	2.37
	A0000177	592814.47	4183055.58	2.55	100.21	45.00	131.90	2.37
	A0000178	592885.33	4182984.72	2.55	100.21	45.00	127.25	2.37
	A0000179	592956.19	4182913.85	2.55	100.21	45.00	131.79	2.37
	A0000180	593027.05	4182842.99	2.55	100.21	45.00	137.00	2.37
	A0000181	593097.92	4182772.13	2.55	100.21	45.00	124.61	2.37
	A0000182	593168.78	4182701.27	2.55	100.21	45.00	118.49	2.37
	A0000183	593239.64	4182630.40	2.55	100.21	45.00	125.41	2.37
	A0000184	593310.50	4182559.54	2.55	100.21	45.00	132.47	2.37
	A0000185	593381.37	4182488.68	2.55	100.21	45.00	126.23	2.37
	A0000186	593453.92	4182416.67	2.55	109.14	23.60	121.28	2.37
	A0000187	593553.93	4182372.98	2.55	109.14	23.60	121.18	2.37
	A0000188	593653.94	4182329.30	2.55	109.14	23.60	120.89	2.37
	A0000189	593753.95	4182285.61	2.55	109.14	23.60	123.30	2.37
	A0000190	593853.96	4182241.93	2.55	109.14	23.60	131.89	2.37
	A0000191	593953.97	4182198.24	2.55	109.14	23.60	141.97	2.37
	A0000192	594053.99	4182154.56	2.55	109.14	23.60	146.71	2.37
	A0000193	594154.00	4182110.87	2.55	109.14	23.60	146.38	2.37
	A0000194	594254.01	4182067.19	2.55	109.14	23.60	153.37	2.37
	A0000195	594358.73	4182023.65	2.55	109.74	332.88	170.52	2.37
	A0000196	594456.40	4182073.68	2.55	109.74	332.88	166.67	2.37
	A0000197	594554.07	4182123.70	2.55	109.74	332.88	167.54	2.37
	A0000198	594651.74	4182173.73	2.55	109.74	332.88	179.92	2.37
	A0000199	594749.41	4182223.76	2.55	109.74	332.88	184.33	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000200	594847.09	4182273.78	2.55	109.74	332.88	178.41	2.37
	A0000201	594944.76	4182323.81	2.55	109.74	332.88	182.96	2.37
	A0000202	595042.43	4182373.84	2.55	109.74	332.88	185.71	2.37
	A0000203	595140.10	4182423.86	2.55	109.74	332.88	188.33	2.37
	A0000204	595237.77	4182473.89	2.55	109.74	332.88	204.70	2.37
	A0000205	595335.45	4182523.92	2.55	104.18	332.78	208.04	2.37
	A0000206	595428.10	4182571.57	2.55	104.18	332.78	201.38	2.37
	A0000207	595520.74	4182619.21	2.55	104.18	332.78	206.78	2.37
	A0000208	595613.38	4182666.86	2.55	104.18	332.78	211.26	2.37
	A0000209	595706.02	4182714.50	2.55	104.18	332.78	211.85	2.37
	A0000210	595798.67	4182762.15	2.55	104.18	332.78	224.88	2.37
	A0000211	595891.31	4182809.79	2.55	104.18	332.78	233.52	2.37
	A0000212	595983.95	4182857.44	2.55	104.18	332.78	236.80	2.37
	A0000213	596076.59	4182905.08	2.55	104.18	332.78	241.81	2.37
	A0000214	596168.89	4182952.56	2.55	108.86	336.80	238.25	2.37
	A0000215	596268.94	4182995.44	2.55	108.86	336.80	230.78	2.37
	A0000216	596368.99	4183038.32	2.55	108.86	336.80	238.01	2.37
	A0000217	596469.05	4183081.20	2.55	108.86	336.80	243.77	2.37
	A0000218	596569.10	4183124.08	2.55	108.86	336.80	245.46	2.37
	A0000219	596669.16	4183166.96	2.55	108.86	336.80	254.59	2.37
	A0000220	596769.21	4183209.84	2.55	108.86	336.80	253.02	2.37
	A0000221	596869.26	4183252.72	2.55	108.86	336.80	242.04	2.37
	A0000222	596969.32	4183295.60	2.55	108.86	336.80	240.35	2.37
	A0000223	597069.37	4183338.48	2.55	108.86	336.80	252.40	2.37
	A0000224	597169.25	4183381.29	2.55	102.24	338.75	252.22	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000225	597264.54	4183418.35	2.55	102.24	338.75	256.32	2.37
	A0000226	597359.83	4183455.41	2.55	102.24	338.75	267.68	2.37
	A0000227	597455.12	4183492.46	2.55	102.24	338.75	258.96	2.37
	A0000228	597550.41	4183529.52	2.55	102.24	338.75	247.27	2.37
	A0000229	597645.70	4183566.58	2.55	102.24	338.75	244.48	2.37
	A0000230	597740.99	4183603.63	2.55	102.24	338.75	243.14	2.37
	A0000231	597836.28	4183640.69	2.55	102.24	338.75	243.15	2.37
	A0000232	597931.57	4183677.75	2.55	102.24	338.75	249.74	2.37
	A0000233	598027.73	4183715.24	2.55	100.51	328.57	250.77	2.37
	A0000234	598113.49	4183767.65	2.55	100.51	328.57	244.15	2.37
	A0000235	598199.25	4183820.06	2.55	100.51	328.57	225.34	2.37
	A0000236	598285.01	4183872.47	2.55	100.51	328.57	216.27	2.37
	A0000237	598370.77	4183924.88	2.55	100.51	328.57	212.69	2.37
	A0000238	598456.53	4183977.28	2.55	100.51	328.57	211.57	2.37
	A0000239	598542.29	4184029.69	2.55	100.51	328.57	203.50	2.37
	A0000240	598628.05	4184082.10	2.55	100.51	328.57	184.98	2.37
	A0000241	598713.82	4184134.51	2.55	100.51	328.57	172.40	2.37
	A0000242	598799.58	4184186.92	2.55	100.51	328.57	167.10	2.37
	A0000243	598885.11	4184239.20	2.55	108.83	331.28	163.44	2.37
	A0000244	598980.56	4184291.49	2.55	108.83	331.28	163.67	2.37
	A0000245	599076.00	4184343.78	2.55	108.83	331.28	153.71	2.37
	A0000246	599171.45	4184396.08	2.55	108.83	331.28	139.70	2.37
	A0000247	599266.90	4184448.37	2.55	108.83	331.28	133.46	2.37
	A0000248	599362.34	4184500.66	2.55	108.83	331.28	130.66	2.37
	A0000249	599457.79	4184552.95	2.55	108.83	331.28	128.00	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000250	599553.23	4184605.25	2.55	108.83	331.28	126.26	2.37
	A0000251	599648.68	4184657.54	2.55	108.83	331.28	129.12	2.37
	A0000252	599740.35	4184709.27	2.55	105.99	11.94	127.96	2.37
	A0000253	599844.04	4184687.34	2.55	105.99	11.94	134.91	2.37
	A0000254	599947.73	4184665.40	2.55	105.99	11.94	137.91	2.37
	A0000255	600051.42	4184643.47	2.55	105.99	11.94	150.85	2.37
	A0000256	600155.12	4184621.53	2.55	105.99	11.94	155.48	2.37
	A0000257	600258.81	4184599.60	2.55	105.99	11.94	160.04	2.37
	A0000258	600362.50	4184577.67	2.55	105.99	11.94	176.15	2.37
	A0000259	600466.19	4184555.73	2.55	105.99	11.94	179.48	2.37
	A0000260	600569.88	4184533.80	2.55	105.99	11.94	180.72	2.37
	A0000261	600673.40	4184511.90	2.55	108.82	13.78	180.70	2.37
	A0000262	600779.09	4184485.98	2.55	108.82	13.78	180.54	2.37
	A0000263	600884.78	4184460.05	2.55	108.82	13.78	180.64	2.37
	A0000264	600990.46	4184434.13	2.55	108.82	13.78	174.97	2.37
	A0000265	601096.15	4184408.21	2.55	108.82	13.78	181.54	2.37
	A0000266	601201.84	4184382.28	2.55	108.82	13.78	187.71	2.37
	A0000267	601307.52	4184356.36	2.55	108.82	13.78	192.32	2.37
	A0000268	601413.21	4184330.44	2.55	108.82	13.78	195.92	2.37
	A0000269	601518.90	4184304.52	2.55	108.82	13.78	193.33	2.37
	A0000270	601628.23	4184278.96	2.55	107.94	334.86	190.29	2.37
	A0000271	601725.94	4184324.82	2.55	107.94	334.86	190.91	2.37
	A0000272	601823.65	4184370.68	2.55	107.94	334.86	184.45	2.37
	A0000273	601921.36	4184416.55	2.55	107.94	334.86	173.08	2.37
	A0000274	602019.07	4184462.41	2.55	107.94	334.86	169.67	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000275	602116.78	4184508.27	2.55	107.94	334.86	181.73	2.37
	A0000276	602214.49	4184554.14	2.55	107.94	334.86	183.11	2.37
	A0000277	602312.20	4184600.00	2.55	107.94	334.86	187.97	2.37
	A0000278	602409.91	4184645.87	2.55	107.94	334.86	201.24	2.37
	A0000279	602509.17	4184692.82	2.55	101.52	315.00	192.98	2.37
	A0000280	602580.96	4184764.61	2.55	101.52	315.00	184.74	2.37
	A0000281	602652.75	4184836.39	2.55	101.52	315.00	191.89	2.37
	A0000282	602724.53	4184908.18	2.55	101.52	315.00	204.61	2.37
	A0000283	602796.32	4184979.97	2.55	101.52	315.00	190.83	2.37
	A0000284	602868.11	4185051.75	2.55	101.52	315.00	182.10	2.37
	A0000285	602939.89	4185123.54	2.55	101.52	315.00	181.46	2.37
	A0000286	603011.68	4185195.33	2.55	101.52	315.00	191.97	2.37
	A0000287	603083.47	4185267.12	2.55	101.52	315.00	205.44	2.37
	A0000288	603155.25	4185338.90	2.55	101.52	315.00	191.13	2.37
	A0000289	603225.61	4185409.66	2.55	100.33	333.43	176.78	2.37
	A0000290	603315.35	4185454.53	2.55	100.33	333.43	186.57	2.37
	A0000291	603405.08	4185499.39	2.55	100.33	333.43	195.48	2.37
	A0000292	603494.81	4185544.26	2.55	100.33	333.43	198.30	2.37
	A0000293	603584.55	4185589.13	2.55	100.33	333.43	198.72	2.37
	A0000294	603674.28	4185633.99	2.55	100.33	333.43	195.17	2.37
	A0000295	603764.01	4185678.86	2.55	100.33	333.43	185.84	2.37
	A0000296	603853.75	4185723.73	2.55	100.33	333.43	188.59	2.37
	A0000297	603943.48	4185768.59	2.55	100.33	333.43	199.07	2.37
	A0000298	604033.21	4185813.46	2.55	100.33	333.43	201.30	2.37
	A0000299	604121.84	4185857.92	2.55	107.42	345.76	201.27	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000300	604225.96	4185884.35	2.55	107.42	345.76	192.36	2.37
	A0000301	604330.08	4185910.77	2.55	107.42	345.76	184.08	2.37
	A0000302	604434.19	4185937.20	2.55	107.42	345.76	176.10	2.37
	A0000303	604538.31	4185963.63	2.55	107.42	345.76	163.21	2.37
	A0000304	604642.43	4185990.06	2.55	107.42	345.76	160.08	2.37
	A0000305	604746.54	4186016.49	2.55	107.42	345.76	158.85	2.37
	A0000306	604850.66	4186042.92	2.55	107.42	345.76	153.80	2.37
	A0000307	604954.78	4186069.35	2.55	107.42	345.76	152.57	2.37
	A0000308	605059.24	4186095.88	2.55	101.21	342.03	161.56	2.37
	A0000309	605155.51	4186127.11	2.55	101.21	342.03	168.39	2.37
	A0000310	605251.78	4186158.33	2.55	101.21	342.03	168.60	2.37
	A0000311	605348.06	4186189.56	2.55	101.21	342.03	166.97	2.37
	A0000312	605444.33	4186220.78	2.55	101.21	342.03	169.48	2.37
	A0000313	605540.60	4186252.01	2.55	101.21	342.03	167.65	2.37
	A0000314	605636.88	4186283.24	2.55	101.21	342.03	168.12	2.37
	A0000315	605733.15	4186314.46	2.55	101.21	342.03	179.40	2.37
	A0000316	605829.42	4186345.69	2.55	101.21	342.03	185.93	2.37
	A0000317	605925.69	4186376.92	2.55	101.21	342.03	189.02	2.37
	A0000318	606023.04	4186408.62	2.55	109.39	329.74	201.61	2.37
	A0000319	606117.53	4186463.74	2.55	109.39	329.74	201.31	2.37
	A0000320	606212.01	4186518.86	2.55	109.39	329.74	185.34	2.37
	A0000321	606306.50	4186573.98	2.55	109.39	329.74	188.47	2.37
	A0000322	606400.99	4186629.09	2.55	109.39	329.74	193.71	2.37
	A0000323	606495.47	4186684.21	2.55	109.39	329.74	195.34	2.37
	A0000324	606589.96	4186739.33	2.55	109.39	329.74	194.10	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000325	606685.80	4186795.56	2.55	83.31	311.42	180.24	2.37
	A0000326	606740.92	4186858.02	2.55	83.31	311.42	169.18	2.37
	A0000327	606796.03	4186920.49	2.55	83.31	311.42	164.66	2.37
	A0000328	606851.49	4186983.37	2.55	104.90	305.84	167.82	2.37
	A0000329	606912.90	4187068.41	2.55	104.90	305.84	175.58	2.37
	A0000330	606974.32	4187153.45	2.55	104.90	305.84	154.93	2.37
	A0000331	607035.73	4187238.49	2.55	104.90	305.84	138.75	2.37
	A0000332	607097.15	4187323.52	2.55	104.90	305.84	139.96	2.37
	A0000333	607158.57	4187408.56	2.55	104.90	305.84	136.28	2.37
	A0000334	607219.98	4187493.60	2.55	104.90	305.84	126.19	2.37
	A0000335	607280.50	4187577.67	2.55	96.45	319.64	124.14	2.37
	A0000336	607353.99	4187640.13	2.55	96.45	319.64	126.36	2.37
	A0000337	607427.48	4187702.60	2.55	96.45	319.64	114.86	2.37
	A0000338	607498.77	4187763.93	2.55	97.85	345.65	108.85	2.37
	A0000339	607593.57	4187788.18	2.55	97.85	345.65	109.34	2.37
	A0000340	607688.38	4187812.43	2.55	97.85	345.65	108.49	2.37
	A0000341	607783.18	4187836.68	2.55	97.85	345.65	113.43	2.37
	A0000342	607877.98	4187860.94	2.55	97.85	345.65	120.79	2.37
	A0000343	607970.67	4187885.07	2.55	107.57	7.85	120.75	2.37
	A0000344	608077.23	4187870.37	2.55	107.57	7.85	124.23	2.37
	A0000345	608183.79	4187855.67	2.55	107.57	7.85	129.77	2.37
	A0000346	608288.12	4187841.79	2.55	91.73	32.74	129.64	2.37
	A0000347	608365.29	4187792.19	2.55	91.73	32.74	135.30	2.37
	A0000348	608442.08	4187742.85	2.55	99.58	37.50	148.74	2.37
	A0000349	608521.08	4187682.22	2.55	99.58	37.50	173.29	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000350	608600.08	4187621.59	2.55	99.58	37.50	177.88	2.37
	A0000351	608679.08	4187560.96	2.55	99.58	37.50	180.64	2.37
	A0000352	608758.08	4187500.33	2.55	99.58	37.50	184.45	2.37
	A0000353	608837.08	4187439.70	2.55	99.58	37.50	206.39	2.37
	A0000354	608917.62	4187378.24	2.55	97.41	19.26	225.78	2.37
	A0000355	609009.58	4187346.12	2.55	97.41	19.26	227.26	2.37
	A0000356	609101.53	4187313.99	2.55	97.41	19.26	226.08	2.37
	A0000357	609193.49	4187281.86	2.55	97.41	19.26	227.33	2.37
	A0000358	609287.07	4187249.42	2.55	94.09	1.97	232.60	2.37
	A0000359	609381.11	4187246.18	2.55	94.09	1.97	236.81	2.37
	A0000360	609475.15	4187242.94	2.55	94.09	1.97	237.23	2.37
	A0000361	609569.18	4187239.69	2.55	94.09	1.97	242.19	2.37
	A0000362	609665.69	4187236.95	2.55	109.31	335.46	251.39	2.37
	A0000363	609765.13	4187282.34	2.55	109.31	335.46	253.33	2.37
	A0000364	609864.57	4187327.74	2.55	109.31	335.46	255.07	2.37
	A0000365	609964.01	4187373.13	2.55	109.31	335.46	249.31	2.37
	A0000366	610063.45	4187418.53	2.55	109.31	335.46	238.24	2.37
	A0000367	610162.89	4187463.93	2.55	109.31	335.46	237.85	2.37
	A0000368	610262.41	4187509.36	2.55	107.01	334.47	239.47	2.37
	A0000369	610358.97	4187555.48	2.55	107.01	334.47	239.85	2.37
	A0000370	610455.53	4187601.60	2.55	107.01	334.47	244.05	2.37
	A0000371	610552.09	4187647.72	2.55	107.01	334.47	249.70	2.37
	A0000372	610648.64	4187693.83	2.55	107.01	334.47	251.69	2.37
	A0000373	610745.20	4187739.95	2.55	107.01	334.47	233.82	2.37
	A0000374	610841.76	4187786.07	2.55	107.01	334.47	217.38	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000375	610938.32	4187832.18	2.55	107.01	334.47	215.59	2.37
	A0000376	611034.88	4187878.30	2.55	107.01	334.47	218.84	2.37
	A0000377	611130.21	4187924.00	2.55	106.08	348.00	224.92	2.37
	A0000378	611233.97	4187946.05	2.55	106.08	348.00	228.00	2.37
	A0000379	611337.73	4187968.10	2.55	106.08	348.00	228.73	2.37
	A0000380	611441.50	4187990.15	2.55	106.08	348.00	224.31	2.37
	A0000381	611545.26	4188012.20	2.55	106.08	348.00	212.52	2.37
	A0000382	611649.02	4188034.25	2.55	106.08	348.00	201.11	2.37
	A0000383	611752.79	4188056.30	2.55	106.08	348.00	178.24	2.37
	A0000384	611856.55	4188078.35	2.55	106.08	348.00	164.02	2.37
	A0000385	611960.31	4188100.40	2.55	106.08	348.00	158.85	2.37
	A0000386	612064.08	4188122.45	2.55	106.08	348.00	142.79	2.37
	A0000387	612166.32	4188144.39	2.55	106.89	3.87	137.36	2.37
	A0000388	612272.97	4188137.18	2.55	106.89	3.87	137.12	2.37
	A0000389	612379.62	4188129.98	2.55	106.89	3.87	128.67	2.37
	A0000390	612486.26	4188122.77	2.55	106.89	3.87	126.71	2.37
	A0000391	612592.91	4188115.57	2.55	106.89	3.87	124.44	2.37
	A0000392	612699.55	4188108.36	2.55	106.89	3.87	119.29	2.37
	A0000393	612806.20	4188101.16	2.55	106.89	3.87	118.68	2.37
	A0000394	612912.84	4188093.95	2.55	106.89	3.87	112.77	2.37
	A0000395	613019.49	4188086.74	2.55	106.89	3.87	109.23	2.37
	A0000396	613124.66	4188079.84	2.55	101.54	19.59	107.91	2.37
	A0000397	613220.32	4188045.80	2.55	101.54	19.59	100.67	2.37
	A0000398	613315.97	4188011.75	2.55	101.54	19.59	98.79	2.37
	A0000399	613411.63	4187977.70	2.55	101.54	19.59	100.19	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000400	613507.29	4187943.65	2.55	101.54	19.59	95.44	2.37
	A0000401	613602.95	4187909.61	2.55	101.54	19.59	92.73	2.37
	A0000402	613698.60	4187875.56	2.55	101.54	19.59	91.13	2.37
	A0000403	613794.26	4187841.51	2.55	101.54	19.59	84.87	2.37
	A0000404	613891.37	4187807.16	2.55	107.76	4.03	80.30	2.37
	A0000405	613998.86	4187799.59	2.55	107.76	4.03	79.37	2.37
	A0000406	614106.35	4187792.01	2.55	107.76	4.03	71.66	2.37
	A0000407	614213.85	4187784.43	2.55	107.76	4.03	68.93	2.37
	A0000408	614321.34	4187776.86	2.55	107.76	4.03	68.69	2.37
	A0000409	614428.83	4187769.28	2.55	107.76	4.03	63.18	2.37
	A0000410	614536.32	4187761.71	2.55	107.76	4.03	61.15	2.37
	A0000411	614643.81	4187754.13	2.55	107.76	4.03	61.00	2.37
	A0000412	614751.30	4187746.56	2.55	107.76	4.03	59.74	2.37
	A0000413	614858.79	4187738.98	2.55	107.76	4.03	59.37	2.37
	A0000414	614966.28	4187731.41	2.55	107.76	4.03	59.37	2.37
	A0000415	615073.77	4187723.83	2.55	107.76	4.03	58.23	2.37
	A0000416	615181.26	4187716.26	2.55	107.76	4.03	57.48	2.37
	A0000417	615288.75	4187708.68	2.55	107.76	4.03	57.58	2.37
	A0000418	615396.25	4187701.11	2.55	107.76	4.03	57.68	2.37
	A0000419	615503.74	4187693.53	2.55	107.76	4.03	58.00	2.37
	A0000420	615612.55	4187686.02	2.55	105.67	350.22	58.00	2.37
	A0000421	615716.68	4187703.98	2.55	105.67	350.22	58.00	2.37
	A0000422	615820.82	4187721.93	2.55	105.67	350.22	58.00	2.37
	A0000423	615924.95	4187739.89	2.55	105.67	350.22	58.00	2.37
	A0000424	616029.09	4187757.84	2.55	105.67	350.22	58.00	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000425	616133.22	4187775.79	2.55	105.67	350.22	58.00	2.37
	A0000426	616237.35	4187793.75	2.55	105.67	350.22	58.00	2.37
	A0000427	616341.49	4187811.70	2.55	105.67	350.22	58.00	2.37
	A0000428	616445.62	4187829.66	2.55	105.67	350.22	58.00	2.37
	A0000429	616549.76	4187847.61	2.55	105.67	350.22	58.00	2.37
	A0000430	616653.89	4187865.57	2.55	105.67	350.22	58.00	2.37
	A0000431	616758.03	4187883.52	2.55	105.67	350.22	58.00	2.37
	A0000432	616862.16	4187901.47	2.55	105.67	350.22	58.00	2.37
	A0000433	616966.29	4187919.43	2.55	105.67	350.22	58.00	2.37
	A0000434	617070.43	4187937.38	2.55	105.67	350.22	57.00	2.37
	A0000435	617176.06	4187955.82	2.55	101.71	333.81	57.00	2.37
	A0000436	617267.32	4188000.71	2.55	101.71	333.81	57.00	2.37
	A0000437	617358.59	4188045.59	2.55	101.71	333.81	57.09	2.37
	A0000438	617449.86	4188090.48	2.55	101.71	333.81	57.00	2.37
	A0000439	617541.12	4188135.36	2.55	101.71	333.81	57.00	2.37
	A0000440	617632.39	4188180.25	2.55	101.71	333.81	57.12	2.37
	A0000441	617723.66	4188225.13	2.55	101.71	333.81	58.38	2.37
	A0000442	617814.93	4188270.02	2.55	101.71	333.81	58.96	2.37
	A0000443	617906.19	4188314.90	2.55	101.71	333.81	59.37	2.37
	A0000444	617997.46	4188359.79	2.55	101.71	333.81	59.41	2.37
	A0000445	618088.73	4188404.68	2.55	101.71	333.81	62.19	2.37
	A0000446	618179.99	4188449.56	2.55	101.71	333.81	62.65	2.37
	A0000447	618273.00	4188495.80	2.55	107.64	310.70	64.36	2.37
	A0000448	618343.19	4188577.41	2.55	107.64	310.70	68.43	2.37
	A0000449	618413.37	4188659.02	2.55	107.64	310.70	67.65	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000450	618483.56	4188740.63	2.55	107.64	310.70	67.07	2.37
	A0000451	618553.74	4188822.24	2.55	107.64	310.70	68.80	2.37
	A0000452	618623.93	4188903.85	2.55	107.64	310.70	68.81	2.37
	A0000453	618694.11	4188985.46	2.55	107.64	310.70	68.13	2.37
	A0000454	618764.30	4189067.07	2.55	107.64	310.70	68.00	2.37
	A0000455	618834.48	4189148.68	2.55	107.64	310.70	69.85	2.37
	A0000456	618904.66	4189230.29	2.55	107.64	310.70	71.72	2.37
	A0000457	618974.85	4189311.90	2.55	107.64	310.70	72.58	2.37
	A0000458	619044.38	4189392.86	2.55	109.65	320.31	73.03	2.37
	A0000459	619128.76	4189462.88	2.55	109.65	320.31	74.73	2.37
	A0000460	619213.15	4189532.90	2.55	109.65	320.31	77.42	2.37
	A0000461	619297.53	4189602.92	2.55	109.65	320.31	75.08	2.37
	A0000462	619381.91	4189672.94	2.55	109.65	320.31	75.57	2.37
	A0000463	619466.30	4189742.97	2.55	109.65	320.31	79.18	2.37
	A0000464	619550.68	4189812.99	2.55	109.65	320.31	79.48	2.37
	A0000465	619635.07	4189883.01	2.55	109.65	320.31	76.74	2.37
	A0000466	619719.45	4189953.03	2.55	109.65	320.31	76.94	2.37
	A0000467	619803.84	4190023.05	2.55	109.65	320.31	80.67	2.37
	A0000468	619886.48	4190092.10	2.55	104.18	341.29	83.84	2.37
	A0000469	619985.15	4190125.51	2.55	104.18	341.29	82.77	2.37
	A0000470	620083.82	4190158.93	2.55	104.18	341.29	83.69	2.37
	A0000471	620182.49	4190192.35	2.55	104.18	341.29	91.25	2.37
	A0000472	620281.16	4190225.76	2.55	104.18	341.29	91.35	2.37
	A0000473	620379.83	4190259.18	2.55	104.18	341.29	97.18	2.37
	A0000474	620478.50	4190292.60	2.55	104.18	341.29	111.52	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000475	620577.17	4190326.01	2.55	104.18	341.29	114.61	2.37
	A0000476	620675.84	4190359.43	2.55	104.18	341.29	116.42	2.37
	A0000477	620774.51	4190392.85	2.55	104.18	341.29	123.17	2.37
	A0000478	620871.22	4190425.98	2.55	107.86	2.03	118.02	2.37
	A0000479	620979.02	4190422.16	2.55	107.86	2.03	124.25	2.37
	A0000480	621086.81	4190418.34	2.55	107.86	2.03	132.88	2.37
	A0000481	621194.61	4190414.53	2.55	107.86	2.03	135.98	2.37
	A0000482	621302.40	4190410.71	2.55	107.86	2.03	143.19	2.37
	A0000483	621410.20	4190406.90	2.55	107.86	2.03	147.62	2.37
	A0000484	621517.99	4190403.08	2.55	107.86	2.03	151.76	2.37
	A0000485	621625.79	4190399.27	2.55	107.86	2.03	162.18	2.37
	A0000486	621733.58	4190395.45	2.55	107.86	2.03	164.60	2.37
	A0000487	621841.38	4190391.63	2.55	107.86	2.03	170.44	2.37
	A0000488	621949.17	4190387.82	2.55	107.86	2.03	182.57	2.37
	A0000489	622056.97	4190384.00	2.55	107.86	2.03	186.77	2.37
	A0000490	622164.76	4190380.19	2.55	107.86	2.03	196.59	2.37
	A0000491	622272.56	4190376.37	2.55	107.86	2.03	206.95	2.37
	A0000492	622380.35	4190372.56	2.55	107.86	2.03	212.92	2.37
	A0000493	622488.15	4190368.74	2.55	107.86	2.03	229.38	2.37
	A0000494	622597.01	4190364.99	2.55	104.34	350.88	238.14	2.37
	A0000495	622700.03	4190381.52	2.55	104.34	350.88	235.10	2.37
	A0000496	622803.06	4190398.06	2.55	104.34	350.88	237.38	2.37
	A0000497	622906.09	4190414.59	2.55	104.34	350.88	245.02	2.37
	A0000498	623009.11	4190431.13	2.55	104.34	350.88	237.75	2.37
	A0000499	623112.14	4190447.66	2.55	104.34	350.88	237.66	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000500	623215.16	4190464.20	2.55	104.34	350.88	237.37	2.37
	A0000501	623318.19	4190480.73	2.55	104.34	350.88	236.09	2.37
	A0000502	623421.21	4190497.27	2.55	104.34	350.88	241.86	2.37
	A0000503	623524.24	4190513.80	2.55	104.34	350.88	241.92	2.37
	A0000504	623627.26	4190530.34	2.55	104.34	350.88	242.89	2.37
	A0000505	623730.29	4190546.87	2.55	104.34	350.88	251.45	2.37
	A0000506	623834.10	4190563.60	2.55	101.37	342.47	250.42	2.37
	A0000507	623930.76	4190594.12	2.55	101.37	342.47	255.05	2.37
	A0000508	624027.43	4190624.65	2.55	101.37	342.47	270.81	2.37
	A0000509	624124.10	4190655.17	2.55	101.37	342.47	275.04	2.37
	A0000510	624220.76	4190685.70	2.55	101.37	342.47	267.52	2.37
	A0000511	624317.43	4190716.23	2.55	101.37	342.47	263.46	2.37
	A0000512	624414.09	4190746.75	2.55	101.37	342.47	247.79	2.37
	A0000513	624510.76	4190777.28	2.55	101.37	342.47	240.44	2.37
	A0000514	624607.42	4190807.80	2.55	101.37	342.47	255.49	2.37
	A0000515	624704.09	4190838.33	2.55	101.37	342.47	256.55	2.37
	A0000516	624800.76	4190868.86	2.55	101.37	342.47	260.11	2.37
	A0000517	624897.42	4190899.38	2.55	101.37	342.47	282.07	2.37
	A0000518	624993.78	4190929.82	2.55	99.21	345.75	290.57	2.37
	A0000519	625089.94	4190954.24	2.55	99.21	345.75	296.86	2.37
	A0000520	625186.10	4190978.66	2.55	99.21	345.75	302.32	2.37
	A0000521	625282.26	4191003.08	2.55	99.21	345.75	299.02	2.37
	A0000522	625378.41	4191027.50	2.55	99.21	345.75	286.06	2.37
	A0000523	625474.57	4191051.93	2.55	99.21	345.75	281.94	2.37
	A0000524	625570.73	4191076.35	2.55	99.21	345.75	285.88	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000525	625666.88	4191100.77	2.55	99.21	345.75	281.28	2.37
	A0000526	625763.04	4191125.19	2.55	99.21	345.75	283.52	2.37
	A0000527	625859.20	4191149.61	2.55	99.21	345.75	289.78	2.37
	A0000528	625954.64	4191173.90	2.55	101.65	353.37	286.76	2.37
	A0000529	626055.61	4191185.64	2.55	101.65	353.37	290.19	2.37
	A0000530	626156.58	4191197.38	2.55	101.65	353.37	294.90	2.37
	A0000531	626257.55	4191209.12	2.55	101.65	353.37	293.24	2.37
	A0000532	626358.52	4191220.86	2.55	101.65	353.37	296.15	2.37
	A0000533	626459.49	4191232.60	2.55	101.65	353.37	297.82	2.37
	A0000534	626560.46	4191244.34	2.55	101.65	353.37	297.06	2.37
	A0000535	626661.43	4191256.08	2.55	101.65	353.37	299.71	2.37
	A0000536	626762.40	4191267.82	2.55	101.65	353.37	299.73	2.37
	A0000537	626863.37	4191279.56	2.55	101.65	353.37	293.81	2.37
	A0000538	626964.34	4191291.30	2.55	101.65	353.37	293.18	2.37
	A0000539	627065.31	4191303.05	2.55	101.65	353.37	296.55	2.37
	A0000540	627166.28	4191314.79	2.55	101.65	353.37	292.10	2.37
	A0000541	627269.92	4191327.59	2.55	107.92	323.15	292.62	2.37
	A0000542	627356.28	4191392.30	2.55	107.92	323.15	278.16	2.37
	A0000543	627442.64	4191457.02	2.55	107.92	323.15	271.04	2.37
	A0000544	627529.00	4191521.74	2.55	107.92	323.15	278.97	2.37
	A0000545	627615.36	4191586.45	2.55	107.92	323.15	271.14	2.37
	A0000546	627701.72	4191651.17	2.55	107.92	323.15	235.60	2.37
	A0000547	627788.08	4191715.88	2.55	107.92	323.15	232.43	2.37
	A0000548	627874.44	4191780.60	2.55	107.92	323.15	243.74	2.37
	A0000549	627960.80	4191845.31	2.55	107.92	323.15	245.51	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000550	628047.16	4191910.03	2.55	107.92	323.15	208.07	2.37
	A0000551	628132.25	4191974.03	2.55	103.66	338.37	196.97	2.37
	A0000552	628228.62	4192012.25	2.55	103.66	338.37	205.34	2.37
	A0000553	628324.98	4192050.46	2.55	103.66	338.37	208.89	2.37
	A0000554	628421.34	4192088.67	2.55	103.66	338.37	210.79	2.37
	A0000555	628517.71	4192126.89	2.55	103.66	338.37	211.99	2.37
	A0000556	628611.76	4192164.72	2.55	109.98	2.89	201.61	2.37
	A0000557	628721.60	4192159.18	2.55	109.98	2.89	205.26	2.37
	A0000558	628831.44	4192153.64	2.55	109.98	2.89	211.04	2.37
	A0000559	628941.28	4192148.10	2.55	109.98	2.89	215.38	2.37
	A0000560	629051.12	4192142.57	2.55	109.98	2.89	218.96	2.37
	A0000561	629160.96	4192137.03	2.55	109.98	2.89	224.90	2.37
	A0000562	629270.80	4192131.49	2.55	109.98	2.89	227.63	2.37
	A0000563	629380.64	4192125.95	2.55	109.98	2.89	230.53	2.37
	A0000564	629490.48	4192120.41	2.55	109.98	2.89	233.16	2.37
	A0000565	629602.24	4192115.12	2.55	88.80	342.58	233.97	2.37
	A0000566	629686.97	4192141.70	2.55	88.80	342.58	239.41	2.37
	A0000567	629771.70	4192168.29	2.55	88.80	342.58	236.22	2.37
	A0000568	629856.44	4192194.87	2.55	88.80	342.58	228.21	2.37
	A0000569	629941.17	4192221.45	2.55	88.80	342.58	223.28	2.37
	A0000570	630026.94	4192248.48	2.55	105.66	330.84	232.98	2.37
	A0000571	630119.21	4192299.96	2.55	105.66	330.84	231.30	2.37
	A0000572	630211.48	4192351.45	2.55	105.66	330.84	233.80	2.37
	A0000573	630303.76	4192402.93	2.55	105.66	330.84	245.81	2.37
	A0000574	630396.03	4192454.41	2.55	105.66	330.84	239.30	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000575	630488.30	4192505.90	2.55	105.66	330.84	218.54	2.37
	A0000576	630580.57	4192557.38	2.55	105.66	330.84	210.85	2.37
	A0000577	630672.85	4192608.86	2.55	105.66	330.84	208.56	2.37
	A0000578	630765.12	4192660.35	2.55	105.66	330.84	208.66	2.37
	A0000579	630857.39	4192711.83	2.55	105.66	330.84	210.00	2.37
	A0000580	630949.67	4192763.31	2.55	105.66	330.84	191.97	2.37
	A0000581	631041.94	4192814.80	2.55	105.66	330.84	178.30	2.37
	A0000582	631134.21	4192866.28	2.55	105.66	330.84	173.23	2.37
	A0000583	631225.36	4192917.29	2.55	106.37	343.61	172.31	2.37
	A0000584	631327.40	4192947.30	2.55	106.37	343.61	171.21	2.37
	A0000585	631429.39	4192977.30	2.55	93.23	344.24	171.55	2.37
	A0000586	631519.11	4193002.62	2.55	93.23	344.24	172.50	2.37
	A0000587	631608.84	4193027.93	2.55	93.23	344.24	171.97	2.37
	A0000588	631698.57	4193053.24	2.55	93.23	344.24	172.09	2.37
	A0000589	631788.30	4193078.56	2.55	93.23	344.24	174.34	2.37
	A0000590	631878.03	4193103.87	2.55	93.23	344.24	175.57	2.37
	A0000591	631966.91	4193129.02	2.55	106.45	353.28	157.31	2.37
	A0000592	632072.63	4193141.48	2.55	106.45	353.28	150.73	2.37
	A0000593	632178.35	4193153.93	2.55	106.45	353.28	154.12	2.37
	A0000594	632284.07	4193166.38	2.55	106.45	353.28	153.02	2.37
	A0000595	632389.80	4193178.84	2.55	106.45	353.28	155.72	2.37
	A0000596	632495.52	4193191.29	2.55	106.45	353.28	156.15	2.37
	A0000597	632602.34	4193203.99	2.55	88.75	341.57	155.93	2.37
	A0000598	632686.54	4193232.06	2.55	88.75	341.57	158.16	2.37

Control Pathway

Dispersion Options

Titles

C:\Users\DELL\Desktop\aydindenizli2\aydindenizli2.isc

Dispersion Options

☑ Regulatory Default ☐ Non-Default Options

Dispersion Coefficient

Rural

Output Type

☑ Concentration
☐ Total Deposition (Dry & Wet)
☐ Dry Deposition
☐ Wet Deposition

Plume Depletion

☐ Dry Removal
☐ Wet Removal

Output Warnings

☐ No Output Warnings
☐ Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

CO

Averaging Time Options

Hours

1	2	3	4	6	8	12	24
☐	☐	☐	☐	☐	☑	☐	☐

☐ Month ☐ Period ☐ Annual

Exponential Decay

Option not available

Terrain Height Options

☐ Flat ☑ Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

☐ Yes ☑ No

Default Height = 0.00 m

Meteorology Pathway

Met Input Data

Surface Met Data

Filename: ..\..\met veri\Denizli Meteorolojik Veriler\Denizli_2015.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: ..\..\met veri\Denizli Meteorolojik Veriler\Denizli_2015.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 425,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2015			
Upper Air		2015			

Data Period

Data Period to Process

Start Date: 1.01.2015 Start Hour: 1 End Date: 31.12.2015 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Output Pathway

Tabular Printed Outputs

Short Term Averaging Period	RECTABLE Highest Values Table										MAXTABLE Maximum Values Table	DAYTABLE Daily Values Table
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		
8	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No

Threshold Violation Files (MAXIFILE)

Path for MAXIFILES: AYDINDENIZLI2-CO.AD

Averaging Period	Source Group ID	Treshhold Value	File Unit (Optional)	File Name
8	highway	10.000,00		highway.MAX

Contour Plot Files (PLOTFILE)

Path for PLOTFILES: AYDINDENIZLI2-CO.AD

Averaging Period	Source Group ID	High Value	File Name
8	highway	1st	08H1G001.PLT

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m (Optional)
1	690318.57	4186097.53	UCART5	293.66	
2	691318.57	4186097.53	UCART5	280.71	
3	692318.57	4186097.53	UCART5	270.09	
4	693318.57	4186097.53	UCART5	272.29	
5	694318.57	4186097.53	UCART5	274.00	
6	695318.57	4186097.53	UCART5	319.43	
7	696318.57	4186097.53	UCART5	290.24	
8	697318.57	4186097.53	UCART5	350.50	
9	698318.57	4186097.53	UCART5	363.91	
10	699318.57	4186097.53	UCART5	365.33	
11	700318.57	4186097.53	UCART5	378.59	
12	701318.57	4186097.53	UCART5	393.23	
13	702318.57	4186097.53	UCART5	398.93	
14	703318.57	4186097.53	UCART5	406.55	
15	704318.57	4186097.53	UCART5	420.37	
16	690318.57	4187097.53	UCART5	268.77	
17	691318.57	4187097.53	UCART5	260.47	
18	692318.57	4187097.53	UCART5	250.52	
19	693318.57	4187097.53	UCART5	252.37	
20	694318.57	4187097.53	UCART5	262.24	
21	695318.57	4187097.53	UCART5	277.52	
22	696318.57	4187097.53	UCART5	290.06	
23	697318.57	4187097.53	UCART5	346.29	
24	698318.57	4187097.53	UCART5	363.97	
25	699318.57	4187097.53	UCART5	376.82	
26	700318.57	4187097.53	UCART5	386.73	
27	701318.57	4187097.53	UCART5	397.16	
28	702318.57	4187097.53	UCART5	407.09	
29	703318.57	4187097.53	UCART5	417.87	
30	704318.57	4187097.53	UCART5	447.56	
31	690318.57	4188097.53	UCART5	240.80	
32	691318.57	4188097.53	UCART5	241.10	
33	692318.57	4188097.53	UCART5	239.03	

34	693318.57	4188097.53	UCART5	248.83
35	694318.57	4188097.53	UCART5	264.29
36	695318.57	4188097.53	UCART5	283.15
37	696318.57	4188097.53	UCART5	295.58
38	697318.57	4188097.53	UCART5	337.21
39	698318.57	4188097.53	UCART5	358.77
40	699318.57	4188097.53	UCART5	370.94
41	700318.57	4188097.53	UCART5	392.29
42	701318.57	4188097.53	UCART5	434.24
43	703318.57	4188097.53	UCART5	460.71
44	704318.57	4188097.53	UCART5	456.96
45	690318.57	4189097.53	UCART5	225.67
46	691318.57	4189097.53	UCART5	230.75
47	692318.57	4189097.53	UCART5	243.91
48	693318.57	4189097.53	UCART5	253.57
49	694318.57	4189097.53	UCART5	272.54
50	696318.57	4189097.53	UCART5	343.60
51	697318.57	4189097.53	UCART5	387.92
52	700318.57	4189097.53	UCART5	467.62
53	701318.57	4189097.53	UCART5	462.13
54	702318.57	4189097.53	UCART5	483.36
55	703318.57	4189097.53	UCART5	476.21
56	704318.57	4189097.53	UCART5	501.09
57	690318.57	4190097.53	UCART5	219.51
58	691318.57	4190097.53	UCART5	235.15
59	692318.57	4190097.53	UCART5	264.32
60	694318.57	4190097.53	UCART5	316.78
61	695318.57	4190097.53	UCART5	384.19
62	696318.57	4190097.53	UCART5	400.22
63	697318.57	4190097.53	UCART5	417.30
64	698318.57	4190097.53	UCART5	519.54
65	699318.57	4190097.53	UCART5	408.71
66	700318.57	4190097.53	UCART5	457.82
67	701318.57	4190097.53	UCART5	446.87
68	702318.57	4190097.53	UCART5	502.12
69	703318.57	4190097.53	UCART5	507.49
70	704318.57	4190097.53	UCART5	501.24
71	690318.57	4191097.53	UCART5	222.42
72	692318.57	4191097.53	UCART5	269.08
73	693318.57	4191097.53	UCART5	320.81
74	694318.57	4191097.53	UCART5	364.34

Receptor Pathway

75	695318.57	4191097.53	UCART5	439.06
76	696318.57	4191097.53	UCART5	499.15
77	697318.57	4191097.53	UCART5	523.12
78	698318.57	4191097.53	UCART5	522.03
79	699318.57	4191097.53	UCART5	471.19
80	700318.57	4191097.53	UCART5	565.85
81	701318.57	4191097.53	UCART5	466.78
82	702318.57	4191097.53	UCART5	512.13
83	703318.57	4191097.53	UCART5	498.56
84	704318.57	4191097.53	UCART5	490.88
85	690318.57	4192097.53	UCART5	233.82
86	691318.57	4192097.53	UCART5	256.25
87	692318.57	4192097.53	UCART5	293.47
88	693318.57	4192097.53	UCART5	347.08
89	694318.57	4192097.53	UCART5	378.01
90	695318.57	4192097.53	UCART5	416.58
91	696318.57	4192097.53	UCART5	435.38
92	697318.57	4192097.53	UCART5	574.61
93	698318.57	4192097.53	UCART5	548.16
94	699318.57	4192097.53	UCART5	581.39
95	700318.57	4192097.53	UCART5	476.75
96	701318.57	4192097.53	UCART5	519.01
97	702318.57	4192097.53	UCART5	523.92
98	703318.57	4192097.53	UCART5	504.05
99	704318.57	4192097.53	UCART5	504.27
100	690318.57	4193097.53	UCART5	250.89
101	691318.57	4193097.53	UCART5	272.93
102	692318.57	4193097.53	UCART5	306.67
103	693318.57	4193097.53	UCART5	348.65
104	694318.57	4193097.53	UCART5	412.82
105	695318.57	4193097.53	UCART5	551.63
106	696318.57	4193097.53	UCART5	570.27
107	697318.57	4193097.53	UCART5	607.47
108	698318.57	4193097.53	UCART5	622.34
109	699318.57	4193097.53	UCART5	619.20
110	700318.57	4193097.53	UCART5	563.51
111	701318.57	4193097.53	UCART5	495.12
112	702318.57	4193097.53	UCART5	525.20
113	703318.57	4193097.53	UCART5	525.56
114	704318.57	4193097.53	UCART5	523.17
115	690318.57	4194097.53	UCART5	262.54

116	691318.57	4194097.53	UCART5	297.79
117	692318.57	4194097.53	UCART5	337.01
118	693318.57	4194097.53	UCART5	379.67
119	694318.57	4194097.53	UCART5	510.61
120	695318.57	4194097.53	UCART5	502.55
121	696318.57	4194097.53	UCART5	572.07
122	697318.57	4194097.53	UCART5	519.48
123	698318.57	4194097.53	UCART5	628.86
124	699318.57	4194097.53	UCART5	706.57
125	700318.57	4194097.53	UCART5	593.89
126	701318.57	4194097.53	UCART5	553.04
127	702318.57	4194097.53	UCART5	565.32
128	703318.57	4194097.53	UCART5	560.56
129	704318.57	4194097.53	UCART5	635.38
130	690318.57	4195097.53	UCART5	261.97
131	691318.57	4195097.53	UCART5	305.91
132	692318.57	4195097.53	UCART5	382.18
133	693318.57	4195097.53	UCART5	475.35
134	694318.57	4195097.53	UCART5	470.43
135	695318.57	4195097.53	UCART5	655.66
136	696318.57	4195097.53	UCART5	584.11
137	697318.57	4195097.53	UCART5	592.67
138	698318.57	4195097.53	UCART5	638.57
139	699318.57	4195097.53	UCART5	686.02
140	700318.57	4195097.53	UCART5	633.27
141	701318.57	4195097.53	UCART5	561.72
142	702318.57	4195097.53	UCART5	638.00
143	703318.57	4195097.53	UCART5	568.55
144	704318.57	4195097.53	UCART5	724.16
145	675824.47	4188157.32	UCART4	469.08
146	676824.47	4188157.32	UCART4	438.17
147	677824.47	4188157.32	UCART4	399.91
148	678824.47	4188157.32	UCART4	413.11
149	679824.47	4188157.32	UCART4	435.68
150	680824.47	4188157.32	UCART4	344.03
151	681824.47	4188157.32	UCART4	328.34
152	682824.47	4188157.32	UCART4	327.28
153	683824.47	4188157.32	UCART4	312.50
154	684824.47	4188157.32	UCART4	311.26
155	685824.47	4188157.32	UCART4	276.72
156	686824.47	4188157.32	UCART4	269.22

Receptor Pathway

157	687824.47	4188157.32	UCART4	247.12
158	688824.47	4188157.32	UCART4	233.16
159	689824.47	4188157.32	UCART4	238.14
160	675824.47	4189157.32	UCART4	424.42
161	676824.47	4189157.32	UCART4	380.23
162	677824.47	4189157.32	UCART4	335.71
163	678824.47	4189157.32	UCART4	370.01
164	679824.47	4189157.32	UCART4	349.32
165	680824.47	4189157.32	UCART4	328.87
166	681824.47	4189157.32	UCART4	326.83
167	682824.47	4189157.32	UCART4	337.17
168	683824.47	4189157.32	UCART4	301.76
169	684824.47	4189157.32	UCART4	260.93
170	685824.47	4189157.32	UCART4	253.25
171	686824.47	4189157.32	UCART4	237.47
172	687824.47	4189157.32	UCART4	223.91
173	688824.47	4189157.32	UCART4	218.31
174	689824.47	4189157.32	UCART4	221.87
175	675824.47	4190157.32	UCART4	350.88
176	676824.47	4190157.32	UCART4	328.14
177	677824.47	4190157.32	UCART4	324.46
178	678824.47	4190157.32	UCART4	329.20
179	679824.47	4190157.32	UCART4	349.59
180	680824.47	4190157.32	UCART4	344.05
181	681824.47	4190157.32	UCART4	320.33
182	682824.47	4190157.32	UCART4	303.30
183	683824.47	4190157.32	UCART4	260.99
184	684824.47	4190157.32	UCART4	232.22
185	685824.47	4190157.32	UCART4	240.98
186	686824.47	4190157.32	UCART4	212.38
187	687824.47	4190157.32	UCART4	214.59
188	688824.47	4190157.32	UCART4	212.95
189	689824.47	4190157.32	UCART4	214.50
190	675824.47	4191157.32	UCART4	301.75
191	676824.47	4191157.32	UCART4	278.16
192	677824.47	4191157.32	UCART4	274.63
193	678824.47	4191157.32	UCART4	297.23
194	679824.47	4191157.32	UCART4	334.72
195	680824.47	4191157.32	UCART4	336.41
196	681824.47	4191157.32	UCART4	304.56
197	682824.47	4191157.32	UCART4	287.63

198	683824.47	4191157.32	UCART4	309.13
199	684824.47	4191157.32	UCART4	242.53
200	685824.47	4191157.32	UCART4	208.48
201	686824.47	4191157.32	UCART4	199.55
202	687824.47	4191157.32	UCART4	201.85
203	688824.47	4191157.32	UCART4	209.63
204	689824.47	4191157.32	UCART4	215.02
205	675824.47	4192157.32	UCART4	254.13
206	676824.47	4192157.32	UCART4	252.21
207	679824.47	4192157.32	UCART4	329.94
208	680824.47	4192157.32	UCART4	356.88
209	681824.47	4192157.32	UCART4	315.27
210	682824.47	4192157.32	UCART4	323.24
211	683824.47	4192157.32	UCART4	263.00
212	684824.47	4192157.32	UCART4	221.18
213	685824.47	4192157.32	UCART4	197.72
214	688824.47	4192157.32	UCART4	206.20
215	689824.47	4192157.32	UCART4	223.02
216	676824.47	4193157.32	UCART4	211.11
217	677824.47	4193157.32	UCART4	228.79
218	678824.47	4193157.32	UCART4	263.29
219	679824.47	4193157.32	UCART4	272.03
220	682824.47	4193157.32	UCART4	254.91
221	685824.47	4193157.32	UCART4	184.87
222	686824.47	4193157.32	UCART4	193.92
223	687824.47	4193157.32	UCART4	198.23
224	688824.47	4193157.32	UCART4	212.23
225	689824.47	4193157.32	UCART4	234.18
226	675824.47	4194157.32	UCART4	203.43
227	676824.47	4194157.32	UCART4	192.43
228	677824.47	4194157.32	UCART4	206.92
229	678824.47	4194157.32	UCART4	210.16
230	679824.47	4194157.32	UCART4	227.00
231	680824.47	4194157.32	UCART4	258.14
232	681824.47	4194157.32	UCART4	263.73
233	682824.47	4194157.32	UCART4	228.75
234	683824.47	4194157.32	UCART4	201.87
235	684824.47	4194157.32	UCART4	183.73
236	685824.47	4194157.32	UCART4	184.72
237	686824.47	4194157.32	UCART4	188.05
238	687824.47	4194157.32	UCART4	199.02

239	688824.47	4194157.32	UCART4	218.58
240	689824.47	4194157.32	UCART4	243.28
241	675824.47	4195157.32	UCART4	181.43
242	676824.47	4195157.32	UCART4	180.86
243	677824.47	4195157.32	UCART4	182.75
244	678824.47	4195157.32	UCART4	194.28
245	679824.47	4195157.32	UCART4	253.68
246	680824.47	4195157.32	UCART4	222.83
247	681824.47	4195157.32	UCART4	201.60
248	682824.47	4195157.32	UCART4	189.40
249	683824.47	4195157.32	UCART4	182.88
250	684824.47	4195157.32	UCART4	179.76
251	685824.47	4195157.32	UCART4	182.04
252	686824.47	4195157.32	UCART4	189.18
253	687824.47	4195157.32	UCART4	208.46
254	688824.47	4195157.32	UCART4	232.21
255	689824.47	4195157.32	UCART4	251.80
256	675824.47	4196157.32	UCART4	166.25
257	676824.47	4196157.32	UCART4	167.07
258	677824.47	4196157.32	UCART4	160.53
259	678824.47	4196157.32	UCART4	163.18
260	679824.47	4196157.32	UCART4	169.66
261	680824.47	4196157.32	UCART4	182.17
262	681824.47	4196157.32	UCART4	173.56
263	682824.47	4196157.32	UCART4	171.55
264	683824.47	4196157.32	UCART4	173.74
265	684824.47	4196157.32	UCART4	176.40
266	685824.47	4196157.32	UCART4	181.04
267	686824.47	4196157.32	UCART4	188.04
268	687824.47	4196157.32	UCART4	213.42
269	688824.47	4196157.32	UCART4	240.96
270	689824.47	4196157.32	UCART4	281.23
271	675824.47	4197157.32	UCART4	156.21
272	676824.47	4197157.32	UCART4	160.40
273	677824.47	4197157.32	UCART4	156.10
274	678824.47	4197157.32	UCART4	157.77
275	679824.47	4197157.32	UCART4	160.49
276	680824.47	4197157.32	UCART4	163.87
277	681824.47	4197157.32	UCART4	166.10
278	682824.47	4197157.32	UCART4	167.78
279	683824.47	4197157.32	UCART4	171.07

280	684824.47	4197157.32	UCART4	184.73
281	685824.47	4197157.32	UCART4	205.58
282	686824.47	4197157.32	UCART4	203.34
283	687824.47	4197157.32	UCART4	266.64
284	688824.47	4197157.32	UCART4	316.37
285	689824.47	4197157.32	UCART4	360.95
286	660443.31	4191912.47	UCART3	492.89
287	661443.31	4191912.47	UCART3	478.80
288	662443.31	4191912.47	UCART3	523.81
289	663443.31	4191912.47	UCART3	455.96
290	664443.31	4191912.47	UCART3	408.60
291	665443.31	4191912.47	UCART3	305.29
292	666443.31	4191912.47	UCART3	285.21
293	667443.31	4191912.47	UCART3	378.07
294	668443.31	4191912.47	UCART3	367.70
295	669443.31	4191912.47	UCART3	454.94
296	670443.31	4191912.47	UCART3	394.52
297	671443.31	4191912.47	UCART3	376.11
298	672443.31	4191912.47	UCART3	398.58
299	673443.31	4191912.47	UCART3	384.12
300	674443.31	4191912.47	UCART3	315.93
301	675443.31	4191912.47	UCART3	279.78
302	660443.31	4192912.47	UCART3	471.24
303	661443.31	4192912.47	UCART3	413.58
304	662443.31	4192912.47	UCART3	341.86
305	663443.31	4192912.47	UCART3	362.80
306	664443.31	4192912.47	UCART3	320.74
307	665443.31	4192912.47	UCART3	375.29
308	666443.31	4192912.47	UCART3	373.35
309	667443.31	4192912.47	UCART3	311.90
310	668443.31	4192912.47	UCART3	300.23
311	669443.31	4192912.47	UCART3	346.96
312	670443.31	4192912.47	UCART3	327.19
313	671443.31	4192912.47	UCART3	322.98
314	672443.31	4192912.47	UCART3	296.78
315	673443.31	4192912.47	UCART3	289.02
316	674443.31	4192912.47	UCART3	269.50
317	675443.31	4192912.47	UCART3	241.25
318	660443.31	4193912.47	UCART3	498.16
319	661443.31	4193912.47	UCART3	439.45
320	662443.31	4193912.47	UCART3	402.64

Receptor Pathway

321	663443.31	4193912.47	UCART3	375.06
322	664443.31	4193912.47	UCART3	284.37
323	665443.31	4193912.47	UCART3	329.77
324	666443.31	4193912.47	UCART3	277.06
325	667443.31	4193912.47	UCART3	236.48
326	668443.31	4193912.47	UCART3	310.09
327	669443.31	4193912.47	UCART3	303.17
328	670443.31	4193912.47	UCART3	272.09
329	671443.31	4193912.47	UCART3	271.81
330	672443.31	4193912.47	UCART3	349.54
331	673443.31	4193912.47	UCART3	277.69
332	675443.31	4193912.47	UCART3	214.02
333	660443.31	4194912.47	UCART3	377.48
334	661443.31	4194912.47	UCART3	305.99
335	662443.31	4194912.47	UCART3	341.51
336	663443.31	4194912.47	UCART3	255.98
337	664443.31	4194912.47	UCART3	313.16
338	665443.31	4194912.47	UCART3	255.16
339	666443.31	4194912.47	UCART3	233.72
340	667443.31	4194912.47	UCART3	223.40
341	668443.31	4194912.47	UCART3	237.36
342	669443.31	4194912.47	UCART3	252.02
343	670443.31	4194912.47	UCART3	241.97
344	671443.31	4194912.47	UCART3	254.72
345	673443.31	4194912.47	UCART3	249.50
346	674443.31	4194912.47	UCART3	212.24
347	675443.31	4194912.47	UCART3	187.28
348	660443.31	4195912.47	UCART3	256.98
349	661443.31	4195912.47	UCART3	259.12
350	662443.31	4195912.47	UCART3	212.44
351	663443.31	4195912.47	UCART3	254.19
352	664443.31	4195912.47	UCART3	230.51
353	665443.31	4195912.47	UCART3	220.64
354	666443.31	4195912.47	UCART3	213.87
355	672443.31	4195912.47	UCART3	199.11
356	673443.31	4195912.47	UCART3	188.02
357	674443.31	4195912.47	UCART3	177.57
358	675443.31	4195912.47	UCART3	168.67
359	660443.31	4196912.47	UCART3	278.22
360	661443.31	4196912.47	UCART3	191.33
361	662443.31	4196912.47	UCART3	227.57

362	663443.31	4196912.47	UCART3	196.09
363	664443.31	4196912.47	UCART3	201.86
364	666443.31	4196912.47	UCART3	181.41
365	667443.31	4196912.47	UCART3	204.06
366	668443.31	4196912.47	UCART3	183.84
367	669443.31	4196912.47	UCART3	206.18
368	670443.31	4196912.47	UCART3	215.21
369	671443.31	4196912.47	UCART3	181.35
370	672443.31	4196912.47	UCART3	175.95
371	673443.31	4196912.47	UCART3	163.52
372	674443.31	4196912.47	UCART3	162.36
373	675443.31	4196912.47	UCART3	159.55
374	660443.31	4197912.47	UCART3	206.84
375	662443.31	4197912.47	UCART3	158.39
376	663443.31	4197912.47	UCART3	165.56
377	664443.31	4197912.47	UCART3	180.08
378	665443.31	4197912.47	UCART3	164.02
379	666443.31	4197912.47	UCART3	163.59
380	667443.31	4197912.47	UCART3	192.11
381	668443.31	4197912.47	UCART3	169.03
382	669443.31	4197912.47	UCART3	168.91
383	670443.31	4197912.47	UCART3	173.66
384	671443.31	4197912.47	UCART3	171.83
385	672443.31	4197912.47	UCART3	168.00
386	673443.31	4197912.47	UCART3	157.19
387	674443.31	4197912.47	UCART3	155.14
388	675443.31	4197912.47	UCART3	154.03
389	660443.31	4198912.47	UCART3	151.48
390	661443.31	4198912.47	UCART3	140.75
391	662443.31	4198912.47	UCART3	145.73
392	663443.31	4198912.47	UCART3	149.65
393	664443.31	4198912.47	UCART3	152.58
394	665443.31	4198912.47	UCART3	152.28
395	666443.31	4198912.47	UCART3	152.14
396	667443.31	4198912.47	UCART3	158.24
397	668443.31	4198912.47	UCART3	158.21
398	669443.31	4198912.47	UCART3	165.61
399	670443.31	4198912.47	UCART3	163.82
400	671443.31	4198912.47	UCART3	161.08
401	672443.31	4198912.47	UCART3	160.20
402	673443.31	4198912.47	UCART3	156.90

403	674443.31	4198912.47	UCART3	150.41
404	675443.31	4198912.47	UCART3	150.53
405	660443.31	4199912.47	UCART3	132.85
406	661443.31	4199912.47	UCART3	133.47
407	662443.31	4199912.47	UCART3	137.09
408	663443.31	4199912.47	UCART3	139.40
409	664443.31	4199912.47	UCART3	142.70
410	665443.31	4199912.47	UCART3	143.92
411	666443.31	4199912.47	UCART3	145.84
412	667443.31	4199912.47	UCART3	148.89
413	668443.31	4199912.47	UCART3	150.43
414	669443.31	4199912.47	UCART3	154.94
415	670443.31	4199912.47	UCART3	155.01
416	671443.31	4199912.47	UCART3	154.30
417	672443.31	4199912.47	UCART3	150.76
418	673443.31	4199912.47	UCART3	149.41
419	674443.31	4199912.47	UCART3	149.03
420	675443.31	4199912.47	UCART3	146.76
421	660443.31	4200912.47	UCART3	134.00
422	661443.31	4200912.47	UCART3	134.76
423	662443.31	4200912.47	UCART3	135.27
424	663443.31	4200912.47	UCART3	137.95
425	664443.31	4200912.47	UCART3	139.00
426	665443.31	4200912.47	UCART3	139.66
427	666443.31	4200912.47	UCART3	141.29
428	667443.31	4200912.47	UCART3	141.49
429	668443.31	4200912.47	UCART3	145.12
430	669443.31	4200912.47	UCART3	147.93
431	670443.31	4200912.47	UCART3	147.66
432	671443.31	4200912.47	UCART3	146.47
433	672443.31	4200912.47	UCART3	145.71
434	673443.31	4200912.47	UCART3	144.95
435	674443.31	4200912.47	UCART3	147.15
436	675443.31	4200912.47	UCART3	148.11
437	631529.04	4189779.39	UCART1	642.91
438	632529.04	4189779.39	UCART1	751.87
439	633529.04	4189779.39	UCART1	597.09
440	634529.04	4189779.39	UCART1	450.02
441	635529.04	4189779.39	UCART1	315.49
442	636529.04	4189779.39	UCART1	165.90
443	637529.04	4189779.39	UCART1	132.21

444	638529.04	4189779.39	UCART1	154.13
445	639529.04	4189779.39	UCART1	235.50
446	640529.04	4189779.39	UCART1	289.65
447	641529.04	4189779.39	UCART1	410.14
448	642529.04	4189779.39	UCART1	606.61
449	643529.04	4189779.39	UCART1	572.55
450	644529.04	4189779.39	UCART1	570.59
451	645529.04	4189779.39	UCART1	616.99
452	646529.04	4189779.39	UCART1	645.48
453	647529.04	4189779.39	UCART1	589.20
454	648529.04	4189779.39	UCART1	689.19
455	631529.04	4190779.39	UCART1	382.81
456	632529.04	4190779.39	UCART1	404.29
457	633529.04	4190779.39	UCART1	442.40
458	634529.04	4190779.39	UCART1	284.01
459	635529.04	4190779.39	UCART1	166.38
460	636529.04	4190779.39	UCART1	113.18
461	637529.04	4190779.39	UCART1	148.23
462	638529.04	4190779.39	UCART1	207.82
463	639529.04	4190779.39	UCART1	217.70
464	640529.04	4190779.39	UCART1	299.83
465	641529.04	4190779.39	UCART1	448.54
466	642529.04	4190779.39	UCART1	481.56
467	643529.04	4190779.39	UCART1	402.31
468	644529.04	4190779.39	UCART1	477.99
469	645529.04	4190779.39	UCART1	474.21
470	646529.04	4190779.39	UCART1	488.30
471	647529.04	4190779.39	UCART1	397.80
472	648529.04	4190779.39	UCART1	522.47
473	631529.04	4191779.39	UCART1	237.74
474	632529.04	4191779.39	UCART1	296.56
475	633529.04	4191779.39	UCART1	310.55
476	634529.04	4191779.39	UCART1	164.98
477	635529.04	4191779.39	UCART1	120.88
478	636529.04	4191779.39	UCART1	102.88
479	637529.04	4191779.39	UCART1	111.59
480	638529.04	4191779.39	UCART1	142.57
481	639529.04	4191779.39	UCART1	192.79
482	640529.04	4191779.39	UCART1	282.43
483	641529.04	4191779.39	UCART1	283.49
484	642529.04	4191779.39	UCART1	342.82

485	643529.04	4191779.39	UCART1	353.42
486	644529.04	4191779.39	UCART1	396.00
487	645529.04	4191779.39	UCART1	462.49
488	646529.04	4191779.39	UCART1	365.86
489	647529.04	4191779.39	UCART1	386.48
490	648529.04	4191779.39	UCART1	454.79
491	631529.04	4192779.39	UCART1	142.94
492	632529.04	4192779.39	UCART1	132.64
493	633529.04	4192779.39	UCART1	193.24
494	635529.04	4192779.39	UCART1	89.01
495	636529.04	4192779.39	UCART1	108.71
496	638529.04	4192779.39	UCART1	163.21
497	639529.04	4192779.39	UCART1	183.35
498	640529.04	4192779.39	UCART1	187.34
499	641529.04	4192779.39	UCART1	194.90
500	642529.04	4192779.39	UCART1	251.62
501	643529.04	4192779.39	UCART1	333.82
502	644529.04	4192779.39	UCART1	419.92
503	645529.04	4192779.39	UCART1	277.26
504	646529.04	4192779.39	UCART1	335.65
505	647529.04	4192779.39	UCART1	441.98
506	648529.04	4192779.39	UCART1	393.26
507	631529.04	4193779.39	UCART1	83.28
508	632529.04	4193779.39	UCART1	79.20
509	633529.04	4193779.39	UCART1	76.08
510	634529.04	4193779.39	UCART1	83.82
511	635529.04	4193779.39	UCART1	82.28
512	636529.04	4193779.39	UCART1	82.92
513	637529.04	4193779.39	UCART1	88.25
514	638529.04	4193779.39	UCART1	105.05
515	639529.04	4193779.39	UCART1	120.72
516	640529.04	4193779.39	UCART1	132.59
517	641529.04	4193779.39	UCART1	209.46
518	642529.04	4193779.39	UCART1	293.73
519	643529.04	4193779.39	UCART1	285.42
520	644529.04	4193779.39	UCART1	280.28
521	645529.04	4193779.39	UCART1	207.46
522	646529.04	4193779.39	UCART1	267.57
523	647529.04	4193779.39	UCART1	298.16
524	648529.04	4193779.39	UCART1	451.32
525	631529.04	4194779.39	UCART1	75.25

526	632529.04	4194779.39	UCART1	75.94
527	633529.04	4194779.39	UCART1	77.46
528	634529.04	4194779.39	UCART1	80.34
529	635529.04	4194779.39	UCART1	80.39
530	636529.04	4194779.39	UCART1	80.50
531	637529.04	4194779.39	UCART1	82.09
532	638529.04	4194779.39	UCART1	85.49
533	639529.04	4194779.39	UCART1	93.86
534	640529.04	4194779.39	UCART1	104.93
535	644529.04	4194779.39	UCART1	174.46
536	645529.04	4194779.39	UCART1	204.17
537	646529.04	4194779.39	UCART1	263.22
538	647529.04	4194779.39	UCART1	401.31
539	648068.07	4194385.65	UCART1	453.87
540	631529.04	4195779.39	UCART1	75.04
541	632529.04	4195779.39	UCART1	74.09
542	633529.04	4195779.39	UCART1	84.56
543	634529.04	4195779.39	UCART1	88.69
544	635529.04	4195779.39	UCART1	88.90
545	636529.04	4195779.39	UCART1	82.31
546	637529.04	4195779.39	UCART1	83.00
547	638529.04	4195779.39	UCART1	83.66
548	639529.04	4195779.39	UCART1	86.62
549	640529.04	4195779.39	UCART1	89.59
550	641529.04	4195779.39	UCART1	94.00
551	642529.04	4195779.39	UCART1	104.10
552	643529.04	4195779.39	UCART1	122.22
553	644529.04	4195779.39	UCART1	138.51
554	645529.04	4195779.39	UCART1	165.30
555	646529.04	4195779.39	UCART1	203.17
556	647529.04	4195779.39	UCART1	327.52
557	631529.04	4196779.39	UCART1	96.71
558	632529.04	4196779.39	UCART1	92.77
559	633529.04	4196779.39	UCART1	102.39
560	634529.04	4196779.39	UCART1	106.26
561	635529.04	4196779.39	UCART1	103.86
562	636529.04	4196779.39	UCART1	98.93
563	637529.04	4196779.39	UCART1	88.08
564	638529.04	4196779.39	UCART1	90.22
565	639529.04	4196779.39	UCART1	85.00
566	640529.04	4196779.39	UCART1	88.55

567	641529.04	4196779.39	UCART1	91.00
568	642529.04	4196779.39	UCART1	97.49
569	643529.04	4196779.39	UCART1	107.72
570	644529.04	4196779.39	UCART1	116.92
571	645529.04	4196779.39	UCART1	130.30
572	646529.04	4196779.39	UCART1	167.26
573	647529.04	4196779.39	UCART1	217.36
574	648529.04	4196779.39	UCART1	267.49
575	631529.04	4197779.39	UCART1	169.73
576	632529.04	4197779.39	UCART1	146.51
577	633529.04	4197779.39	UCART1	130.21
578	634529.04	4197779.39	UCART1	140.87
579	635529.04	4197779.39	UCART1	127.62
580	636529.04	4197779.39	UCART1	109.71
581	637529.04	4197779.39	UCART1	107.70
582	638529.04	4197779.39	UCART1	112.62
583	639529.04	4197779.39	UCART1	113.56
584	640529.04	4197779.39	UCART1	109.65
585	641529.04	4197779.39	UCART1	116.23
586	642529.04	4197779.39	UCART1	116.25
587	643529.04	4197779.39	UCART1	105.95
588	644529.04	4197779.39	UCART1	102.20
589	645529.04	4197779.39	UCART1	112.43
590	646529.04	4197779.39	UCART1	143.43
591	647529.04	4197779.39	UCART1	205.98
592	648529.04	4197779.39	UCART1	280.60
593	631529.04	4198779.39	UCART1	255.31
594	632529.04	4198779.39	UCART1	204.75
595	633529.04	4198779.39	UCART1	199.96
596	634529.04	4198779.39	UCART1	183.83
597	635529.04	4198779.39	UCART1	161.11
598	636529.04	4198779.39	UCART1	179.19
599	637529.04	4198779.39	UCART1	164.39
600	638529.04	4198779.39	UCART1	154.41
601	639529.04	4198779.39	UCART1	157.24
602	640529.04	4198779.39	UCART1	152.51
603	641529.04	4198779.39	UCART1	168.16
604	642529.04	4198779.39	UCART1	161.51
605	643529.04	4198779.39	UCART1	152.54
606	644529.04	4198779.39	UCART1	130.61
607	645529.04	4198779.39	UCART1	120.77

608	646529.04	4198779.39	UCART1	109.19
609	648529.04	4198779.39	UCART1	238.56
610	647074.24	4195469.20	UCART2	276.93
611	648074.24	4195469.20	UCART2	314.88
612	650074.24	4195469.20	UCART2	450.45
613	651074.24	4195469.20	UCART2	615.32
614	652074.24	4195469.20	UCART2	879.25
615	653074.24	4195469.20	UCART2	942.03
616	654074.24	4195469.20	UCART2	669.70
617	655074.24	4195469.20	UCART2	567.33
618	656074.24	4195469.20	UCART2	640.61
619	657074.24	4195469.20	UCART2	687.96
620	658074.24	4195469.20	UCART2	552.21
621	659074.24	4195469.20	UCART2	399.37
622	660074.24	4195469.20	UCART2	369.05
623	647074.24	4196469.20	UCART2	218.67
624	648074.24	4196469.20	UCART2	250.00
625	649074.24	4196469.20	UCART2	314.56
626	650074.24	4196469.20	UCART2	409.76
627	651074.24	4196469.20	UCART2	608.04
628	652074.24	4196469.20	UCART2	756.00
629	653074.24	4196469.20	UCART2	785.89
630	654074.24	4196469.20	UCART2	623.41
631	655074.24	4196469.20	UCART2	461.16
632	656074.24	4196469.20	UCART2	463.56
633	657074.24	4196469.20	UCART2	577.55
634	658074.24	4196469.20	UCART2	481.58
635	659074.24	4196469.20	UCART2	451.93
636	660074.24	4196469.20	UCART2	382.31
637	647074.24	4197469.20	UCART2	190.84
638	648074.24	4197469.20	UCART2	260.93
639	649074.24	4197469.20	UCART2	309.61
640	650074.24	4197469.20	UCART2	498.23
641	651074.24	4197469.20	UCART2	609.38
642	652074.24	4197469.20	UCART2	600.10
643	653074.24	4197469.20	UCART2	546.27
644	654074.24	4197469.20	UCART2	501.66
645	655074.24	4197469.20	UCART2	490.31
646	656074.24	4197469.20	UCART2	312.30
647	657074.24	4197469.20	UCART2	401.25
648	658074.24	4197469.20	UCART2	464.65

649	659074.24	4197469.20	UCART2	389.32
650	660074.24	4197469.20	UCART2	269.52
651	647074.24	4198469.20	UCART2	135.06
652	648074.24	4198469.20	UCART2	205.50
653	649074.24	4198469.20	UCART2	334.21
654	650074.24	4198469.20	UCART2	477.27
655	651074.24	4198469.20	UCART2	587.73
656	652074.24	4198469.20	UCART2	624.27
657	653074.24	4198469.20	UCART2	439.80
658	654074.24	4198469.20	UCART2	299.08
659	655074.24	4198469.20	UCART2	463.63
660	656074.24	4198469.20	UCART2	264.78
661	657074.24	4198469.20	UCART2	206.43
662	647074.24	4199469.20	UCART2	118.70
663	649074.24	4199469.20	UCART2	213.59
664	650074.24	4199469.20	UCART2	377.29
665	651074.24	4199469.20	UCART2	464.67
666	652074.24	4199469.20	UCART2	463.02
667	653074.24	4199469.20	UCART2	472.02
668	654074.24	4199469.20	UCART2	247.70
669	655074.24	4199469.20	UCART2	200.09
670	657074.24	4199469.20	UCART2	190.50
671	658074.24	4199469.20	UCART2	142.52
672	659074.24	4199469.20	UCART2	133.35
673	660074.24	4199469.20	UCART2	134.55
674	647074.24	4200469.20	UCART2	158.57
675	648074.24	4200469.20	UCART2	131.75
676	650074.24	4200469.20	UCART2	209.88
677	651074.24	4200469.20	UCART2	307.04
678	652074.24	4200469.20	UCART2	341.82
679	653074.24	4200469.20	UCART2	292.54
680	654074.24	4200469.20	UCART2	240.99
681	656074.24	4200469.20	UCART2	129.70
682	657074.24	4200469.20	UCART2	130.89
683	658074.24	4200469.20	UCART2	132.81
684	659074.24	4200469.20	UCART2	134.09
685	660074.24	4200469.20	UCART2	133.98
686	647074.24	4201469.20	UCART2	206.95
687	648074.24	4201469.20	UCART2	161.67
688	649074.24	4201469.20	UCART2	150.93
689	650074.24	4201469.20	UCART2	129.67

690	654074.24	4201469.20	UCART2	128.78
691	655074.24	4201469.20	UCART2	128.94
692	656074.24	4201469.20	UCART2	133.30
693	657074.24	4201469.20	UCART2	143.02
694	658074.24	4201469.20	UCART2	166.28
695	659074.24	4201469.20	UCART2	161.32
696	660074.24	4201469.20	UCART2	147.80
697	647074.24	4202469.20	UCART2	235.17
698	648074.24	4202469.20	UCART2	205.58
699	649074.24	4202469.20	UCART2	194.19
700	650074.24	4202469.20	UCART2	158.13
701	651074.24	4202469.20	UCART2	133.94
702	652074.24	4202469.20	UCART2	135.88
703	653074.24	4202469.20	UCART2	145.25
704	654074.24	4202469.20	UCART2	148.63
705	655074.24	4202469.20	UCART2	157.02
706	656074.24	4202469.20	UCART2	156.86
707	657074.24	4202469.20	UCART2	167.03
708	658074.24	4202469.20	UCART2	198.62
709	659074.24	4202469.20	UCART2	196.70
710	660074.24	4202469.20	UCART2	196.67
711	647074.24	4203469.20	UCART2	327.93
712	648074.24	4203469.20	UCART2	258.06
713	649074.24	4203469.20	UCART2	229.21
714	650074.24	4203469.20	UCART2	176.25
715	651074.24	4203469.20	UCART2	146.78
716	652074.24	4203469.20	UCART2	152.66
717	653074.24	4203469.20	UCART2	176.42
718	654074.24	4203469.20	UCART2	182.54
719	655074.24	4203469.20	UCART2	206.32
720	656074.24	4203469.20	UCART2	189.87
721	657074.24	4203469.20	UCART2	208.43
722	658074.24	4203469.20	UCART2	225.72
723	659074.24	4203469.20	UCART2	313.27
724	660074.24	4203469.20	UCART2	355.12
725	647074.24	4204469.20	UCART2	396.92
726	648074.24	4204469.20	UCART2	304.67
727	649074.24	4204469.20	UCART2	371.23
728	650074.24	4204469.20	UCART2	331.98
729	651074.24	4204469.20	UCART2	279.81
730	652074.24	4204469.20	UCART2	209.25

731	653074.24	4204469.20	UCART2	218.18
732	654074.24	4204469.20	UCART2	223.36
733	655074.24	4204469.20	UCART2	240.54
734	656074.24	4204469.20	UCART2	275.55
735	657074.24	4204469.20	UCART2	334.49
736	658074.24	4204469.20	UCART2	471.98
737	659074.24	4204469.20	UCART2	374.67
738	660074.24	4204469.20	UCART2	507.00
739	699388.00	4188032.00		372.33
740	693023.00	4190525.00		290.05
741	683802.00	4193520.00		212.16
742	678692.00	4192804.00		256.83
743	679309.00	4190519.00		337.05
744	674023.00	4194530.00		252.91
745	671553.00	4196745.00		184.09
746	670327.00	4199829.00		155.32
747	668133.00	4196410.00		193.40
748	654789.00	4200696.00		141.83
749	654966.00	4202308.00		150.35
750	653098.00	4202601.00		148.80
751	649097.00	4196063.00		345.86
752	637852.60	4192943.52		128.67
753	635692.00	4191904.00		109.10
754	668118.00	4196151.00		207.81
755	669993.00	4199783.00		155.60
756	649110.00	4196043.00		350.29
757	700793.00	4187746.00		431.66
758	683737.00	4193304.00		217.60
759	693174.80	4190223.74		285.73
760	635870.00	4191870.00		104.02
761	637966.00	4193040.00		133.00
762	673976.00	4194352.00		266.21
763	678657.00	4192640.98		264.17
764	679245.00	4190295.00		345.99
765	654800.00	4200475.00		148.62
766	671422.00	4196466.00		197.80
767	653213.00	4202815.00		155.26
768	655010.00	4202257.00		148.99

Plant Boundary Receptors

Receptor Pathway

Receptor Groups

Record Number	Group ID	Group Description
1	UPOL1	
2	NPOL1	
3	NPOL2	
4	UCART5	Receptors generated from Uniform Cartesian Grid
5	UCART4	Receptors generated from Uniform Cartesian Grid
6	UCART3	Receptors generated from Uniform Cartesian Grid
7	UCART1	Receptors generated from Uniform Cartesian Grid
8	UCART2	Receptors generated from Uniform Cartesian Grid

Results Summary

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CO - Concentration - Source Group: _____

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
__		1.00000	COUNT	0.00	0.00	0.00	0.00	0.00	

CO - Concentration - Source Group: HIGHWAY

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
8-HR	1ST	136.18488	ug/m^3	637966.00	4193040.00	133.00	0.00	1538.00	9.03.2015, 24

Source Pathway - Source Inputs

Source Pathway - Source Inputs

Line Area Sources

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	632721.04	4193329.80	93.15	2.55
			633372.68	4193292.92	84.14	2.55
			633663.14	4193192.50	85.95	2.55
			634044.77	4193047.25	85.03	2.55
			634426.40	4192890.61	93.15	2.55
			634766.53	4192738.60	96.76	2.55
			635182.05	4192493.98	91.66	2.55
			635590.87	4192282.87	93.32	2.55
			635691.39	4192256.07	95.16	2.55
			635990.61	4192185.44	97.08	2.55
			636167.37	4192158.80	96.01	2.55
			636407.08	4192168.49	96.99	2.55
			636736.38	4192202.38	99.30	2.55
			637005.15	4192284.71	101.28	2.55
			637436.14	4192509.89	111.59	2.55
			637970.37	4192916.43	134.93	2.55
			638557.04	4193251.14	140.72	2.55
			639294.81	4193482.25	162.97	2.55
			639863.69	4193695.58	150.50	2.55
			640530.34	4194104.46	126.78	2.55
			641161.44	4194753.34	113.12	2.55
			641641.43	4195020.00	119.03	2.55
			642130.31	4195073.33	161.57	2.55
			642921.41	4194984.44	158.31	2.55
			643765.62	4194964.89	207.99	2.55
			644581.39	4195247.27	150.12	2.55
			645167.07	4195770.20	145.69	2.55
			645585.42	4196334.97	138.85	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	646028.07	4196859.04	148.22	2.55
			646671.78	4197426.87	155.64	2.55
			647211.37	4198127.06	144.61	2.55
			648115.10	4199373.95	121.73	2.55
			649226.63	4200476.58	126.60	2.55
			650587.13	4201241.31	126.32	2.55
			651271.83	4201516.97	142.55	2.55
			652001.87	4201607.16	130.70	2.55
			652689.77	4201501.33	132.72	2.55
			653503.67	4201278.21	130.17	2.55
			654473.17	4200477.71	178.48	2.55
			654647.42	4200355.13	184.74	2.55
			654801.52	4200262.32	175.76	2.55
			655884.74	4199450.48	163.61	2.55
			656809.84	4198851.95	203.39	2.55
			657279.08	4198652.69	192.89	2.55
			658031.14	4198421.28	184.95	2.55
			658924.63	4198344.15	247.05	2.55
			659644.55	4198292.72	181.97	2.55
			660884.10	4197987.55	157.78	2.55
			661362.51	4197783.18	176.61	2.55
			662003.49	4197569.52	167.91	2.55
			663104.49	4197407.33	170.20	2.55
			664028.29	4197407.33	187.97	2.55
			664915.14	4197222.57	172.01	2.55
			665838.93	4196692.93	189.33	2.55
			666504.07	4196298.77	197.43	2.55
			667230.79	4196064.74	208.51	2.55
			667834.34	4195966.21	197.77	2.55
			668634.96	4195990.84	198.35	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	669429.91	4196048.99	225.86	2.55
			670275.44	4195951.09	209.08	2.55
			670987.46	4195799.78	209.56	2.55
			671654.98	4195523.87	224.54	2.55
			672108.90	4195256.86	217.63	2.55
			673572.48	4194273.47	280.92	2.55
			674484.16	4193854.59	227.17	2.55
			675506.72	4193497.31	224.52	2.55
			676258.24	4193016.83	223.32	2.55
			676919.78	4192538.39	233.44	2.55
			677863.43	4192298.03	240.24	2.55
			678424.28	4192333.64	234.68	2.55
			679617.19	4192698.63	272.82	2.55
			680988.16	4193259.48	305.80	2.55
			681381.01	4193501.00	303.57	2.55
			681916.85	4193621.30	284.62	2.55
			682507.38	4193670.51	247.37	2.55
			683048.70	4193604.89	239.67	2.55
			683436.91	4193490.07	220.24	2.55
			683901.68	4193347.90	208.00	2.55
			686416.84	4192308.74	190.97	2.55
			689276.83	4191627.79	211.01	2.55
			690313.97	4191460.17	225.19	2.55
			691078.73	4191030.64	236.00	2.55
			692388.25	4190244.93	268.79	2.55
			693153.01	4190024.93	280.46	2.55
			694846.68	4189185.34	289.92	2.55
			695367.87	4188902.23	308.96	2.55
			695869.76	4188677.02	322.35	2.55
			696358.01	4188590.07	332.99	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	697735.78	4188807.61	368.64	2.55
			698620.45	4188981.64	412.63	2.55
			699798.00	4188749.49	424.87	2.55
			700463.79	4188901.78	452.05	2.55
			701084.68	4189393.95	480.34	2.55
			701751.01	4189742.26	486.85	2.55
			702385.70	4189803.57	519.96	2.55
			702946.97	4189571.93	483.46	2.55
			703036.07	4189465.02	486.10	2.55
			701726.21	4187633.82	424.15	2.55

Source Pathway - Source Inputs

Area Sources Generated from Line Sources

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000053	632720.59	4193321.82	2.55	652.68	3.24	92.69	2.37
	A0000054	633370.07	4193285.36	2.55	307.33	19.07	85.89	2.37
	A0000055	633660.29	4193185.02	2.55	408.34	20.84	89.73	2.37
	A0000056	634041.73	4193039.85	2.55	412.53	22.32	84.97	2.37
	A0000057	634423.14	4192883.31	2.55	372.56	24.08	92.86	2.37
	A0000058	634762.48	4192731.71	2.55	482.18	30.49	99.10	2.37
	A0000059	635178.38	4192486.88	2.55	460.11	27.31	91.85	2.37
	A0000060	635588.80	4192275.14	2.55	104.04	14.93	93.02	2.37
	A0000061	635689.56	4192248.28	2.55	307.44	13.28	95.33	2.37
	A0000062	635989.42	4192177.52	2.55	178.75	8.57	96.25	2.37
	A0000063	636167.69	4192150.81	2.55	239.91	357.69	96.00	2.37
	A0000064	636407.90	4192160.53	2.55	331.04	354.12	96.96	2.37
	A0000065	636738.72	4192194.74	2.55	281.09	342.97	99.00	2.37
	A0000066	637008.85	4192277.62	2.55	486.28	332.41	101.13	2.37
	A0000067	637440.99	4192503.53	2.55	671.32	322.73	110.48	2.37
	A0000068	637974.34	4192909.48	2.55	675.44	330.29	135.21	2.37
	A0000069	638559.43	4193243.51	2.55	773.12	342.61	136.74	2.37
	A0000070	639297.62	4193474.76	2.55	607.56	339.44	159.14	2.37
	A0000071	639867.87	4193688.76	2.55	782.06	328.48	149.98	2.37
	A0000072	640536.08	4194098.88	2.55	905.17	314.20	125.94	2.37
	A0000073	641165.33	4194746.34	2.55	549.09	330.95	113.35	2.37
	A0000074	641642.30	4195012.05	2.55	491.78	353.77	120.27	2.37
	A0000075	642129.42	4195065.38	2.55	796.08	6.41	154.40	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000076	642921.22	4194976.45	2.55	844.43	1.33	154.12	2.37
	A0000077	643768.23	4194957.33	2.55	863.26	340.91	207.11	2.37
	A0000078	644586.72	4195241.30	2.55	785.16	318.24	151.31	2.37
	A0000079	645173.50	4195765.44	2.55	702.83	306.53	146.57	2.37
	A0000080	645591.53	4196329.80	2.55	686.00	310.19	138.91	2.37
	A0000081	646033.36	4196853.04	2.55	858.37	318.58	149.17	2.37
	A0000082	646678.12	4197421.99	2.55	883.98	307.62	156.07	2.37
	A0000083	647217.85	4198122.36	2.55	1539.96	305.93	149.36	2.37
	A0000084	648120.74	4199368.27	2.55	1565.66	315.23	126.44	2.37
	A0000085	649230.55	4200469.61	2.55	1560.70	330.66	125.47	2.37
	A0000086	650590.12	4201233.89	2.55	738.11	338.07	126.08	2.37
	A0000087	651272.81	4201509.03	2.55	735.59	352.96	142.07	2.37
	A0000088	652000.66	4201599.25	2.55	695.99	8.75	129.62	2.37
	A0000089	652687.66	4201493.61	2.55	843.92	15.33	133.33	2.37
	A0000090	653498.57	4201272.04	2.55	1257.28	39.55	129.27	2.37
	A0000091	654468.57	4200471.16	2.55	213.04	35.12	177.73	2.37
	A0000092	654643.29	4200348.28	2.55	179.89	31.06	189.76	2.37
	A0000093	654796.72	4200255.92	2.55	1353.69	36.85	178.37	2.37
	A0000094	655880.40	4199443.76	2.55	1101.83	32.90	163.53	2.37
	A0000095	656806.71	4198844.59	2.55	509.80	23.01	201.70	2.37
	A0000096	657276.72	4198645.04	2.55	786.86	17.10	192.32	2.37
	A0000097	658030.46	4198413.31	2.55	896.80	4.93	185.49	2.37
	A0000098	658924.06	4198336.17	2.55	721.76	4.09	241.97	2.37
	A0000099	659642.64	4198284.96	2.55	1276.56	13.83	183.03	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000100	660880.96	4197980.19	2.55	520.23	23.13	158.26	2.37
	A0000101	661359.98	4197775.59	2.55	675.65	18.43	176.18	2.37
	A0000102	662002.32	4197561.61	2.55	1112.89	8.38	168.75	2.37
	A0000103	663104.49	4197399.33	2.55	923.80	0.00	170.41	2.37
	A0000104	664026.66	4197399.50	2.55	905.89	11.77	188.70	2.37
	A0000105	664911.16	4197215.63	2.55	1064.86	29.83	171.94	2.37
	A0000106	665834.85	4196686.04	2.55	773.15	30.65	188.67	2.37
	A0000107	666501.62	4196291.16	2.55	763.47	17.85	197.96	2.37
	A0000108	667229.50	4196056.85	2.55	611.54	9.27	208.58	2.37
	A0000109	667834.58	4195958.21	2.55	801.00	358.24	198.00	2.37
	A0000110	668635.54	4195982.86	2.55	797.07	355.82	198.19	2.37
	A0000111	669428.99	4196041.04	2.55	851.18	6.60	225.89	2.37
	A0000112	670273.77	4195943.26	2.55	727.92	12.00	208.89	2.37
	A0000113	670984.40	4195792.39	2.55	722.30	22.46	215.43	2.37
	A0000114	671650.93	4195516.98	2.55	526.62	30.47	223.40	2.37
	A0000115	672104.44	4195250.22	2.55	881.63	33.90	217.40	2.37
	A0000116	672836.23	4194758.53	2.55	881.63	33.90	271.26	2.37
	A0000117	673569.14	4194266.20	2.55	1003.31	24.68	282.35	2.37
	A0000118	674481.52	4193847.04	2.55	1083.18	19.26	227.83	2.37
	A0000119	675502.41	4193490.57	2.55	891.99	32.59	226.25	2.37
	A0000120	676253.56	4193010.34	2.55	816.41	35.88	223.68	2.37
	A0000121	676917.80	4192530.64	2.55	973.78	14.29	234.26	2.37
	A0000122	677863.94	4192290.04	2.55	561.98	356.37	239.61	2.37
	A0000123	678426.62	4192325.99	2.55	1247.51	342.99	233.93	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000124	679620.22	4192691.23	2.55	1481.25	337.75	271.85	2.37
	A0000125	680992.35	4193252.67	2.55	461.15	328.42	307.98	2.37
	A0000126	681382.76	4193493.20	2.55	549.18	347.35	302.24	2.37
	A0000127	681917.52	4193613.32	2.55	592.57	355.24	283.63	2.37
	A0000128	682506.42	4193662.57	2.55	545.28	6.91	248.85	2.37
	A0000129	683046.43	4193597.22	2.55	404.84	16.48	239.24	2.37
	A0000130	683434.57	4193482.42	2.55	486.02	17.01	221.32	2.37
	A0000131	683898.62	4193340.51	2.55	1360.69	22.45	208.56	2.37
	A0000132	685156.21	4192820.93	2.55	1360.69	22.45	188.12	2.37
	A0000133	686414.99	4192300.95	2.55	1469.97	13.39	190.63	2.37
	A0000134	687844.99	4191960.48	2.55	1469.97	13.39	201.86	2.37
	A0000135	689275.56	4191619.89	2.55	1050.60	9.18	211.04	2.37
	A0000136	690310.06	4191453.19	2.55	877.12	29.32	225.10	2.37
	A0000137	691074.62	4191023.78	2.55	1527.15	30.96	236.00	2.37
	A0000138	692386.04	4190237.25	2.55	795.77	16.05	268.82	2.37
	A0000139	693149.46	4190017.77	2.55	945.17	26.37	279.43	2.37
	A0000140	693996.29	4189597.97	2.55	945.17	26.37	273.87	2.37
	A0000141	694842.86	4189178.32	2.55	593.12	28.51	289.44	2.37
	A0000142	695364.59	4188894.93	2.55	550.10	24.17	307.77	2.37
	A0000143	695868.35	4188669.15	2.55	495.93	10.10	325.43	2.37
	A0000144	696359.26	4188582.17	2.55	1394.84	351.03	332.56	2.37
	A0000145	697737.32	4188799.76	2.55	901.63	348.87	369.93	2.37
	A0000146	698618.91	4188973.80	2.55	1200.21	11.15	411.93	2.37
	A0000147	699799.78	4188741.69	2.55	682.98	347.12	424.53	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000148	700468.76	4188895.51	2.55	792.30	321.60	451.15	2.37
	A0000149	701088.39	4189386.86	2.55	751.87	332.40	479.54	2.37
	A0000150	701751.78	4189734.30	2.55	637.65	354.48	477.49	2.37
	A0000151	702382.65	4189796.17	2.55	607.19	22.43	519.12	2.37
	A0000152	702940.83	4189566.81	2.55	139.16	50.19	482.53	2.37
	A0000153	703029.56	4189469.68	2.55	1125.72	125.58	485.59	2.37
	A0000154	702374.63	4188554.07	2.55	1125.72	125.58	450.11	2.37

Control Pathway

Dispersion Options

Titles

C:\Users\DELL\Desktop\aydindenizli1-NO2\aydindenizli1-NO2.isc

Dispersion Options

- [■] Regulatory Default
- [ ] Non-Default Options

Dispersion Coefficient

Rural

Output Type

- [■] Concentration
- [ ] Total Deposition (Dry & Wet)
- [ ] Dry Deposition
- [ ] Wet Deposition

Plume Depletion

- [ ] Dry Removal
- [ ] Wet Removal

Output Warnings

- [ ] No Output Warnings
- [ ] Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

NO2

Averaging Time Options

Hours

1	2	3	4	6	8	12	24
■	☐	☐	☐	☐	☐	☐	☐

- [ ] Month
- [ ] Period
- [■] Annual

- [■] 1-Hour NO2 Non-NAAQS
- [ ] 1-Hour NO2 NAAQS

Exponential Decay

Option not available

Terrain Height Options

- [ ] Flat
- [■] Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

- [ ] Yes
- [■] No

Default Height = 0.00 m

Meteorology Pathway

Met Input Data

Surface Met Data

Filename: Aydin_2019.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: Aydin_2019.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 56,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2019			
Upper Air		2019			

Data Period

Data Period to Process

Start Date: 1.01.2019 Start Hour: 1 End Date: 31.12.2019 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Output Pathway

Tabular Printed Outputs

Short Term Averaging Period	RECTABLE Highest Values Table										MAXTABLE Maximum Values Table	DAYTABLE Daily Values Table
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		
1	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No

Threshold Violation Files (MAXIFILE)

Path for MAXIFILES: AYDINDENIZLI1-NO2.AD

Averaging Period	Source Group ID	Treshhold Value	File Unit (Optional)	File Name
1	ALL	200,00		highway.MAX

Contour Plot Files (PLOTFILE)

Path for PLOTFILES: AYDINDENIZLI1-NO2.AD

Averaging Period	Source Group ID	High Value	File Name
1	ALL	1st	01H1GALL.PLT
1	ALL	N/A	01H19GALL.PLT
Annual	ALL	N/A	AN00GALL.PLT

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m (Optional)
1	597469.05	4184521.45		46.53	
2	576522.48	4186209.06		31.97	
3	583957.82	4183876.52		95.88	
4	585917.79	4183805.76		93.82	
5	594165.65	4183637.08		48.21	
6	602000.50	4185284.76		49.54	
7	597498.23	4184538.22		46.82	
8	594205.72	4183793.17		45.07	
9	601059.34	4185145.31		52.23	
10	584111.80	4183909.34		91.33	
11	576345.41	4186168.74		31.10	
12	573726.51	4179808.96	UCART1	30.84	
13	574726.51	4179808.96	UCART1	158.20	
14	575726.51	4179808.96	UCART1	242.33	
15	576726.51	4179808.96	UCART1	161.26	
16	577726.51	4179808.96	UCART1	233.84	
17	578726.51	4179808.96	UCART1	319.90	
18	579726.51	4179808.96	UCART1	355.61	
19	580726.51	4179808.96	UCART1	306.66	
20	581726.51	4179808.96	UCART1	338.64	
21	573726.51	4180808.96	UCART1	28.42	
22	574726.51	4180808.96	UCART1	34.74	
23	575726.51	4180808.96	UCART1	70.22	
24	576726.51	4180808.96	UCART1	72.05	
25	577726.51	4180808.96	UCART1	165.55	
26	578726.51	4180808.96	UCART1	189.59	
27	579726.51	4180808.96	UCART1	171.56	
28	580726.51	4180808.96	UCART1	213.56	
29	581726.51	4180808.96	UCART1	225.06	
30	582726.51	4180808.96	UCART1	316.22	
31	573726.51	4181808.96	UCART1	29.19	
32	574726.51	4181808.96	UCART1	28.00	
33	575726.51	4181808.96	UCART1	28.34	

34	576726.51	4181808.96	UCART1	28.00
35	577726.51	4181808.96	UCART1	41.12
36	578726.51	4181808.96	UCART1	86.96
37	579726.51	4181808.96	UCART1	195.89
38	580726.51	4181808.96	UCART1	334.69
39	581726.51	4181808.96	UCART1	311.85
40	582726.51	4181808.96	UCART1	284.48
41	573726.51	4182808.96	UCART1	28.21
42	574726.51	4182808.96	UCART1	27.27
43	575726.51	4182808.96	UCART1	28.45
44	576726.51	4182808.96	UCART1	28.81
45	577726.51	4182808.96	UCART1	32.53
46	578726.51	4182808.96	UCART1	33.39
47	579726.51	4182808.96	UCART1	75.85
48	580726.51	4182808.96	UCART1	141.82
49	581726.51	4182808.96	UCART1	146.53
50	573726.51	4183808.96	UCART1	26.20
51	574726.51	4183808.96	UCART1	27.14
52	575726.51	4183808.96	UCART1	27.08
53	576726.51	4183808.96	UCART1	28.18
54	577726.51	4183808.96	UCART1	28.59
55	578726.51	4183808.96	UCART1	31.70
56	579726.51	4183808.96	UCART1	28.76
57	580726.51	4183808.96	UCART1	35.63
58	573726.51	4184808.96	UCART1	27.93
59	574726.51	4184808.96	UCART1	27.86
60	575726.51	4184808.96	UCART1	29.04
61	579726.51	4184808.96	UCART1	31.06
62	580726.51	4184808.96	UCART1	29.75
63	581726.51	4184808.96	UCART1	35.25
64	582726.51	4184808.96	UCART1	39.70
65	573726.51	4185808.96	UCART1	30.80
66	575726.51	4185808.96	UCART1	32.71
67	576726.51	4185808.96	UCART1	28.02
68	577726.51	4185808.96	UCART1	27.76
69	578726.51	4185808.96	UCART1	29.26
70	579726.51	4185808.96	UCART1	29.61
71	580726.51	4185808.96	UCART1	30.60
72	581726.51	4185808.96	UCART1	31.18
73	582726.51	4185808.96	UCART1	32.11
74	573726.51	4186808.96	UCART1	38.40

75	574726.51	4186808.96	UCART1	46.91
76	575726.51	4186808.96	UCART1	35.62
77	576726.51	4186808.96	UCART1	33.20
78	577726.51	4186808.96	UCART1	28.84
79	578726.51	4186808.96	UCART1	29.66
80	579726.51	4186808.96	UCART1	30.64
81	580726.51	4186808.96	UCART1	30.34
82	581726.51	4186808.96	UCART1	31.93
83	582726.51	4186808.96	UCART1	32.00
84	573726.51	4187808.96	UCART1	48.73
85	574726.51	4187808.96	UCART1	47.82
86	575726.51	4187808.96	UCART1	44.20
87	576726.51	4187808.96	UCART1	35.33
88	577726.51	4187808.96	UCART1	31.02
89	578726.51	4187808.96	UCART1	28.68
90	579726.51	4187808.96	UCART1	30.31
91	580726.51	4187808.96	UCART1	30.16
92	581726.51	4187808.96	UCART1	32.00
93	582726.51	4187808.96	UCART1	33.40
94	573726.51	4188808.96	UCART1	62.08
95	574726.51	4188808.96	UCART1	62.04
96	575726.51	4188808.96	UCART1	45.74
97	576726.51	4188808.96	UCART1	37.83
98	577726.51	4188808.96	UCART1	42.26
99	578726.51	4188808.96	UCART1	43.68
100	579726.51	4188808.96	UCART1	39.37
101	580726.51	4188808.96	UCART1	33.78
102	581726.51	4188808.96	UCART1	35.89
103	582768.64	4179791.46	UCART2	328.25
104	583768.64	4179791.46	UCART2	462.63
105	584768.64	4179791.46	UCART2	499.47
106	585768.64	4179791.46	UCART2	465.52
107	586768.64	4179791.46	UCART2	468.73
108	587768.64	4179791.46	UCART2	477.43
109	588768.64	4179791.46	UCART2	380.90
110	589768.64	4179791.46	UCART2	419.24
111	590768.64	4179791.46	UCART2	293.44
112	591768.64	4179791.46	UCART2	239.56
113	583768.64	4180791.46	UCART2	335.63
114	584768.64	4180791.46	UCART2	454.18
115	585768.64	4180791.46	UCART2	577.90

116	586768.64	4180791.46	UCART2	653.81
117	587768.64	4180791.46	UCART2	554.11
118	588768.64	4180791.46	UCART2	694.52
119	589768.64	4180791.46	UCART2	494.25
120	583768.64	4181791.46	UCART2	261.39
121	584768.64	4181791.46	UCART2	294.90
122	585768.64	4181791.46	UCART2	510.47
123	586768.64	4181791.46	UCART2	453.55
124	587768.64	4181791.46	UCART2	547.88
125	588768.64	4181791.46	UCART2	508.48
126	589768.64	4181791.46	UCART2	454.97
127	590768.64	4181791.46	UCART2	424.53
128	582768.64	4182791.46	UCART2	101.58
129	583768.64	4182791.46	UCART2	182.61
130	584768.64	4182791.46	UCART2	319.17
131	585768.64	4182791.46	UCART2	309.41
132	586768.64	4182791.46	UCART2	283.12
133	587768.64	4182791.46	UCART2	264.81
134	588768.64	4182791.46	UCART2	237.17
135	589768.64	4182791.46	UCART2	293.14
136	590768.64	4182791.46	UCART2	251.93
137	585768.64	4183791.46	UCART2	114.21
138	586768.64	4183791.46	UCART2	94.41
139	587768.64	4183791.46	UCART2	104.98
140	588768.64	4183791.46	UCART2	104.41
141	589768.64	4183791.46	UCART2	68.04
142	590768.64	4183791.46	UCART2	64.20
143	583768.64	4184791.46	UCART2	36.00
144	584768.64	4184791.46	UCART2	33.00
145	585768.64	4184791.46	UCART2	33.44
146	586768.64	4184791.46	UCART2	38.31
147	587768.64	4184791.46	UCART2	39.80
148	588768.64	4184791.46	UCART2	35.52
149	589768.64	4184791.46	UCART2	35.45
150	590768.64	4184791.46	UCART2	35.94
151	583768.64	4185791.46	UCART2	32.24
152	584768.64	4185791.46	UCART2	32.91
153	585768.64	4185791.46	UCART2	32.27
154	586768.64	4185791.46	UCART2	33.56
155	587768.64	4185791.46	UCART2	34.63
156	588768.64	4185791.46	UCART2	36.00

157	589768.64	4185791.46	UCART2	34.23
158	590768.64	4185791.46	UCART2	37.98
159	583768.64	4186791.46	UCART2	32.13
160	584768.64	4186791.46	UCART2	32.32
161	585768.64	4186791.46	UCART2	31.59
162	586768.64	4186791.46	UCART2	36.15
163	587768.64	4186791.46	UCART2	34.39
164	588768.64	4186791.46	UCART2	36.54
165	589768.64	4186791.46	UCART2	38.95
166	590768.64	4186791.46	UCART2	40.89
167	583768.64	4187791.46	UCART2	33.25
168	584768.64	4187791.46	UCART2	34.01
169	585768.64	4187791.46	UCART2	34.93
170	586768.64	4187791.46	UCART2	38.00
171	587768.64	4187791.46	UCART2	38.99
172	588768.64	4187791.46	UCART2	40.03
173	589768.64	4187791.46	UCART2	43.84
174	590768.64	4187791.46	UCART2	46.13
175	592772.54	4180731.94	UCART3	266.01
176	593772.54	4180731.94	UCART3	149.34
177	594772.54	4180731.94	UCART3	229.47
178	595772.54	4180731.94	UCART3	306.73
179	596772.54	4180731.94	UCART3	287.33
180	597772.54	4180731.94	UCART3	302.46
181	598772.54	4180731.94	UCART3	419.07
182	592772.54	4181731.94	UCART3	230.34
183	595772.54	4181731.94	UCART3	208.96
184	596772.54	4181731.94	UCART3	291.78
185	597772.54	4181731.94	UCART3	335.36
186	598772.54	4181731.94	UCART3	295.54
187	599772.54	4181731.94	UCART3	338.49
188	600772.54	4181731.94	UCART3	298.55
189	601772.54	4181731.94	UCART3	398.56
190	602772.54	4181731.94	UCART3	436.70
191	603772.54	4181731.94	UCART3	491.77
192	604772.54	4181731.94	UCART3	505.57
193	605772.54	4181731.94	UCART3	450.19
194	606772.54	4181731.94	UCART3	637.77
195	591772.54	4182731.94	UCART3	303.22
196	592772.54	4182731.94	UCART3	180.15
197	593772.54	4182731.94	UCART3	73.34

198	594772.54	4182731.94	UCART3	70.28
199	596772.54	4182731.94	UCART3	227.92
200	597772.54	4182731.94	UCART3	293.17
201	598772.54	4182731.94	UCART3	337.62
202	599772.54	4182731.94	UCART3	183.76
203	600772.54	4182731.94	UCART3	184.96
204	601772.54	4182731.94	UCART3	305.72
205	602772.54	4182731.94	UCART3	297.46
206	603772.54	4182731.94	UCART3	396.52
207	604772.54	4182731.94	UCART3	425.17
208	605772.54	4182731.94	UCART3	527.74
209	606772.54	4182731.94	UCART3	591.71
210	591772.54	4183731.94	UCART3	69.45
211	594772.54	4183731.94	UCART3	90.41
212	595772.54	4183731.94	UCART3	42.46
213	596772.54	4183731.94	UCART3	95.93
214	598772.54	4183731.94	UCART3	172.89
215	599772.54	4183731.94	UCART3	143.83
216	600772.54	4183731.94	UCART3	240.25
217	601772.54	4183731.94	UCART3	193.79
218	602772.54	4183731.94	UCART3	212.58
219	603772.54	4183731.94	UCART3	320.59
220	604772.54	4183731.94	UCART3	293.37
221	605772.54	4183731.94	UCART3	340.17
222	606772.54	4183731.94	UCART3	505.92
223	607772.54	4183731.94	UCART3	555.67
224	608772.54	4183731.94	UCART3	707.94
225	609772.54	4183731.94	UCART3	796.39
226	591772.54	4184731.94	UCART3	36.12
227	592772.54	4184731.94	UCART3	35.80
228	593772.54	4184731.94	UCART3	36.78
229	594781.86	4184927.58	UCART3	36.97
230	597772.54	4184731.94	UCART3	41.68
231	598772.54	4184731.94	UCART3	49.53
232	600772.54	4184731.94	UCART3	72.39
233	601772.54	4184731.94	UCART3	81.75
234	603772.54	4184731.94	UCART3	228.03
235	604772.54	4184731.94	UCART3	262.46
236	605772.54	4184731.94	UCART3	284.99
237	606772.54	4184731.94	UCART3	405.56
238	607772.54	4184731.94	UCART3	476.14

239	608772.54	4184731.94	UCART3	558.12
240	609772.54	4184731.94	UCART3	562.57
241	591772.54	4185731.94	UCART3	35.08
242	592772.54	4185731.94	UCART3	38.05
243	593772.54	4185731.94	UCART3	37.00
244	594772.54	4185731.94	UCART3	38.60
245	595772.54	4185731.94	UCART3	37.40
246	596772.54	4185731.94	UCART3	38.84
247	597772.54	4185731.94	UCART3	39.05
248	601772.54	4185731.94	UCART3	41.49
249	602772.54	4185731.94	UCART3	60.53
250	604780.16	4185579.49	UCART3	199.93
251	605772.54	4185731.94	UCART3	167.95
252	606772.54	4185731.94	UCART3	246.19
253	607772.54	4185731.94	UCART3	300.35
254	608772.54	4185731.94	UCART3	430.07
255	609772.54	4185731.94	UCART3	374.43
256	591772.54	4186731.94	UCART3	43.08
257	592772.54	4186731.94	UCART3	40.79
258	593772.54	4186731.94	UCART3	36.82
259	594772.54	4186731.94	UCART3	38.00
260	595772.54	4186731.94	UCART3	36.94
261	596772.54	4186731.94	UCART3	38.27
262	597772.54	4186731.94	UCART3	38.12
263	598772.54	4186731.94	UCART3	38.30
264	599772.54	4186731.94	UCART3	41.17
265	600772.54	4186731.94	UCART3	42.91
266	601772.54	4186731.94	UCART3	44.21
267	602772.54	4186731.94	UCART3	43.82
268	603772.54	4186731.94	UCART3	43.56
269	604772.54	4186731.94	UCART3	55.07
270	605772.54	4186731.94	UCART3	66.55
271	607772.54	4186731.94	UCART3	155.86
272	608772.54	4186731.94	UCART3	218.33
273	609772.54	4186731.94	UCART3	214.02
274	591772.54	4187731.94	UCART3	46.86
275	592772.54	4187731.94	UCART3	45.70
276	593772.54	4187731.94	UCART3	38.73
277	594772.54	4187731.94	UCART3	37.21
278	595772.54	4187731.94	UCART3	36.62
279	596772.54	4187731.94	UCART3	38.10

280	597772.54	4187731.94	UCART3	39.42
281	598772.54	4187731.94	UCART3	40.91
282	599772.54	4187731.94	UCART3	40.12
283	600772.54	4187731.94	UCART3	43.09
284	601772.54	4187731.94	UCART3	42.53
285	602772.54	4187731.94	UCART3	43.71
286	603772.54	4187731.94	UCART3	45.75
287	604772.54	4187731.94	UCART3	51.57
288	605772.54	4187731.94	UCART3	53.43
289	608772.54	4187731.94	UCART3	85.86
290	609772.54	4187731.94	UCART3	119.49
291	592772.54	4188731.94	UCART3	57.42
292	593772.54	4188731.94	UCART3	39.86
293	594772.54	4188731.94	UCART3	39.00
294	595772.54	4188731.94	UCART3	39.30
295	596772.54	4188731.94	UCART3	38.17
296	597772.54	4188731.94	UCART3	40.97
297	598772.54	4188731.94	UCART3	40.74
298	599772.54	4188731.94	UCART3	40.48
299	600772.54	4188731.94	UCART3	42.55
300	601772.54	4188731.94	UCART3	42.42
301	602772.54	4188731.94	UCART3	46.00
302	603772.54	4188731.94	UCART3	46.04
303	604772.54	4188731.94	UCART3	46.88
304	605772.54	4188731.94	UCART3	49.07
305	606772.54	4188859.78	UCART3	47.16
306	607772.54	4188859.78	UCART3	48.38
307	608772.54	4188731.94	UCART3	53.00
308	609772.54	4188731.94	UCART3	54.99
309	601772.54	4189731.94	UCART3	43.88
310	602772.54	4189731.94	UCART3	44.10
311	603772.54	4189731.94	UCART3	45.43
312	604772.54	4189731.94	UCART3	46.88
313	605772.54	4189731.94	UCART3	47.41
314	606772.54	4189731.94	UCART3	48.55
315	607772.54	4189731.94	UCART3	48.57
316	608772.54	4189731.94	UCART3	51.06
317	609772.54	4189731.94	UCART3	51.40
318	610821.14	4184138.72	UCART4	506.32
319	611821.14	4184138.72	UCART4	665.50
320	612821.14	4184138.72	UCART4	359.74

321	613821.14	4184138.72	UCART4	226.76
322	614821.14	4184138.72	UCART4	114.48
323	615821.14	4184138.72	UCART4	66.69
324	616821.14	4184138.72	UCART4	59.87
325	617821.14	4184138.72	UCART4	62.61
326	618821.14	4184138.72	UCART4	93.26
327	619821.14	4184138.72	UCART4	303.52
328	610821.14	4185138.72	UCART4	435.25
329	611821.14	4185138.72	UCART4	524.03
330	612821.14	4185138.72	UCART4	306.68
331	613821.14	4185138.72	UCART4	161.74
332	614821.14	4185138.72	UCART4	99.72
333	615821.14	4185138.72	UCART4	59.66
334	616821.14	4185138.72	UCART4	62.02
335	617821.14	4185138.72	UCART4	61.27
336	618821.14	4185138.72	UCART4	109.08
337	619821.14	4185138.72	UCART4	318.39
338	610821.14	4186138.72	UCART4	395.35
339	611821.14	4186138.72	UCART4	390.72
340	612821.14	4186138.72	UCART4	263.11
341	613821.14	4186138.72	UCART4	138.28
342	614821.14	4186138.72	UCART4	81.98
343	615821.14	4186138.72	UCART4	57.67
344	616821.14	4186138.72	UCART4	56.86
345	617821.14	4186138.72	UCART4	58.68
346	618821.14	4186138.72	UCART4	74.23
347	619821.14	4186138.72	UCART4	159.69
348	620821.14	4186138.72	UCART4	267.32
349	621821.14	4186138.72	UCART4	392.78
350	622821.14	4186138.72	UCART4	520.30
351	623821.14	4186138.72	UCART4	680.29
352	624821.14	4186138.72	UCART4	854.26
353	610821.14	4187138.72	UCART4	241.43
354	611821.14	4187138.72	UCART4	276.32
355	612821.14	4187138.72	UCART4	152.79
356	613821.14	4187138.72	UCART4	126.45
357	615821.14	4187138.72	UCART4	57.96
358	616821.14	4187138.72	UCART4	60.16
359	617821.14	4187138.72	UCART4	58.50
360	618821.14	4187138.72	UCART4	95.52
361	619821.14	4187138.72	UCART4	112.79

362	620821.14	4187138.72	UCART4	262.08
363	621821.14	4187138.72	UCART4	391.31
364	622821.14	4187138.72	UCART4	458.03
365	623821.14	4187138.72	UCART4	655.06
366	614821.14	4188138.72	UCART4	56.21
367	615821.14	4188138.72	UCART4	57.00
368	616821.14	4188138.72	UCART4	55.43
369	618821.14	4188138.72	UCART4	63.17
370	619821.14	4188138.72	UCART4	100.42
371	620821.14	4188138.72	UCART4	148.67
372	621821.14	4188138.72	UCART4	401.25
373	622821.14	4188138.72	UCART4	467.41
374	623821.14	4188138.72	UCART4	600.13
375	610821.14	4189138.72	UCART4	49.24
376	611821.14	4189138.72	UCART4	52.00
377	612821.14	4189138.72	UCART4	54.03
378	613821.14	4189138.72	UCART4	52.85
379	614821.14	4189138.72	UCART4	53.02
380	615821.14	4189138.72	UCART4	56.49
381	616821.14	4189138.72	UCART4	53.99
382	617821.14	4189138.72	UCART4	55.56
383	619821.14	4189138.72	UCART4	70.87
384	620821.14	4189138.72	UCART4	148.71
385	621821.14	4189138.72	UCART4	243.09
386	622821.14	4189138.72	UCART4	317.42
387	623821.14	4189138.72	UCART4	467.72
388	610821.14	4190138.72	UCART4	51.92
389	611821.14	4190138.72	UCART4	52.26
390	612821.14	4190138.72	UCART4	52.25
391	613821.14	4190138.72	UCART4	52.08
392	614821.14	4190138.72	UCART4	52.53
393	615821.14	4190138.72	UCART4	53.19
394	616821.14	4190138.72	UCART4	55.00
395	617821.14	4190138.72	UCART4	56.60
396	618821.14	4190138.72	UCART4	56.15
397	620879.88	4189799.36	UCART4	97.68
398	622821.14	4190138.72	UCART4	169.53
399	623821.14	4190138.72	UCART4	227.31
400	624821.14	4190138.72	UCART4	333.30
401	610821.14	4191138.72	UCART4	50.16
402	611821.14	4191138.72	UCART4	52.03

403	612821.14	4191138.72	UCART4	53.22
404	613821.14	4191138.72	UCART4	54.07
405	614821.14	4191138.72	UCART4	53.58
406	615821.14	4191138.72	UCART4	53.86
407	616821.14	4191138.72	UCART4	56.30
408	617821.14	4191138.72	UCART4	58.03
409	618821.14	4191138.72	UCART4	59.85
410	619821.14	4191138.72	UCART4	59.19
411	620821.14	4191138.72	UCART4	63.06
412	621821.14	4191138.72	UCART4	63.73
413	622821.14	4191138.72	UCART4	64.51
414	623821.14	4191138.72	UCART4	67.47
415	610821.14	4192138.72	UCART4	51.98
416	611821.14	4192138.72	UCART4	51.32
417	612821.14	4192138.72	UCART4	51.16
418	613821.14	4192138.72	UCART4	53.96
419	614821.14	4192138.72	UCART4	54.91
420	615821.14	4192138.72	UCART4	56.10
421	616821.14	4192138.72	UCART4	60.77
422	617821.14	4192138.72	UCART4	58.00
423	618821.14	4192138.72	UCART4	58.89
424	619821.14	4192138.72	UCART4	60.15
425	620821.14	4192138.72	UCART4	61.93
426	621821.14	4192138.72	UCART4	63.33
427	622821.14	4192138.72	UCART4	64.00
428	623821.14	4192138.72	UCART4	63.68
429	620821.14	4193138.72	UCART4	62.00
430	621821.14	4193138.72	UCART4	63.20
431	622821.14	4193138.72	UCART4	63.29
432	623821.14	4193138.72	UCART4	64.89
433	624856.81	4187506.02	UCART5	833.13
434	625856.81	4187506.02	UCART5	921.71
435	626856.81	4187506.02	UCART5	981.53
436	627856.81	4187506.02	UCART5	993.57
437	628856.81	4187506.02	UCART5	901.61
438	629856.81	4187506.02	UCART5	1063.82
439	630856.81	4187506.02	UCART5	1163.40
440	631856.81	4187506.02	UCART5	1106.36
441	632856.81	4187506.02	UCART5	796.31
442	633856.81	4187506.02	UCART5	548.53
443	624856.81	4188506.02	UCART5	703.28

444	625856.81	4188506.02	UCART5	812.56
445	626856.81	4188506.02	UCART5	894.30
446	627856.81	4188506.02	UCART5	915.17
447	628856.81	4188506.02	UCART5	701.05
448	629856.81	4188506.02	UCART5	870.39
449	630856.81	4188506.02	UCART5	925.03
450	631856.81	4188506.02	UCART5	1036.92
451	632856.81	4188506.02	UCART5	922.16
452	633856.81	4188506.02	UCART5	745.18
453	624856.81	4189506.02	UCART5	424.20
454	625856.81	4189506.02	UCART5	544.05
455	626856.81	4189506.02	UCART5	637.19
456	627856.81	4189506.02	UCART5	708.93
457	628856.81	4189506.02	UCART5	580.80
458	629856.81	4189506.02	UCART5	637.48
459	630856.81	4189506.02	UCART5	627.90
460	631856.81	4189506.02	UCART5	801.57
461	632856.81	4189506.02	UCART5	798.70
462	633856.81	4189506.02	UCART5	592.32
463	624856.81	4190506.02	UCART5	204.41
464	625856.81	4190506.02	UCART5	341.75
465	626856.81	4190506.02	UCART5	284.51
466	627856.81	4190506.02	UCART5	387.33
467	628856.81	4190506.02	UCART5	484.71
468	629856.81	4190506.02	UCART5	450.00
469	630856.81	4190506.02	UCART5	521.82
470	631856.81	4190506.02	UCART5	538.60
471	632856.81	4190506.02	UCART5	597.76
472	633856.81	4190506.02	UCART5	527.14
473	624856.81	4191506.02	UCART5	66.66
474	625856.81	4191506.02	UCART5	96.08
475	626856.81	4191506.02	UCART5	124.33
476	627906.50	4191153.71	UCART5	197.13
477	628856.81	4191506.02	UCART5	237.28
478	629856.81	4191506.02	UCART5	247.16
479	630856.81	4191506.02	UCART5	347.88
480	631856.81	4191506.02	UCART5	303.61
481	632856.81	4191506.02	UCART5	458.74
482	633856.81	4191506.02	UCART5	262.76
483	624856.81	4192506.02	UCART5	63.72
484	625856.81	4192506.02	UCART5	69.16

485	626856.81	4192506.02	UCART5	68.60	
486	627856.81	4192506.02	UCART5	69.90	
487	628856.81	4192506.02	UCART5	103.85	
488	629856.81	4192506.02	UCART5	122.19	
489	631856.81	4192506.02	UCART5	169.98	
490	632856.81	4192506.02	UCART5	204.17	
491	633856.81	4192506.02	UCART5	197.17	
492	624856.81	4193506.02	UCART5	66.01	
493	625856.81	4193506.02	UCART5	66.73	
494	626856.81	4193506.02	UCART5	67.26	
495	627856.81	4193506.02	UCART5	68.25	
496	628856.81	4193506.02	UCART5	69.97	
497	629856.81	4193506.02	UCART5	75.19	
498	630856.81	4193506.02	UCART5	80.94	
499	631843.65	4193748.62	UCART5	85.73	
500	632856.81	4193506.02	UCART5	83.63	
501	633856.81	4193506.02	UCART5	79.49	
502	624856.81	4194506.02	UCART5	68.06	
503	625856.81	4194506.02	UCART5	67.36	
504	626856.81	4194506.02	UCART5	68.98	
505	627856.81	4194506.02	UCART5	69.70	
506	628856.81	4194506.02	UCART5	70.50	
507	629856.81	4194506.02	UCART5	71.57	
508	630856.81	4194506.02	UCART5	72.04	
509	631856.81	4194506.02	UCART5	73.55	
510	632856.81	4194506.02	UCART5	75.84	
511	633856.81	4194506.02	UCART5	77.68	
512	624856.81	4195506.02	UCART5	74.22	
513	625856.81	4195506.02	UCART5	74.04	
514	626856.81	4195506.02	UCART5	69.95	
515	627856.81	4195506.02	UCART5	70.34	
516	628856.81	4195506.02	UCART5	71.32	
517	629856.81	4195506.02	UCART5	73.86	
518	630856.81	4195506.02	UCART5	73.00	
519	631856.81	4195506.02	UCART5	73.72	
520	632856.81	4195506.02	UCART5	76.46	
521	633856.81	4195506.02	UCART5	78.49	
522	605492.09	4186315.42		86.81	
523	593305.83	4183067.06		83.53	

Plant Boundary Receptors

Receptor Pathway

Receptor Groups

Record Number	Group ID	Group Description
1	UPOL1	
2	UCART1	Receptors generated from Uniform Cartesian Grid
3	UCART2	Receptors generated from Uniform Cartesian Grid
4	UCART3	Receptors generated from Uniform Cartesian Grid
5	UCART4	Receptors generated from Uniform Cartesian Grid
6	UCART5	Receptors generated from Uniform Cartesian Grid

Results Summary

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NO2 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	225.44404	ug/m^3	593305.83	4183067.06	83.53	0.00	713.00	
1-HR	19TH	190.29645	ug/m^3	580726.51	4183808.96	35.63	0.00	700.00	
ANNUAL		28.88585	ug/m^3	605492.09	4186315.42	86.81	0.00	1014.00	
1		15.00000	COUNT	618821.14	4188138.72	63.17	0.00	1553.00	

Source Pathway - Source Inputs

Source Pathway - Source Inputs

Line Area Sources

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00004	2.37	575193.84	4185715.07	32.01	2.55
			576123.60	4185292.45	30.15	2.55
			577148.45	4184996.62	28.09	2.55
			578321.22	4184658.52	30.00	2.55
			579652.47	4184426.08	29.85	2.55
			580867.50	4184214.77	32.05	2.55
			582124.80	4183718.19	59.73	2.55
			583664.10	4183618.88	137.61	2.55
			584770.49	4183556.72	174.90	2.55
			585441.78	4183544.29	169.30	2.55
			586374.14	4183183.78	213.61	2.55
			586908.68	4183171.35	229.14	2.55
			587893.71	4183081.61	211.46	2.55
			588826.16	4183031.88	210.02	2.55
			589808.34	4183181.07	177.37	2.55
			590813.97	4183262.06	183.89	2.55
			591806.05	4183201.32	173.03	2.55
			592737.38	4182998.86	140.33	2.55
			593446.00	4182290.23	115.11	2.55
			594346.11	4181897.07	106.73	2.55
			595322.82	4182397.34	131.85	2.55
			596156.61	4182826.14	191.67	2.55
			597157.15	4183254.94	175.98	2.55
			598014.75	4183588.46	190.86	2.55
			598872.36	4184112.55	108.15	2.55
			599731.37	4184583.18	80.93	2.55
			600664.60	4184385.77	147.97	2.55
			601615.78	4184152.46	154.85	2.55
			602495.17	4184565.23	149.51	2.55
			603213.04	4185283.10	142.05	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00004	2.37	604110.38	4185731.77	121.22	2.55
			605047.43	4185969.64	160.04	2.55
			606010.16	4186281.90	138.07	2.55
			606671.56	4186667.72	125.79	2.55
			606836.91	4186855.12	93.18	2.55
			607266.83	4187450.38	55.13	2.55
			607487.30	4187637.78	53.33	2.55
			607961.30	4187759.04	55.15	2.55
			608280.98	4187714.95	64.61	2.55
			608435.31	4187615.74	81.49	2.55
			608909.32	4187251.96	160.76	2.55
			609277.15	4187123.45	176.99	2.55
			609653.29	4187110.47	167.01	2.55
			610249.93	4187382.85	194.42	2.55
			611118.95	4187797.91	131.49	2.55
			612156.58	4188018.40	167.53	2.55
			613116.39	4187953.55	96.61	2.55
			613881.65	4187681.17	93.16	2.55
			615601.50	4187559.97	57.10	2.55
			617163.52	4187829.28	57.55	2.55
			618258.72	4188367.91	54.25	2.55
			619030.75	4189265.62	64.75	2.55
			619874.60	4189965.83	61.08	2.55
			620861.30	4190300.00	69.84	2.55
			622586.02	4190238.95	127.85	2.55
			623822.33	4190437.37	114.58	2.55
			624982.32	4190803.68	127.92	2.55
			625943.89	4191047.89	158.63	2.55
			627256.51	4191200.52	205.10	2.55
			628120.11	4191847.67	97.87	2.55
			628601.93	4192038.74	103.97	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	0,00004	2.37	629590.48	4191988.89	164.47	2.55
			630014.14	4192121.81	141.88	2.55
			631213.69	4192791.09	140.43	2.55
			631417.78	4192851.12	135.25	2.55
			631956.15	4193003.01	123.51	2.55
			632590.49	4193077.74	104.97	2.55
			632758.88	4193133.87	103.51	2.55

Source Pathway - Source Inputs

Area Sources Generated from Line Sources

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000001	575191.56	4185710.06	2.55	102.13	24.44	32.11	2.37
	A0000002	575284.54	4185667.80	2.55	102.13	24.44	32.22	2.37
	A0000003	575377.51	4185625.54	2.55	102.13	24.44	30.55	2.37
	A0000004	575470.49	4185583.28	2.55	102.13	24.44	29.55	2.37
	A0000005	575563.47	4185541.01	2.55	102.13	24.44	30.02	2.37
	A0000006	575656.44	4185498.75	2.55	102.13	24.44	29.51	2.37
	A0000007	575749.42	4185456.49	2.55	102.13	24.44	30.46	2.37
	A0000008	575842.40	4185414.23	2.55	102.13	24.44	30.57	2.37
	A0000009	575935.37	4185371.97	2.55	102.13	24.44	30.87	2.37
	A0000010	576028.35	4185329.70	2.55	102.13	24.44	31.00	2.37
	A0000011	576122.08	4185287.17	2.55	106.67	16.10	30.40	2.37
	A0000012	576224.56	4185257.58	2.55	106.67	16.10	30.54	2.37
	A0000013	576327.05	4185228.00	2.55	106.67	16.10	29.22	2.37
	A0000014	576429.53	4185198.42	2.55	106.67	16.10	28.86	2.37
	A0000015	576532.02	4185168.83	2.55	106.67	16.10	28.95	2.37
	A0000016	576634.50	4185139.25	2.55	106.67	16.10	28.75	2.37
	A0000017	576736.99	4185109.67	2.55	106.67	16.10	27.00	2.37
	A0000018	576839.47	4185080.08	2.55	106.67	16.10	27.00	2.37
	A0000019	576941.96	4185050.50	2.55	106.67	16.10	26.57	2.37
	A0000020	577044.44	4185020.92	2.55	106.67	16.10	26.83	2.37
	A0000021	577146.93	4184991.33	2.55	101.71	16.08	27.34	2.37
	A0000022	577244.66	4184963.16	2.55	101.71	16.08	27.05	2.37
	A0000023	577342.39	4184934.98	2.55	101.71	16.08	29.70	2.37
	A0000024	577440.12	4184906.81	2.55	101.71	16.08	29.26	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000025	577537.85	4184878.63	2.55	101.71	16.08	29.39	2.37
	A0000026	577635.58	4184850.46	2.55	101.71	16.08	28.86	2.37
	A0000027	577733.31	4184822.28	2.55	101.71	16.08	28.04	2.37
	A0000028	577831.04	4184794.11	2.55	101.71	16.08	28.34	2.37
	A0000029	577928.78	4184765.93	2.55	101.71	16.08	26.89	2.37
	A0000030	578026.51	4184737.76	2.55	101.71	16.08	28.26	2.37
	A0000031	578124.24	4184709.59	2.55	101.71	16.08	29.28	2.37
	A0000032	578221.97	4184681.41	2.55	101.71	16.08	29.19	2.37
	A0000033	578320.28	4184653.10	2.55	103.95	9.90	29.97	2.37
	A0000034	578422.68	4184635.22	2.55	103.95	9.90	29.96	2.37
	A0000035	578525.08	4184617.34	2.55	103.95	9.90	29.62	2.37
	A0000036	578627.49	4184599.46	2.55	103.95	9.90	29.17	2.37
	A0000037	578729.89	4184581.58	2.55	103.95	9.90	29.59	2.37
	A0000038	578832.30	4184563.70	2.55	103.95	9.90	29.36	2.37
	A0000039	578934.70	4184545.82	2.55	103.95	9.90	29.01	2.37
	A0000040	579037.10	4184527.94	2.55	103.95	9.90	29.53	2.37
	A0000041	579139.51	4184510.06	2.55	103.95	9.90	29.98	2.37
	A0000042	579241.91	4184492.18	2.55	103.95	9.90	29.30	2.37
	A0000043	579344.32	4184474.30	2.55	103.95	9.90	29.63	2.37
	A0000044	579446.72	4184456.42	2.55	103.95	9.90	29.02	2.37
	A0000045	579549.12	4184438.54	2.55	103.95	9.90	29.36	2.37
	A0000046	579651.53	4184420.66	2.55	102.77	9.87	29.99	2.37
	A0000047	579752.78	4184403.05	2.55	102.77	9.87	30.62	2.37
	A0000048	579854.04	4184385.44	2.55	102.77	9.87	29.97	2.37
	A0000049	579955.29	4184367.83	2.55	102.77	9.87	30.00	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000050	580056.54	4184350.22	2.55	102.77	9.87	30.00	2.37
	A0000051	580157.79	4184332.62	2.55	102.77	9.87	29.35	2.37
	A0000052	580259.05	4184315.01	2.55	102.77	9.87	30.23	2.37
	A0000053	580360.30	4184297.40	2.55	102.77	9.87	29.61	2.37
	A0000054	580461.55	4184279.79	2.55	102.77	9.87	29.27	2.37
	A0000055	580562.80	4184262.18	2.55	102.77	9.87	30.52	2.37
	A0000056	580664.06	4184244.57	2.55	102.77	9.87	30.31	2.37
	A0000057	580765.31	4184226.96	2.55	102.77	9.87	30.27	2.37
	A0000058	580865.48	4184209.65	2.55	103.98	21.55	32.00	2.37
	A0000059	580962.20	4184171.46	2.55	103.98	21.55	33.90	2.37
	A0000060	581058.91	4184133.26	2.55	103.98	21.55	36.83	2.37
	A0000061	581155.63	4184095.06	2.55	103.98	21.55	39.58	2.37
	A0000062	581252.34	4184056.86	2.55	103.98	21.55	42.38	2.37
	A0000063	581349.06	4184018.66	2.55	103.98	21.55	45.62	2.37
	A0000064	581445.77	4183980.46	2.55	103.98	21.55	47.41	2.37
	A0000065	581542.49	4183942.27	2.55	103.98	21.55	50.35	2.37
	A0000066	581639.20	4183904.07	2.55	103.98	21.55	52.59	2.37
	A0000067	581735.92	4183865.87	2.55	103.98	21.55	52.96	2.37
	A0000068	581832.63	4183827.67	2.55	103.98	21.55	56.11	2.37
	A0000069	581929.35	4183789.47	2.55	103.98	21.55	57.62	2.37
	A0000070	582026.06	4183751.28	2.55	103.98	21.55	60.17	2.37
	A0000071	582124.44	4183712.70	2.55	102.83	3.69	60.89	2.37
	A0000072	582227.06	4183706.08	2.55	102.83	3.69	59.46	2.37
	A0000073	582329.68	4183699.46	2.55	102.83	3.69	61.55	2.37
	A0000074	582432.30	4183692.84	2.55	102.83	3.69	67.34	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000075	582534.92	4183686.22	2.55	102.83	3.69	78.99	2.37
	A0000076	582637.54	4183679.60	2.55	102.83	3.69	93.29	2.37
	A0000077	582740.16	4183672.98	2.55	102.83	3.69	96.71	2.37
	A0000078	582842.78	4183666.36	2.55	102.83	3.69	93.15	2.37
	A0000079	582945.40	4183659.74	2.55	102.83	3.69	99.28	2.37
	A0000080	583048.03	4183653.12	2.55	102.83	3.69	101.24	2.37
	A0000081	583150.65	4183646.50	2.55	102.83	3.69	92.48	2.37
	A0000082	583253.27	4183639.88	2.55	102.83	3.69	92.58	2.37
	A0000083	583355.89	4183633.25	2.55	102.83	3.69	106.36	2.37
	A0000084	583458.51	4183626.63	2.55	102.83	3.69	127.72	2.37
	A0000085	583561.13	4183620.01	2.55	102.83	3.69	142.78	2.37
	A0000086	583663.79	4183613.39	2.55	100.74	3.22	133.67	2.37
	A0000087	583764.37	4183607.74	2.55	100.74	3.22	113.98	2.37
	A0000088	583864.95	4183602.09	2.55	100.74	3.22	124.44	2.37
	A0000089	583965.53	4183596.44	2.55	100.74	3.22	146.25	2.37
	A0000090	584066.12	4183590.79	2.55	100.74	3.22	150.20	2.37
	A0000091	584166.70	4183585.14	2.55	100.74	3.22	152.80	2.37
	A0000092	584267.28	4183579.49	2.55	100.74	3.22	167.74	2.37
	A0000093	584367.86	4183573.84	2.55	100.74	3.22	164.60	2.37
	A0000094	584468.44	4183568.18	2.55	100.74	3.22	159.11	2.37
	A0000095	584569.02	4183562.53	2.55	100.74	3.22	166.67	2.37
	A0000096	584669.60	4183556.88	2.55	100.74	3.22	173.65	2.37
	A0000097	584770.39	4183551.23	2.55	95.92	1.06	171.58	2.37
	A0000098	584866.29	4183549.45	2.55	95.92	1.06	166.50	2.37
	A0000099	584962.19	4183547.67	2.55	95.92	1.06	170.39	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000100	585058.09	4183545.90	2.55	95.92	1.06	176.20	2.37
	A0000101	585153.99	4183544.12	2.55	95.92	1.06	170.04	2.37
	A0000102	585249.88	4183542.35	2.55	95.92	1.06	170.50	2.37
	A0000103	585345.78	4183540.57	2.55	95.92	1.06	176.71	2.37
	A0000104	585439.80	4183539.16	2.55	99.96	21.14	160.85	2.37
	A0000105	585533.04	4183503.11	2.55	99.96	21.14	183.55	2.37
	A0000106	585626.27	4183467.06	2.55	99.96	21.14	199.22	2.37
	A0000107	585719.51	4183431.01	2.55	99.96	21.14	187.57	2.37
	A0000108	585812.74	4183394.96	2.55	99.96	21.14	162.20	2.37
	A0000109	585905.98	4183358.91	2.55	99.96	21.14	169.97	2.37
	A0000110	585999.21	4183322.86	2.55	99.96	21.14	170.55	2.37
	A0000111	586092.45	4183286.81	2.55	99.96	21.14	186.04	2.37
	A0000112	586185.68	4183250.76	2.55	99.96	21.14	200.71	2.37
	A0000113	586278.92	4183214.70	2.55	99.96	21.14	210.45	2.37
	A0000114	586374.01	4183178.28	2.55	106.94	1.33	207.51	2.37
	A0000115	586480.92	4183175.80	2.55	106.94	1.33	220.53	2.37
	A0000116	586587.83	4183173.31	2.55	106.94	1.33	230.38	2.37
	A0000117	586694.74	4183170.83	2.55	106.94	1.33	238.86	2.37
	A0000118	586801.65	4183168.34	2.55	106.94	1.33	229.91	2.37
	A0000119	586908.19	4183165.87	2.55	109.90	5.21	229.00	2.37
	A0000120	587017.63	4183155.90	2.55	109.90	5.21	198.40	2.37
	A0000121	587127.08	4183145.93	2.55	109.90	5.21	167.23	2.37
	A0000122	587236.53	4183135.96	2.55	109.90	5.21	158.44	2.37
	A0000123	587345.98	4183125.99	2.55	109.90	5.21	167.19	2.37
	A0000124	587455.42	4183116.02	2.55	109.90	5.21	170.18	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000125	587564.87	4183106.05	2.55	109.90	5.21	169.63	2.37
	A0000126	587674.32	4183096.07	2.55	109.90	5.21	189.45	2.37
	A0000127	587783.77	4183086.10	2.55	109.90	5.21	225.98	2.37
	A0000128	587893.42	4183076.12	2.55	103.75	3.05	213.43	2.37
	A0000129	587997.02	4183070.59	2.55	103.75	3.05	218.58	2.37
	A0000130	588100.63	4183065.06	2.55	103.75	3.05	228.30	2.37
	A0000131	588204.24	4183059.54	2.55	103.75	3.05	220.45	2.37
	A0000132	588307.84	4183054.01	2.55	103.75	3.05	208.55	2.37
	A0000133	588411.45	4183048.49	2.55	103.75	3.05	197.00	2.37
	A0000134	588515.05	4183042.96	2.55	103.75	3.05	190.22	2.37
	A0000135	588618.66	4183037.44	2.55	103.75	3.05	189.49	2.37
	A0000136	588722.26	4183031.91	2.55	103.75	3.05	188.40	2.37
	A0000137	588826.99	4183026.44	2.55	99.34	351.36	205.60	2.37
	A0000138	588925.21	4183041.36	2.55	99.34	351.36	221.70	2.37
	A0000139	589023.42	4183056.28	2.55	99.34	351.36	235.03	2.37
	A0000140	589121.64	4183071.20	2.55	99.34	351.36	241.14	2.37
	A0000141	589219.86	4183086.12	2.55	99.34	351.36	224.40	2.37
	A0000142	589318.08	4183101.04	2.55	99.34	351.36	199.25	2.37
	A0000143	589416.30	4183115.96	2.55	99.34	351.36	188.35	2.37
	A0000144	589514.52	4183130.87	2.55	99.34	351.36	161.58	2.37
	A0000145	589612.73	4183145.79	2.55	99.34	351.36	175.41	2.37
	A0000146	589710.95	4183160.71	2.55	99.34	351.36	177.12	2.37
	A0000147	589808.79	4183175.59	2.55	100.89	355.40	181.58	2.37
	A0000148	589909.35	4183183.69	2.55	100.89	355.40	192.03	2.37
	A0000149	590009.91	4183191.79	2.55	100.89	355.40	186.56	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000150	590110.47	4183199.88	2.55	100.89	355.40	164.05	2.37
	A0000151	590211.04	4183207.98	2.55	100.89	355.40	146.35	2.37
	A0000152	590311.60	4183216.08	2.55	100.89	355.40	131.36	2.37
	A0000153	590412.16	4183224.18	2.55	100.89	355.40	124.66	2.37
	A0000154	590512.72	4183232.28	2.55	100.89	355.40	130.19	2.37
	A0000155	590613.29	4183240.38	2.55	100.89	355.40	149.19	2.37
	A0000156	590713.85	4183248.48	2.55	100.89	355.40	174.45	2.37
	A0000157	590813.64	4183256.57	2.55	99.39	3.50	180.38	2.37
	A0000158	590912.84	4183250.50	2.55	99.39	3.50	179.09	2.37
	A0000159	591012.05	4183244.42	2.55	99.39	3.50	158.77	2.37
	A0000160	591111.26	4183238.35	2.55	99.39	3.50	161.18	2.37
	A0000161	591210.46	4183232.27	2.55	99.39	3.50	168.88	2.37
	A0000162	591309.67	4183226.20	2.55	99.39	3.50	135.98	2.37
	A0000163	591408.88	4183220.13	2.55	99.39	3.50	120.81	2.37
	A0000164	591508.09	4183214.05	2.55	99.39	3.50	141.24	2.37
	A0000165	591607.29	4183207.98	2.55	99.39	3.50	145.53	2.37
	A0000166	591706.50	4183201.90	2.55	99.39	3.50	159.85	2.37
	A0000167	591804.88	4183195.95	2.55	105.90	12.26	178.42	2.37
	A0000168	591908.36	4183173.45	2.55	105.90	12.26	189.63	2.37
	A0000169	592011.84	4183150.95	2.55	105.90	12.26	193.05	2.37
	A0000170	592115.32	4183128.46	2.55	105.90	12.26	179.41	2.37
	A0000171	592218.80	4183105.96	2.55	105.90	12.26	149.81	2.37
	A0000172	592322.29	4183083.47	2.55	105.90	12.26	145.68	2.37
	A0000173	592425.77	4183060.97	2.55	105.90	12.26	153.94	2.37
	A0000174	592529.25	4183038.47	2.55	105.90	12.26	151.02	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000175	592632.73	4183015.98	2.55	105.90	12.26	149.46	2.37
	A0000176	592733.49	4182994.97	2.55	100.21	45.00	146.61	2.37
	A0000177	592804.35	4182924.10	2.55	100.21	45.00	154.23	2.37
	A0000178	592875.22	4182853.24	2.55	100.21	45.00	158.65	2.37
	A0000179	592946.08	4182782.38	2.55	100.21	45.00	142.30	2.37
	A0000180	593016.94	4182711.52	2.55	100.21	45.00	131.94	2.37
	A0000181	593087.80	4182640.65	2.55	100.21	45.00	130.52	2.37
	A0000182	593158.67	4182569.79	2.55	100.21	45.00	129.51	2.37
	A0000183	593229.53	4182498.93	2.55	100.21	45.00	133.55	2.37
	A0000184	593300.39	4182428.07	2.55	100.21	45.00	126.76	2.37
	A0000185	593371.25	4182357.20	2.55	100.21	45.00	123.62	2.37
	A0000186	593443.80	4182285.19	2.55	109.14	23.60	115.96	2.37
	A0000187	593543.81	4182241.51	2.55	109.14	23.60	102.83	2.37
	A0000188	593643.83	4182197.82	2.55	109.14	23.60	104.12	2.37
	A0000189	593743.84	4182154.14	2.55	109.14	23.60	98.02	2.37
	A0000190	593843.85	4182110.45	2.55	109.14	23.60	92.09	2.37
	A0000191	593943.86	4182066.77	2.55	109.14	23.60	86.69	2.37
	A0000192	594043.87	4182023.08	2.55	109.14	23.60	76.26	2.37
	A0000193	594143.88	4181979.40	2.55	109.14	23.60	80.60	2.37
	A0000194	594243.89	4181935.71	2.55	109.14	23.60	96.83	2.37
	A0000195	594348.61	4181892.17	2.55	109.74	332.88	112.40	2.37
	A0000196	594446.29	4181942.20	2.55	109.74	332.88	129.25	2.37
	A0000197	594543.96	4181992.23	2.55	109.74	332.88	120.27	2.37
	A0000198	594641.63	4182042.26	2.55	109.74	332.88	97.12	2.37
	A0000199	594739.30	4182092.28	2.55	109.74	332.88	106.25	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000200	594836.97	4182142.31	2.55	109.74	332.88	131.80	2.37
	A0000201	594934.64	4182192.34	2.55	109.74	332.88	141.64	2.37
	A0000202	595032.32	4182242.36	2.55	109.74	332.88	140.42	2.37
	A0000203	595129.99	4182292.39	2.55	109.74	332.88	131.88	2.37
	A0000204	595227.66	4182342.42	2.55	109.74	332.88	113.67	2.37
	A0000205	595325.34	4182392.45	2.55	104.18	332.78	132.13	2.37
	A0000206	595417.98	4182440.09	2.55	104.18	332.78	161.42	2.37
	A0000207	595510.62	4182487.74	2.55	104.18	332.78	175.59	2.37
	A0000208	595603.27	4182535.38	2.55	104.18	332.78	175.12	2.37
	A0000209	595695.91	4182583.03	2.55	104.18	332.78	177.71	2.37
	A0000210	595788.55	4182630.67	2.55	104.18	332.78	183.07	2.37
	A0000211	595881.19	4182678.32	2.55	104.18	332.78	190.98	2.37
	A0000212	595973.84	4182725.96	2.55	104.18	332.78	179.86	2.37
	A0000213	596066.48	4182773.61	2.55	104.18	332.78	181.43	2.37
	A0000214	596158.77	4182821.09	2.55	108.86	336.80	188.12	2.37
	A0000215	596258.83	4182863.97	2.55	108.86	336.80	193.30	2.37
	A0000216	596358.88	4182906.85	2.55	108.86	336.80	188.54	2.37
	A0000217	596458.93	4182949.73	2.55	108.86	336.80	184.20	2.37
	A0000218	596558.99	4182992.61	2.55	108.86	336.80	159.96	2.37
	A0000219	596659.04	4183035.49	2.55	108.86	336.80	149.95	2.37
	A0000220	596759.10	4183078.37	2.55	108.86	336.80	152.84	2.37
	A0000221	596859.15	4183121.25	2.55	108.86	336.80	170.64	2.37
	A0000222	596959.20	4183164.13	2.55	108.86	336.80	171.68	2.37
	A0000223	597059.26	4183207.01	2.55	108.86	336.80	183.78	2.37
	A0000224	597159.14	4183249.82	2.55	102.24	338.75	180.12	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000225	597254.43	4183286.88	2.55	102.24	338.75	185.69	2.37
	A0000226	597349.72	4183323.93	2.55	102.24	338.75	195.63	2.37
	A0000227	597445.01	4183360.99	2.55	102.24	338.75	188.46	2.37
	A0000228	597540.30	4183398.05	2.55	102.24	338.75	191.16	2.37
	A0000229	597635.59	4183435.10	2.55	102.24	338.75	180.08	2.37
	A0000230	597730.88	4183472.16	2.55	102.24	338.75	154.83	2.37
	A0000231	597826.16	4183509.22	2.55	102.24	338.75	151.51	2.37
	A0000232	597921.45	4183546.27	2.55	102.24	338.75	173.89	2.37
	A0000233	598017.62	4183583.76	2.55	100.51	328.57	188.79	2.37
	A0000234	598103.38	4183636.17	2.55	100.51	328.57	176.42	2.37
	A0000235	598189.14	4183688.58	2.55	100.51	328.57	177.51	2.37
	A0000236	598274.90	4183740.99	2.55	100.51	328.57	174.35	2.37
	A0000237	598360.66	4183793.40	2.55	100.51	328.57	170.41	2.37
	A0000238	598446.42	4183845.81	2.55	100.51	328.57	167.37	2.37
	A0000239	598532.18	4183898.22	2.55	100.51	328.57	156.89	2.37
	A0000240	598617.94	4183950.63	2.55	100.51	328.57	141.54	2.37
	A0000241	598703.70	4184003.04	2.55	100.51	328.57	135.40	2.37
	A0000242	598789.46	4184055.45	2.55	100.51	328.57	119.76	2.37
	A0000243	598875.00	4184107.73	2.55	108.83	331.28	107.52	2.37
	A0000244	598970.44	4184160.02	2.55	108.83	331.28	128.28	2.37
	A0000245	599065.89	4184212.31	2.55	108.83	331.28	113.44	2.37
	A0000246	599161.34	4184264.60	2.55	108.83	331.28	90.17	2.37
	A0000247	599256.78	4184316.90	2.55	108.83	331.28	98.31	2.37
	A0000248	599352.23	4184369.19	2.55	108.83	331.28	113.18	2.37
	A0000249	599447.68	4184421.48	2.55	108.83	331.28	116.85	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000250	599543.12	4184473.77	2.55	108.83	331.28	101.64	2.37
	A0000251	599638.57	4184526.07	2.55	108.83	331.28	89.05	2.37
	A0000252	599730.23	4184577.80	2.55	105.99	11.94	82.74	2.37
	A0000253	599833.93	4184555.87	2.55	105.99	11.94	83.99	2.37
	A0000254	599937.62	4184533.93	2.55	105.99	11.94	65.77	2.37
	A0000255	600041.31	4184512.00	2.55	105.99	11.94	64.64	2.37
	A0000256	600145.00	4184490.06	2.55	105.99	11.94	79.79	2.37
	A0000257	600248.69	4184468.13	2.55	105.99	11.94	99.19	2.37
	A0000258	600352.39	4184446.19	2.55	105.99	11.94	125.75	2.37
	A0000259	600456.08	4184424.26	2.55	105.99	11.94	147.02	2.37
	A0000260	600559.77	4184402.32	2.55	105.99	11.94	153.50	2.37
	A0000261	600663.29	4184380.43	2.55	108.82	13.78	148.29	2.37
	A0000262	600768.98	4184354.50	2.55	108.82	13.78	148.30	2.37
	A0000263	600874.66	4184328.58	2.55	108.82	13.78	171.86	2.37
	A0000264	600980.35	4184302.66	2.55	108.82	13.78	163.00	2.37
	A0000265	601086.04	4184276.73	2.55	108.82	13.78	153.51	2.37
	A0000266	601191.72	4184250.81	2.55	108.82	13.78	152.13	2.37
	A0000267	601297.41	4184224.89	2.55	108.82	13.78	146.51	2.37
	A0000268	601403.10	4184198.96	2.55	108.82	13.78	139.85	2.37
	A0000269	601508.78	4184173.04	2.55	108.82	13.78	153.11	2.37
	A0000270	601618.12	4184147.48	2.55	107.94	334.86	154.79	2.37
	A0000271	601715.83	4184193.34	2.55	107.94	334.86	121.74	2.37
	A0000272	601813.54	4184239.21	2.55	107.94	334.86	104.14	2.37
	A0000273	601911.25	4184285.07	2.55	107.94	334.86	103.21	2.37
	A0000274	602008.96	4184330.94	2.55	107.94	334.86	119.43	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000275	602106.67	4184376.80	2.55	107.94	334.86	117.08	2.37
	A0000276	602204.38	4184422.66	2.55	107.94	334.86	107.46	2.37
	A0000277	602302.09	4184468.53	2.55	107.94	334.86	139.30	2.37
	A0000278	602399.80	4184514.39	2.55	107.94	334.86	147.99	2.37
	A0000279	602499.06	4184561.35	2.55	101.52	315.00	143.86	2.37
	A0000280	602570.84	4184633.13	2.55	101.52	315.00	117.70	2.37
	A0000281	602642.63	4184704.92	2.55	101.52	315.00	116.15	2.37
	A0000282	602714.42	4184776.71	2.55	101.52	315.00	109.67	2.37
	A0000283	602786.21	4184848.49	2.55	101.52	315.00	98.67	2.37
	A0000284	602857.99	4184920.28	2.55	101.52	315.00	88.53	2.37
	A0000285	602929.78	4184992.07	2.55	101.52	315.00	93.10	2.37
	A0000286	603001.57	4185063.85	2.55	101.52	315.00	102.90	2.37
	A0000287	603073.35	4185135.64	2.55	101.52	315.00	128.37	2.37
	A0000288	603145.14	4185207.43	2.55	101.52	315.00	144.78	2.37
	A0000289	603215.50	4185278.19	2.55	100.33	333.43	142.54	2.37
	A0000290	603305.23	4185323.05	2.55	100.33	333.43	127.21	2.37
	A0000291	603394.97	4185367.92	2.55	100.33	333.43	125.99	2.37
	A0000292	603484.70	4185412.79	2.55	100.33	333.43	128.02	2.37
	A0000293	603574.43	4185457.65	2.55	100.33	333.43	113.71	2.37
	A0000294	603664.17	4185502.52	2.55	100.33	333.43	105.93	2.37
	A0000295	603753.90	4185547.39	2.55	100.33	333.43	113.95	2.37
	A0000296	603843.63	4185592.25	2.55	100.33	333.43	121.61	2.37
	A0000297	603933.37	4185637.12	2.55	100.33	333.43	145.74	2.37
	A0000298	604023.10	4185681.99	2.55	100.33	333.43	142.17	2.37
	A0000299	604111.73	4185726.44	2.55	107.42	345.76	123.28	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000300	604215.85	4185752.87	2.55	107.42	345.76	134.75	2.37
	A0000301	604319.96	4185779.30	2.55	107.42	345.76	139.72	2.37
	A0000302	604424.08	4185805.73	2.55	107.42	345.76	144.57	2.37
	A0000303	604528.20	4185832.16	2.55	107.42	345.76	156.06	2.37
	A0000304	604632.31	4185858.59	2.55	107.42	345.76	154.13	2.37
	A0000305	604736.43	4185885.02	2.55	107.42	345.76	158.80	2.37
	A0000306	604840.55	4185911.45	2.55	107.42	345.76	156.93	2.37
	A0000307	604944.67	4185937.88	2.55	107.42	345.76	163.51	2.37
	A0000308	605049.13	4185964.41	2.55	101.21	342.03	157.84	2.37
	A0000309	605145.40	4185995.63	2.55	101.21	342.03	137.92	2.37
	A0000310	605241.67	4186026.86	2.55	101.21	342.03	123.76	2.37
	A0000311	605337.94	4186058.08	2.55	101.21	342.03	106.58	2.37
	A0000312	605434.22	4186089.31	2.55	101.21	342.03	90.18	2.37
	A0000313	605530.49	4186120.54	2.55	101.21	342.03	87.15	2.37
	A0000314	605626.76	4186151.76	2.55	101.21	342.03	87.89	2.37
	A0000315	605723.03	4186182.99	2.55	101.21	342.03	99.60	2.37
	A0000316	605819.31	4186214.22	2.55	101.21	342.03	116.47	2.37
	A0000317	605915.58	4186245.44	2.55	101.21	342.03	122.94	2.37
	A0000318	606012.93	4186277.15	2.55	109.39	329.74	133.09	2.37
	A0000319	606107.41	4186332.27	2.55	109.39	329.74	138.97	2.37
	A0000320	606201.90	4186387.38	2.55	109.39	329.74	132.32	2.37
	A0000321	606296.39	4186442.50	2.55	109.39	329.74	144.02	2.37
	A0000322	606390.87	4186497.62	2.55	109.39	329.74	133.41	2.37
	A0000323	606485.36	4186552.74	2.55	109.39	329.74	107.70	2.37
	A0000324	606579.85	4186607.85	2.55	109.39	329.74	114.39	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000325	606675.69	4186664.08	2.55	83.31	311.42	132.00	2.37
	A0000326	606730.80	4186726.55	2.55	83.31	311.42	126.65	2.37
	A0000327	606785.92	4186789.01	2.55	83.31	311.42	111.56	2.37
	A0000328	606841.37	4186851.90	2.55	104.90	305.84	90.57	2.37
	A0000329	606902.79	4186936.94	2.55	104.90	305.84	79.60	2.37
	A0000330	606964.20	4187021.97	2.55	104.90	305.84	73.82	2.37
	A0000331	607025.62	4187107.01	2.55	104.90	305.84	64.39	2.37
	A0000332	607087.04	4187192.05	2.55	104.90	305.84	61.34	2.37
	A0000333	607148.45	4187277.09	2.55	104.90	305.84	58.37	2.37
	A0000334	607209.87	4187362.13	2.55	104.90	305.84	56.53	2.37
	A0000335	607270.39	4187446.19	2.55	96.45	319.64	55.37	2.37
	A0000336	607343.88	4187508.66	2.55	96.45	319.64	56.05	2.37
	A0000337	607417.37	4187571.13	2.55	96.45	319.64	58.11	2.37
	A0000338	607488.66	4187632.45	2.55	97.85	345.65	54.18	2.37
	A0000339	607583.46	4187656.71	2.55	97.85	345.65	51.11	2.37
	A0000340	607678.26	4187680.96	2.55	97.85	345.65	53.35	2.37
	A0000341	607773.06	4187705.21	2.55	97.85	345.65	53.32	2.37
	A0000342	607867.87	4187729.46	2.55	97.85	345.65	55.09	2.37
	A0000343	607960.55	4187753.59	2.55	107.57	7.85	55.56	2.37
	A0000344	608067.11	4187738.89	2.55	107.57	7.85	58.17	2.37
	A0000345	608173.67	4187724.20	2.55	107.57	7.85	61.53	2.37
	A0000346	608278.01	4187710.32	2.55	91.73	32.74	63.13	2.37
	A0000347	608355.17	4187660.72	2.55	91.73	32.74	69.02	2.37
	A0000348	608431.96	4187611.37	2.55	99.58	37.50	80.42	2.37
	A0000349	608510.96	4187550.74	2.55	99.58	37.50	89.82	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000350	608589.97	4187490.12	2.55	99.58	37.50	97.66	2.37
	A0000351	608668.97	4187429.49	2.55	99.58	37.50	118.74	2.37
	A0000352	608747.97	4187368.86	2.55	99.58	37.50	123.33	2.37
	A0000353	608826.97	4187308.23	2.55	99.58	37.50	145.71	2.37
	A0000354	608907.51	4187246.77	2.55	97.41	19.26	160.91	2.37
	A0000355	608999.46	4187214.64	2.55	97.41	19.26	160.29	2.37
	A0000356	609091.42	4187182.51	2.55	97.41	19.26	151.85	2.37
	A0000357	609183.38	4187150.38	2.55	97.41	19.26	150.38	2.37
	A0000358	609276.96	4187117.95	2.55	94.09	1.97	177.96	2.37
	A0000359	609371.00	4187114.71	2.55	94.09	1.97	183.45	2.37
	A0000360	609465.03	4187111.46	2.55	94.09	1.97	183.52	2.37
	A0000361	609559.07	4187108.22	2.55	94.09	1.97	182.39	2.37
	A0000362	609655.58	4187105.47	2.55	109.31	335.46	167.84	2.37
	A0000363	609755.02	4187150.87	2.55	109.31	335.46	146.32	2.37
	A0000364	609854.46	4187196.26	2.55	109.31	335.46	167.12	2.37
	A0000365	609953.90	4187241.66	2.55	109.31	335.46	182.19	2.37
	A0000366	610053.34	4187287.06	2.55	109.31	335.46	191.20	2.37
	A0000367	610152.78	4187332.45	2.55	109.31	335.46	202.40	2.37
	A0000368	610252.30	4187377.89	2.55	107.01	334.47	197.59	2.37
	A0000369	610348.86	4187424.01	2.55	107.01	334.47	195.74	2.37
	A0000370	610445.42	4187470.12	2.55	107.01	334.47	187.90	2.37
	A0000371	610541.97	4187516.24	2.55	107.01	334.47	181.75	2.37
	A0000372	610638.53	4187562.36	2.55	107.01	334.47	186.43	2.37
	A0000373	610735.09	4187608.48	2.55	107.01	334.47	187.53	2.37
	A0000374	610831.65	4187654.59	2.55	107.01	334.47	176.24	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000375	610928.20	4187700.71	2.55	107.01	334.47	169.96	2.37
	A0000376	611024.76	4187746.83	2.55	107.01	334.47	152.33	2.37
	A0000377	611120.09	4187792.53	2.55	106.08	348.00	133.75	2.37
	A0000378	611223.86	4187814.58	2.55	106.08	348.00	146.00	2.37
	A0000379	611327.62	4187836.63	2.55	106.08	348.00	138.79	2.37
	A0000380	611431.38	4187858.68	2.55	106.08	348.00	132.72	2.37
	A0000381	611535.15	4187880.73	2.55	106.08	348.00	129.73	2.37
	A0000382	611638.91	4187902.78	2.55	106.08	348.00	150.68	2.37
	A0000383	611742.67	4187924.82	2.55	106.08	348.00	166.26	2.37
	A0000384	611846.44	4187946.87	2.55	106.08	348.00	174.69	2.37
	A0000385	611950.20	4187968.92	2.55	106.08	348.00	169.49	2.37
	A0000386	612053.96	4187990.97	2.55	106.08	348.00	182.08	2.37
	A0000387	612156.21	4188012.92	2.55	106.89	3.87	162.38	2.37
	A0000388	612262.86	4188005.71	2.55	106.89	3.87	163.39	2.37
	A0000389	612369.50	4187998.50	2.55	106.89	3.87	140.89	2.37
	A0000390	612476.15	4187991.30	2.55	106.89	3.87	105.39	2.37
	A0000391	612582.79	4187984.09	2.55	106.89	3.87	92.69	2.37
	A0000392	612689.44	4187976.89	2.55	106.89	3.87	85.23	2.37
	A0000393	612796.08	4187969.68	2.55	106.89	3.87	87.31	2.37
	A0000394	612902.73	4187962.48	2.55	106.89	3.87	87.89	2.37
	A0000395	613009.38	4187955.27	2.55	106.89	3.87	89.90	2.37
	A0000396	613114.55	4187948.37	2.55	101.54	19.59	94.33	2.37
	A0000397	613210.20	4187914.32	2.55	101.54	19.59	101.92	2.37
	A0000398	613305.86	4187880.28	2.55	101.54	19.59	112.21	2.37
	A0000399	613401.52	4187846.23	2.55	101.54	19.59	120.56	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000400	613497.18	4187812.18	2.55	101.54	19.59	124.25	2.37
	A0000401	613592.83	4187778.13	2.55	101.54	19.59	121.83	2.37
	A0000402	613688.49	4187744.09	2.55	101.54	19.59	114.41	2.37
	A0000403	613784.15	4187710.04	2.55	101.54	19.59	102.43	2.37
	A0000404	613881.26	4187675.69	2.55	107.76	4.03	93.66	2.37
	A0000405	613988.75	4187668.11	2.55	107.76	4.03	86.09	2.37
	A0000406	614096.24	4187660.54	2.55	107.76	4.03	83.53	2.37
	A0000407	614203.73	4187652.96	2.55	107.76	4.03	80.06	2.37
	A0000408	614311.22	4187645.39	2.55	107.76	4.03	75.48	2.37
	A0000409	614418.71	4187637.81	2.55	107.76	4.03	67.58	2.37
	A0000410	614526.21	4187630.24	2.55	107.76	4.03	60.52	2.37
	A0000411	614633.70	4187622.66	2.55	107.76	4.03	58.22	2.37
	A0000412	614741.19	4187615.08	2.55	107.76	4.03	56.91	2.37
	A0000413	614848.68	4187607.51	2.55	107.76	4.03	55.20	2.37
	A0000414	614956.17	4187599.93	2.55	107.76	4.03	56.04	2.37
	A0000415	615063.66	4187592.36	2.55	107.76	4.03	55.61	2.37
	A0000416	615171.15	4187584.78	2.55	107.76	4.03	54.98	2.37
	A0000417	615278.64	4187577.21	2.55	107.76	4.03	55.08	2.37
	A0000418	615386.13	4187569.63	2.55	107.76	4.03	55.98	2.37
	A0000419	615493.62	4187562.06	2.55	107.76	4.03	56.19	2.37
	A0000420	615602.44	4187554.55	2.55	105.67	350.22	57.14	2.37
	A0000421	615706.57	4187572.50	2.55	105.67	350.22	56.44	2.37
	A0000422	615810.70	4187590.46	2.55	105.67	350.22	56.46	2.37
	A0000423	615914.84	4187608.41	2.55	105.67	350.22	57.40	2.37
	A0000424	616018.97	4187626.37	2.55	105.67	350.22	57.41	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000425	616123.11	4187644.32	2.55	105.67	350.22	57.20	2.37
	A0000426	616227.24	4187662.27	2.55	105.67	350.22	59.48	2.37
	A0000427	616331.38	4187680.23	2.55	105.67	350.22	60.16	2.37
	A0000428	616435.51	4187698.18	2.55	105.67	350.22	59.46	2.37
	A0000429	616539.64	4187716.14	2.55	105.67	350.22	58.59	2.37
	A0000430	616643.78	4187734.09	2.55	105.67	350.22	58.27	2.37
	A0000431	616747.91	4187752.05	2.55	105.67	350.22	58.67	2.37
	A0000432	616852.05	4187770.00	2.55	105.67	350.22	57.85	2.37
	A0000433	616956.18	4187787.95	2.55	105.67	350.22	58.83	2.37
	A0000434	617060.32	4187805.91	2.55	105.67	350.22	57.80	2.37
	A0000435	617165.94	4187824.35	2.55	101.71	333.81	57.12	2.37
	A0000436	617257.21	4187869.23	2.55	101.71	333.81	56.19	2.37
	A0000437	617348.48	4187914.12	2.55	101.71	333.81	56.06	2.37
	A0000438	617439.74	4187959.00	2.55	101.71	333.81	55.00	2.37
	A0000439	617531.01	4188003.89	2.55	101.71	333.81	55.16	2.37
	A0000440	617622.28	4188048.77	2.55	101.71	333.81	54.75	2.37
	A0000441	617713.55	4188093.66	2.55	101.71	333.81	55.79	2.37
	A0000442	617804.81	4188138.55	2.55	101.71	333.81	55.47	2.37
	A0000443	617896.08	4188183.43	2.55	101.71	333.81	57.53	2.37
	A0000444	617987.35	4188228.32	2.55	101.71	333.81	56.06	2.37
	A0000445	618078.61	4188273.20	2.55	101.71	333.81	55.85	2.37
	A0000446	618169.88	4188318.09	2.55	101.71	333.81	55.52	2.37
	A0000447	618262.89	4188364.32	2.55	107.64	310.70	54.34	2.37
	A0000448	618333.08	4188445.93	2.55	107.64	310.70	56.58	2.37
	A0000449	618403.26	4188527.54	2.55	107.64	310.70	56.06	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000450	618473.44	4188609.15	2.55	107.64	310.70	56.67	2.37
	A0000451	618543.63	4188690.76	2.55	107.64	310.70	56.16	2.37
	A0000452	618613.81	4188772.37	2.55	107.64	310.70	55.64	2.37
	A0000453	618684.00	4188853.98	2.55	107.64	310.70	56.42	2.37
	A0000454	618754.18	4188935.59	2.55	107.64	310.70	57.83	2.37
	A0000455	618824.37	4189017.20	2.55	107.64	310.70	60.12	2.37
	A0000456	618894.55	4189098.81	2.55	107.64	310.70	62.95	2.37
	A0000457	618964.74	4189180.42	2.55	107.64	310.70	66.11	2.37
	A0000458	619034.26	4189261.38	2.55	109.65	320.31	66.24	2.37
	A0000459	619118.65	4189331.41	2.55	109.65	320.31	61.73	2.37
	A0000460	619203.03	4189401.43	2.55	109.65	320.31	59.66	2.37
	A0000461	619287.42	4189471.45	2.55	109.65	320.31	59.13	2.37
	A0000462	619371.80	4189541.47	2.55	109.65	320.31	59.06	2.37
	A0000463	619456.19	4189611.49	2.55	109.65	320.31	61.35	2.37
	A0000464	619540.57	4189681.51	2.55	109.65	320.31	60.90	2.37
	A0000465	619624.96	4189751.53	2.55	109.65	320.31	60.66	2.37
	A0000466	619709.34	4189821.56	2.55	109.65	320.31	60.73	2.37
	A0000467	619793.72	4189891.58	2.55	109.65	320.31	60.91	2.37
	A0000468	619876.36	4189960.62	2.55	104.18	341.29	61.19	2.37
	A0000469	619975.03	4189994.04	2.55	104.18	341.29	62.61	2.37
	A0000470	620073.70	4190027.46	2.55	104.18	341.29	62.29	2.37
	A0000471	620172.37	4190060.87	2.55	104.18	341.29	62.13	2.37
	A0000472	620271.04	4190094.29	2.55	104.18	341.29	63.41	2.37
	A0000473	620369.71	4190127.71	2.55	104.18	341.29	63.49	2.37
	A0000474	620468.39	4190161.12	2.55	104.18	341.29	62.20	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000475	620567.06	4190194.54	2.55	104.18	341.29	64.66	2.37
	A0000476	620665.73	4190227.96	2.55	104.18	341.29	68.09	2.37
	A0000477	620764.40	4190261.37	2.55	104.18	341.29	69.87	2.37
	A0000478	620861.11	4190294.50	2.55	107.86	2.03	69.98	2.37
	A0000479	620968.90	4190290.69	2.55	107.86	2.03	71.44	2.37
	A0000480	621076.70	4190286.87	2.55	107.86	2.03	73.08	2.37
	A0000481	621184.49	4190283.05	2.55	107.86	2.03	77.16	2.37
	A0000482	621292.29	4190279.24	2.55	107.86	2.03	78.32	2.37
	A0000483	621400.08	4190275.42	2.55	107.86	2.03	81.51	2.37
	A0000484	621507.88	4190271.61	2.55	107.86	2.03	89.61	2.37
	A0000485	621615.67	4190267.79	2.55	107.86	2.03	95.63	2.37
	A0000486	621723.47	4190263.98	2.55	107.86	2.03	96.82	2.37
	A0000487	621831.26	4190260.16	2.55	107.86	2.03	103.68	2.37
	A0000488	621939.06	4190256.34	2.55	107.86	2.03	104.36	2.37
	A0000489	622046.85	4190252.53	2.55	107.86	2.03	109.85	2.37
	A0000490	622154.65	4190248.71	2.55	107.86	2.03	117.18	2.37
	A0000491	622262.44	4190244.90	2.55	107.86	2.03	122.32	2.37
	A0000492	622370.24	4190241.08	2.55	107.86	2.03	120.39	2.37
	A0000493	622478.03	4190237.27	2.55	107.86	2.03	120.28	2.37
	A0000494	622586.90	4190233.52	2.55	104.34	350.88	117.81	2.37
	A0000495	622689.92	4190250.05	2.55	104.34	350.88	132.35	2.37
	A0000496	622792.95	4190266.59	2.55	104.34	350.88	135.38	2.37
	A0000497	622895.97	4190283.12	2.55	104.34	350.88	140.58	2.37
	A0000498	622999.00	4190299.66	2.55	104.34	350.88	143.54	2.37
	A0000499	623102.02	4190316.19	2.55	104.34	350.88	152.57	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000500	623205.05	4190332.73	2.55	104.34	350.88	146.92	2.37
	A0000501	623308.07	4190349.26	2.55	104.34	350.88	149.33	2.37
	A0000502	623411.10	4190365.80	2.55	104.34	350.88	130.72	2.37
	A0000503	623514.12	4190382.33	2.55	104.34	350.88	133.15	2.37
	A0000504	623617.15	4190398.87	2.55	104.34	350.88	156.47	2.37
	A0000505	623720.17	4190415.40	2.55	104.34	350.88	136.66	2.37
	A0000506	623823.98	4190432.12	2.55	101.37	342.47	117.63	2.37
	A0000507	623920.65	4190462.65	2.55	101.37	342.47	115.66	2.37
	A0000508	624017.32	4190493.17	2.55	101.37	342.47	124.97	2.37
	A0000509	624113.98	4190523.70	2.55	101.37	342.47	134.37	2.37
	A0000510	624210.65	4190554.23	2.55	101.37	342.47	129.54	2.37
	A0000511	624307.31	4190584.75	2.55	101.37	342.47	130.64	2.37
	A0000512	624403.98	4190615.28	2.55	101.37	342.47	141.51	2.37
	A0000513	624500.65	4190645.80	2.55	101.37	342.47	147.87	2.37
	A0000514	624597.31	4190676.33	2.55	101.37	342.47	134.35	2.37
	A0000515	624693.98	4190706.86	2.55	101.37	342.47	132.07	2.37
	A0000516	624790.64	4190737.38	2.55	101.37	342.47	139.68	2.37
	A0000517	624887.31	4190767.91	2.55	101.37	342.47	135.37	2.37
	A0000518	624983.67	4190798.35	2.55	99.21	345.75	125.59	2.37
	A0000519	625079.83	4190822.77	2.55	99.21	345.75	130.67	2.37
	A0000520	625175.99	4190847.19	2.55	99.21	345.75	137.51	2.37
	A0000521	625272.14	4190871.61	2.55	99.21	345.75	145.78	2.37
	A0000522	625368.30	4190896.03	2.55	99.21	345.75	149.50	2.37
	A0000523	625464.46	4190920.45	2.55	99.21	345.75	157.25	2.37
	A0000524	625560.61	4190944.87	2.55	99.21	345.75	159.57	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000525	625656.77	4190969.29	2.55	99.21	345.75	169.52	2.37
	A0000526	625752.93	4190993.71	2.55	99.21	345.75	181.47	2.37
	A0000527	625849.08	4191018.13	2.55	99.21	345.75	174.28	2.37
	A0000528	625944.52	4191042.42	2.55	101.65	353.37	165.19	2.37
	A0000529	626045.49	4191054.16	2.55	101.65	353.37	192.01	2.37
	A0000530	626146.46	4191065.90	2.55	101.65	353.37	193.57	2.37
	A0000531	626247.43	4191077.65	2.55	101.65	353.37	189.94	2.37
	A0000532	626348.41	4191089.39	2.55	101.65	353.37	199.11	2.37
	A0000533	626449.38	4191101.13	2.55	101.65	353.37	184.56	2.37
	A0000534	626550.35	4191112.87	2.55	101.65	353.37	174.29	2.37
	A0000535	626651.32	4191124.61	2.55	101.65	353.37	181.18	2.37
	A0000536	626752.29	4191136.35	2.55	101.65	353.37	187.42	2.37
	A0000537	626853.26	4191148.09	2.55	101.65	353.37	178.70	2.37
	A0000538	626954.23	4191159.83	2.55	101.65	353.37	197.93	2.37
	A0000539	627055.20	4191171.57	2.55	101.65	353.37	185.39	2.37
	A0000540	627156.17	4191183.31	2.55	101.65	353.37	179.36	2.37
	A0000541	627259.80	4191196.12	2.55	107.92	323.15	201.90	2.37
	A0000542	627346.17	4191260.83	2.55	107.92	323.15	180.05	2.37
	A0000543	627432.53	4191325.55	2.55	107.92	323.15	144.73	2.37
	A0000544	627518.89	4191390.26	2.55	107.92	323.15	135.61	2.37
	A0000545	627605.25	4191454.98	2.55	107.92	323.15	143.78	2.37
	A0000546	627691.61	4191519.69	2.55	107.92	323.15	129.97	2.37
	A0000547	627777.97	4191584.41	2.55	107.92	323.15	121.99	2.37
	A0000548	627864.33	4191649.12	2.55	107.92	323.15	117.57	2.37
	A0000549	627950.69	4191713.84	2.55	107.92	323.15	109.31	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000550	628037.05	4191778.56	2.55	107.92	323.15	103.03	2.37
	A0000551	628122.14	4191842.56	2.55	103.66	338.37	97.78	2.37
	A0000552	628218.50	4191880.77	2.55	103.66	338.37	92.81	2.37
	A0000553	628314.87	4191918.99	2.55	103.66	338.37	100.66	2.37
	A0000554	628411.23	4191957.20	2.55	103.66	338.37	105.38	2.37
	A0000555	628507.59	4191995.41	2.55	103.66	338.37	104.19	2.37
	A0000556	628601.65	4192033.24	2.55	109.98	2.89	103.31	2.37
	A0000557	628711.49	4192027.71	2.55	109.98	2.89	115.10	2.37
	A0000558	628821.33	4192022.17	2.55	109.98	2.89	127.50	2.37
	A0000559	628931.17	4192016.63	2.55	109.98	2.89	131.54	2.37
	A0000560	629041.01	4192011.09	2.55	109.98	2.89	138.88	2.37
	A0000561	629150.85	4192005.55	2.55	109.98	2.89	153.06	2.37
	A0000562	629260.68	4192000.02	2.55	109.98	2.89	157.12	2.37
	A0000563	629370.52	4191994.48	2.55	109.98	2.89	158.52	2.37
	A0000564	629480.36	4191988.94	2.55	109.98	2.89	162.17	2.37
	A0000565	629592.12	4191983.65	2.55	88.80	342.58	165.27	2.37
	A0000566	629676.86	4192010.23	2.55	88.80	342.58	163.65	2.37
	A0000567	629761.59	4192036.81	2.55	88.80	342.58	159.01	2.37
	A0000568	629846.32	4192063.40	2.55	88.80	342.58	154.81	2.37
	A0000569	629931.06	4192089.98	2.55	88.80	342.58	150.75	2.37
	A0000570	630016.82	4192117.01	2.55	105.66	330.84	143.98	2.37
	A0000571	630109.10	4192168.49	2.55	105.66	330.84	137.07	2.37
	A0000572	630201.37	4192219.97	2.55	105.66	330.84	131.31	2.37
	A0000573	630293.64	4192271.46	2.55	105.66	330.84	124.10	2.37
	A0000574	630385.91	4192322.94	2.55	105.66	330.84	119.30	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000575	630478.19	4192374.42	2.55	105.66	330.84	123.19	2.37
	A0000576	630570.46	4192425.91	2.55	105.66	330.84	130.83	2.37
	A0000577	630662.73	4192477.39	2.55	105.66	330.84	135.52	2.37
	A0000578	630755.01	4192528.87	2.55	105.66	330.84	133.61	2.37
	A0000579	630847.28	4192580.36	2.55	105.66	330.84	138.28	2.37
	A0000580	630939.55	4192631.84	2.55	105.66	330.84	139.69	2.37
	A0000581	631031.82	4192683.32	2.55	105.66	330.84	140.35	2.37
	A0000582	631124.10	4192734.81	2.55	105.66	330.84	142.12	2.37
	A0000583	631215.24	4192785.82	2.55	106.37	343.61	141.82	2.37
	A0000584	631317.29	4192815.83	2.55	106.37	343.61	141.69	2.37
	A0000585	631419.27	4192845.83	2.55	93.23	344.24	136.01	2.37
	A0000586	631509.00	4192871.14	2.55	93.23	344.24	134.67	2.37
	A0000587	631598.73	4192896.46	2.55	93.23	344.24	132.07	2.37
	A0000588	631688.46	4192921.77	2.55	93.23	344.24	131.35	2.37
	A0000589	631778.19	4192947.09	2.55	93.23	344.24	131.15	2.37
	A0000590	631867.91	4192972.40	2.55	93.23	344.24	126.51	2.37
	A0000591	631956.79	4192997.55	2.55	106.45	353.28	124.66	2.37
	A0000592	632062.52	4193010.00	2.55	106.45	353.28	123.15	2.37
	A0000593	632168.24	4193022.46	2.55	106.45	353.28	117.27	2.37
	A0000594	632273.96	4193034.91	2.55	106.45	353.28	115.42	2.37
	A0000595	632379.68	4193047.36	2.55	106.45	353.28	115.57	2.37
	A0000596	632485.41	4193059.82	2.55	106.45	353.28	109.41	2.37
	A0000597	632592.23	4193072.52	2.55	88.75	341.57	106.60	2.37
	A0000598	632676.42	4193100.58	2.55	88.75	341.57	104.88	2.37

Control Pathway

Dispersion Options

Titles

C:\Users\DELL\Desktop\aydindenizli2\aydindenizli2.isc

Dispersion Options

☑ Regulatory Default ☐ Non-Default Options

Dispersion Coefficient

Rural

Output Type

☑ Concentration
☐ Total Deposition (Dry & Wet)
☐ Dry Deposition
☐ Wet Deposition

Plume Depletion

☐ Dry Removal
☐ Wet Removal

Output Warnings

☐ No Output Warnings
☐ Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

NO2

Averaging Time Options

Hours ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 6 ☐ 8 ☐ 12 ☐ 24

☐ Month ☐ Period ☑ Annual

☑ 1-Hour NO2 Non-NAAQS
☐ 1-Hour NO2 NAAQS

Exponential Decay

Option not available

Terrain Height Options

☐ Flat ☑ Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

☐ Yes ☑ No

Default Height = 0.00 m

Meteorology Pathway

Met Input Data

Surface Met Data

Filename: ..\..\met veri\Denizli Meteorolojik Veriler\Denizli_2015.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: ..\..\met veri\Denizli Meteorolojik Veriler\Denizli_2015.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 425,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2015			
Upper Air		2015			

Data Period

Data Period to Process

Start Date: 1.01.2015 Start Hour: 1 End Date: 31.12.2015 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Output Pathway

Tabular Printed Outputs

Short Term Averaging Period	RECTABLE Highest Values Table										MAXTABLE Maximum Values Table	DAYTABLE Daily Values Table
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		
1	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No

Threshold Violation Files (MAXIFILE)

Path for MAXIFILES: AYDINDENIZLI2-NO2.AD

Averaging Period	Source Group ID	Treshhold Value	File Unit (Optional)	File Name
1	highway	200,00		highway.MAX

Contour Plot Files (PLOTFILE)

Path for PLOTFILES: AYDINDENIZLI2-NO2.AD

Averaging Period	Source Group ID	High Value	File Name
1	highway	1st	01H1G001.PLT
1	highway	N/A	01H19G000.PLT
Annual	highway	N/A	AN00G000.PLT

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m (Optional)
1	690318.57	4186097.53	UCART5	293.66	
2	691318.57	4186097.53	UCART5	280.71	
3	692318.57	4186097.53	UCART5	270.09	
4	693318.57	4186097.53	UCART5	272.29	
5	694318.57	4186097.53	UCART5	274.00	
6	695318.57	4186097.53	UCART5	319.43	
7	696318.57	4186097.53	UCART5	290.24	
8	697318.57	4186097.53	UCART5	350.50	
9	698318.57	4186097.53	UCART5	363.91	
10	699318.57	4186097.53	UCART5	365.33	
11	700318.57	4186097.53	UCART5	378.59	
12	701318.57	4186097.53	UCART5	393.23	
13	702318.57	4186097.53	UCART5	398.93	
14	703318.57	4186097.53	UCART5	406.55	
15	704318.57	4186097.53	UCART5	420.37	
16	690318.57	4187097.53	UCART5	268.77	
17	691318.57	4187097.53	UCART5	260.47	
18	692318.57	4187097.53	UCART5	250.52	
19	693318.57	4187097.53	UCART5	252.37	
20	694318.57	4187097.53	UCART5	262.24	
21	695318.57	4187097.53	UCART5	277.52	
22	696318.57	4187097.53	UCART5	290.06	
23	697318.57	4187097.53	UCART5	346.29	
24	698318.57	4187097.53	UCART5	363.97	
25	699318.57	4187097.53	UCART5	376.82	
26	700318.57	4187097.53	UCART5	386.73	
27	701318.57	4187097.53	UCART5	397.16	
28	702318.57	4187097.53	UCART5	407.09	
29	703318.57	4187097.53	UCART5	417.87	
30	704318.57	4187097.53	UCART5	447.56	
31	690318.57	4188097.53	UCART5	240.80	
32	691318.57	4188097.53	UCART5	241.10	
33	692318.57	4188097.53	UCART5	239.03	

34	693318.57	4188097.53	UCART5	248.83
35	694318.57	4188097.53	UCART5	264.29
36	695318.57	4188097.53	UCART5	283.15
37	696318.57	4188097.53	UCART5	295.58
38	697318.57	4188097.53	UCART5	337.21
39	698318.57	4188097.53	UCART5	358.77
40	699318.57	4188097.53	UCART5	370.94
41	700318.57	4188097.53	UCART5	392.29
42	701318.57	4188097.53	UCART5	434.24
43	703318.57	4188097.53	UCART5	460.71
44	704318.57	4188097.53	UCART5	456.96
45	690318.57	4189097.53	UCART5	225.67
46	691318.57	4189097.53	UCART5	230.75
47	692318.57	4189097.53	UCART5	243.91
48	693318.57	4189097.53	UCART5	253.57
49	694318.57	4189097.53	UCART5	272.54
50	696318.57	4189097.53	UCART5	343.60
51	697318.57	4189097.53	UCART5	387.92
52	700318.57	4189097.53	UCART5	467.62
53	701318.57	4189097.53	UCART5	462.13
54	702318.57	4189097.53	UCART5	483.36
55	703318.57	4189097.53	UCART5	476.21
56	704318.57	4189097.53	UCART5	501.09
57	690318.57	4190097.53	UCART5	219.51
58	691318.57	4190097.53	UCART5	235.15
59	692318.57	4190097.53	UCART5	264.32
60	694318.57	4190097.53	UCART5	316.78
61	695318.57	4190097.53	UCART5	384.19
62	696318.57	4190097.53	UCART5	400.22
63	697318.57	4190097.53	UCART5	417.30
64	698318.57	4190097.53	UCART5	519.54
65	699318.57	4190097.53	UCART5	408.71
66	700318.57	4190097.53	UCART5	457.82
67	701318.57	4190097.53	UCART5	446.87
68	702318.57	4190097.53	UCART5	502.12
69	703318.57	4190097.53	UCART5	507.49
70	704318.57	4190097.53	UCART5	501.24
71	690318.57	4191097.53	UCART5	222.42
72	692318.57	4191097.53	UCART5	269.08
73	693318.57	4191097.53	UCART5	320.81
74	694318.57	4191097.53	UCART5	364.34

75	695318.57	4191097.53	UCART5	439.06
76	696318.57	4191097.53	UCART5	499.15
77	697318.57	4191097.53	UCART5	523.12
78	698318.57	4191097.53	UCART5	522.03
79	699318.57	4191097.53	UCART5	471.19
80	700318.57	4191097.53	UCART5	565.85
81	701318.57	4191097.53	UCART5	466.78
82	702318.57	4191097.53	UCART5	512.13
83	703318.57	4191097.53	UCART5	498.56
84	704318.57	4191097.53	UCART5	490.88
85	690318.57	4192097.53	UCART5	233.82
86	691318.57	4192097.53	UCART5	256.25
87	692318.57	4192097.53	UCART5	293.47
88	693318.57	4192097.53	UCART5	347.08
89	694318.57	4192097.53	UCART5	378.01
90	695318.57	4192097.53	UCART5	416.58
91	696318.57	4192097.53	UCART5	435.38
92	697318.57	4192097.53	UCART5	574.61
93	698318.57	4192097.53	UCART5	548.16
94	699318.57	4192097.53	UCART5	581.39
95	700318.57	4192097.53	UCART5	476.75
96	701318.57	4192097.53	UCART5	519.01
97	702318.57	4192097.53	UCART5	523.92
98	703318.57	4192097.53	UCART5	504.05
99	704318.57	4192097.53	UCART5	504.27
100	690318.57	4193097.53	UCART5	250.89
101	691318.57	4193097.53	UCART5	272.93
102	692318.57	4193097.53	UCART5	306.67
103	693318.57	4193097.53	UCART5	348.65
104	694318.57	4193097.53	UCART5	412.82
105	695318.57	4193097.53	UCART5	551.63
106	696318.57	4193097.53	UCART5	570.27
107	697318.57	4193097.53	UCART5	607.47
108	698318.57	4193097.53	UCART5	622.34
109	699318.57	4193097.53	UCART5	619.20
110	700318.57	4193097.53	UCART5	563.51
111	701318.57	4193097.53	UCART5	495.12
112	702318.57	4193097.53	UCART5	525.20
113	703318.57	4193097.53	UCART5	525.56
114	704318.57	4193097.53	UCART5	523.17
115	690318.57	4194097.53	UCART5	262.54

116	691318.57	4194097.53	UCART5	297.79
117	692318.57	4194097.53	UCART5	337.01
118	693318.57	4194097.53	UCART5	379.67
119	694318.57	4194097.53	UCART5	510.61
120	695318.57	4194097.53	UCART5	502.55
121	696318.57	4194097.53	UCART5	572.07
122	697318.57	4194097.53	UCART5	519.48
123	698318.57	4194097.53	UCART5	628.86
124	699318.57	4194097.53	UCART5	706.57
125	700318.57	4194097.53	UCART5	593.89
126	701318.57	4194097.53	UCART5	553.04
127	702318.57	4194097.53	UCART5	565.32
128	703318.57	4194097.53	UCART5	560.56
129	704318.57	4194097.53	UCART5	635.38
130	690318.57	4195097.53	UCART5	261.97
131	691318.57	4195097.53	UCART5	305.91
132	692318.57	4195097.53	UCART5	382.18
133	693318.57	4195097.53	UCART5	475.35
134	694318.57	4195097.53	UCART5	470.43
135	695318.57	4195097.53	UCART5	655.66
136	696318.57	4195097.53	UCART5	584.11
137	697318.57	4195097.53	UCART5	592.67
138	698318.57	4195097.53	UCART5	638.57
139	699318.57	4195097.53	UCART5	686.02
140	700318.57	4195097.53	UCART5	633.27
141	701318.57	4195097.53	UCART5	561.72
142	702318.57	4195097.53	UCART5	638.00
143	703318.57	4195097.53	UCART5	568.55
144	704318.57	4195097.53	UCART5	724.16
145	675824.47	4188157.32	UCART4	469.08
146	676824.47	4188157.32	UCART4	438.17
147	677824.47	4188157.32	UCART4	399.91
148	678824.47	4188157.32	UCART4	413.11
149	679824.47	4188157.32	UCART4	435.68
150	680824.47	4188157.32	UCART4	344.03
151	681824.47	4188157.32	UCART4	328.34
152	682824.47	4188157.32	UCART4	327.28
153	683824.47	4188157.32	UCART4	312.50
154	684824.47	4188157.32	UCART4	311.26
155	685824.47	4188157.32	UCART4	276.72
156	686824.47	4188157.32	UCART4	269.22

157	687824.47	4188157.32	UCART4	247.12
158	688824.47	4188157.32	UCART4	233.16
159	689824.47	4188157.32	UCART4	238.14
160	675824.47	4189157.32	UCART4	424.42
161	676824.47	4189157.32	UCART4	380.23
162	677824.47	4189157.32	UCART4	335.71
163	678824.47	4189157.32	UCART4	370.01
164	679824.47	4189157.32	UCART4	349.32
165	680824.47	4189157.32	UCART4	328.87
166	681824.47	4189157.32	UCART4	326.83
167	682824.47	4189157.32	UCART4	337.17
168	683824.47	4189157.32	UCART4	301.76
169	684824.47	4189157.32	UCART4	260.93
170	685824.47	4189157.32	UCART4	253.25
171	686824.47	4189157.32	UCART4	237.47
172	687824.47	4189157.32	UCART4	223.91
173	688824.47	4189157.32	UCART4	218.31
174	689824.47	4189157.32	UCART4	221.87
175	675824.47	4190157.32	UCART4	350.88
176	676824.47	4190157.32	UCART4	328.14
177	677824.47	4190157.32	UCART4	324.46
178	678824.47	4190157.32	UCART4	329.20
179	679824.47	4190157.32	UCART4	349.59
180	680824.47	4190157.32	UCART4	344.05
181	681824.47	4190157.32	UCART4	320.33
182	682824.47	4190157.32	UCART4	303.30
183	683824.47	4190157.32	UCART4	260.99
184	684824.47	4190157.32	UCART4	232.22
185	685824.47	4190157.32	UCART4	240.98
186	686824.47	4190157.32	UCART4	212.38
187	687824.47	4190157.32	UCART4	214.59
188	688824.47	4190157.32	UCART4	212.95
189	689824.47	4190157.32	UCART4	214.50
190	675824.47	4191157.32	UCART4	301.75
191	676824.47	4191157.32	UCART4	278.16
192	677824.47	4191157.32	UCART4	274.63
193	678824.47	4191157.32	UCART4	297.23
194	679824.47	4191157.32	UCART4	334.72
195	680824.47	4191157.32	UCART4	336.41
196	681824.47	4191157.32	UCART4	304.56
197	682824.47	4191157.32	UCART4	287.63

198	683824.47	4191157.32	UCART4	309.13
199	684824.47	4191157.32	UCART4	242.53
200	685824.47	4191157.32	UCART4	208.48
201	686824.47	4191157.32	UCART4	199.55
202	687824.47	4191157.32	UCART4	201.85
203	688824.47	4191157.32	UCART4	209.63
204	689824.47	4191157.32	UCART4	215.02
205	675824.47	4192157.32	UCART4	254.13
206	676824.47	4192157.32	UCART4	252.21
207	679824.47	4192157.32	UCART4	329.94
208	680824.47	4192157.32	UCART4	356.88
209	681824.47	4192157.32	UCART4	315.27
210	682824.47	4192157.32	UCART4	323.24
211	683824.47	4192157.32	UCART4	263.00
212	684824.47	4192157.32	UCART4	221.18
213	685824.47	4192157.32	UCART4	197.72
214	688824.47	4192157.32	UCART4	206.20
215	689824.47	4192157.32	UCART4	223.02
216	676824.47	4193157.32	UCART4	211.11
217	677824.47	4193157.32	UCART4	228.79
218	678824.47	4193157.32	UCART4	263.29
219	679824.47	4193157.32	UCART4	272.03
220	682824.47	4193157.32	UCART4	254.91
221	685824.47	4193157.32	UCART4	184.87
222	686824.47	4193157.32	UCART4	193.92
223	687824.47	4193157.32	UCART4	198.23
224	688824.47	4193157.32	UCART4	212.23
225	689824.47	4193157.32	UCART4	234.18
226	675824.47	4194157.32	UCART4	203.43
227	676824.47	4194157.32	UCART4	192.43
228	677824.47	4194157.32	UCART4	206.92
229	678824.47	4194157.32	UCART4	210.16
230	679824.47	4194157.32	UCART4	227.00
231	680824.47	4194157.32	UCART4	258.14
232	681824.47	4194157.32	UCART4	263.73
233	682824.47	4194157.32	UCART4	228.75
234	683824.47	4194157.32	UCART4	201.87
235	684824.47	4194157.32	UCART4	183.73
236	685824.47	4194157.32	UCART4	184.72
237	686824.47	4194157.32	UCART4	188.05
238	687824.47	4194157.32	UCART4	199.02

239	688824.47	4194157.32	UCART4	218.58
240	689824.47	4194157.32	UCART4	243.28
241	675824.47	4195157.32	UCART4	181.43
242	676824.47	4195157.32	UCART4	180.86
243	677824.47	4195157.32	UCART4	182.75
244	678824.47	4195157.32	UCART4	194.28
245	679824.47	4195157.32	UCART4	253.68
246	680824.47	4195157.32	UCART4	222.83
247	681824.47	4195157.32	UCART4	201.60
248	682824.47	4195157.32	UCART4	189.40
249	683824.47	4195157.32	UCART4	182.88
250	684824.47	4195157.32	UCART4	179.76
251	685824.47	4195157.32	UCART4	182.04
252	686824.47	4195157.32	UCART4	189.18
253	687824.47	4195157.32	UCART4	208.46
254	688824.47	4195157.32	UCART4	232.21
255	689824.47	4195157.32	UCART4	251.80
256	675824.47	4196157.32	UCART4	166.25
257	676824.47	4196157.32	UCART4	167.07
258	677824.47	4196157.32	UCART4	160.53
259	678824.47	4196157.32	UCART4	163.18
260	679824.47	4196157.32	UCART4	169.66
261	680824.47	4196157.32	UCART4	182.17
262	681824.47	4196157.32	UCART4	173.56
263	682824.47	4196157.32	UCART4	171.55
264	683824.47	4196157.32	UCART4	173.74
265	684824.47	4196157.32	UCART4	176.40
266	685824.47	4196157.32	UCART4	181.04
267	686824.47	4196157.32	UCART4	188.04
268	687824.47	4196157.32	UCART4	213.42
269	688824.47	4196157.32	UCART4	240.96
270	689824.47	4196157.32	UCART4	281.23
271	675824.47	4197157.32	UCART4	156.21
272	676824.47	4197157.32	UCART4	160.40
273	677824.47	4197157.32	UCART4	156.10
274	678824.47	4197157.32	UCART4	157.77
275	679824.47	4197157.32	UCART4	160.49
276	680824.47	4197157.32	UCART4	163.87
277	681824.47	4197157.32	UCART4	166.10
278	682824.47	4197157.32	UCART4	167.78
279	683824.47	4197157.32	UCART4	171.07

280	684824.47	4197157.32	UCART4	184.73
281	685824.47	4197157.32	UCART4	205.58
282	686824.47	4197157.32	UCART4	203.34
283	687824.47	4197157.32	UCART4	266.64
284	688824.47	4197157.32	UCART4	316.37
285	689824.47	4197157.32	UCART4	360.95
286	660443.31	4191912.47	UCART3	492.89
287	661443.31	4191912.47	UCART3	478.80
288	662443.31	4191912.47	UCART3	523.81
289	663443.31	4191912.47	UCART3	455.96
290	664443.31	4191912.47	UCART3	408.60
291	665443.31	4191912.47	UCART3	305.29
292	666443.31	4191912.47	UCART3	285.21
293	667443.31	4191912.47	UCART3	378.07
294	668443.31	4191912.47	UCART3	367.70
295	669443.31	4191912.47	UCART3	454.94
296	670443.31	4191912.47	UCART3	394.52
297	671443.31	4191912.47	UCART3	376.11
298	672443.31	4191912.47	UCART3	398.58
299	673443.31	4191912.47	UCART3	384.12
300	674443.31	4191912.47	UCART3	315.93
301	675443.31	4191912.47	UCART3	279.78
302	660443.31	4192912.47	UCART3	471.24
303	661443.31	4192912.47	UCART3	413.58
304	662443.31	4192912.47	UCART3	341.86
305	663443.31	4192912.47	UCART3	362.80
306	664443.31	4192912.47	UCART3	320.74
307	665443.31	4192912.47	UCART3	375.29
308	666443.31	4192912.47	UCART3	373.35
309	667443.31	4192912.47	UCART3	311.90
310	668443.31	4192912.47	UCART3	300.23
311	669443.31	4192912.47	UCART3	346.96
312	670443.31	4192912.47	UCART3	327.19
313	671443.31	4192912.47	UCART3	322.98
314	672443.31	4192912.47	UCART3	296.78
315	673443.31	4192912.47	UCART3	289.02
316	674443.31	4192912.47	UCART3	269.50
317	675443.31	4192912.47	UCART3	241.25
318	660443.31	4193912.47	UCART3	498.16
319	661443.31	4193912.47	UCART3	439.45
320	662443.31	4193912.47	UCART3	402.64

Receptor Pathway

321	663443.31	4193912.47	UCART3	375.06
322	664443.31	4193912.47	UCART3	284.37
323	665443.31	4193912.47	UCART3	329.77
324	666443.31	4193912.47	UCART3	277.06
325	667443.31	4193912.47	UCART3	236.48
326	668443.31	4193912.47	UCART3	310.09
327	669443.31	4193912.47	UCART3	303.17
328	670443.31	4193912.47	UCART3	272.09
329	671443.31	4193912.47	UCART3	271.81
330	672443.31	4193912.47	UCART3	349.54
331	673443.31	4193912.47	UCART3	277.69
332	675443.31	4193912.47	UCART3	214.02
333	660443.31	4194912.47	UCART3	377.48
334	661443.31	4194912.47	UCART3	305.99
335	662443.31	4194912.47	UCART3	341.51
336	663443.31	4194912.47	UCART3	255.98
337	664443.31	4194912.47	UCART3	313.16
338	665443.31	4194912.47	UCART3	255.16
339	666443.31	4194912.47	UCART3	233.72
340	667443.31	4194912.47	UCART3	223.40
341	668443.31	4194912.47	UCART3	237.36
342	669443.31	4194912.47	UCART3	252.02
343	670443.31	4194912.47	UCART3	241.97
344	671443.31	4194912.47	UCART3	254.72
345	673443.31	4194912.47	UCART3	249.50
346	674443.31	4194912.47	UCART3	212.24
347	675443.31	4194912.47	UCART3	187.28
348	660443.31	4195912.47	UCART3	256.98
349	661443.31	4195912.47	UCART3	259.12
350	662443.31	4195912.47	UCART3	212.44
351	663443.31	4195912.47	UCART3	254.19
352	664443.31	4195912.47	UCART3	230.51
353	665443.31	4195912.47	UCART3	220.64
354	666443.31	4195912.47	UCART3	213.87
355	672443.31	4195912.47	UCART3	199.11
356	673443.31	4195912.47	UCART3	188.02
357	674443.31	4195912.47	UCART3	177.57
358	675443.31	4195912.47	UCART3	168.67
359	660443.31	4196912.47	UCART3	278.22
360	661443.31	4196912.47	UCART3	191.33
361	662443.31	4196912.47	UCART3	227.57

362	663443.31	4196912.47	UCART3	196.09
363	664443.31	4196912.47	UCART3	201.86
364	666443.31	4196912.47	UCART3	181.41
365	667443.31	4196912.47	UCART3	204.06
366	668443.31	4196912.47	UCART3	183.84
367	669443.31	4196912.47	UCART3	206.18
368	670443.31	4196912.47	UCART3	215.21
369	671443.31	4196912.47	UCART3	181.35
370	672443.31	4196912.47	UCART3	175.95
371	673443.31	4196912.47	UCART3	163.52
372	674443.31	4196912.47	UCART3	162.36
373	675443.31	4196912.47	UCART3	159.55
374	660443.31	4197912.47	UCART3	206.84
375	662443.31	4197912.47	UCART3	158.39
376	663443.31	4197912.47	UCART3	165.56
377	664443.31	4197912.47	UCART3	180.08
378	665443.31	4197912.47	UCART3	164.02
379	666443.31	4197912.47	UCART3	163.59
380	667443.31	4197912.47	UCART3	192.11
381	668443.31	4197912.47	UCART3	169.03
382	669443.31	4197912.47	UCART3	168.91
383	670443.31	4197912.47	UCART3	173.66
384	671443.31	4197912.47	UCART3	171.83
385	672443.31	4197912.47	UCART3	168.00
386	673443.31	4197912.47	UCART3	157.19
387	674443.31	4197912.47	UCART3	155.14
388	675443.31	4197912.47	UCART3	154.03
389	660443.31	4198912.47	UCART3	151.48
390	661443.31	4198912.47	UCART3	140.75
391	662443.31	4198912.47	UCART3	145.73
392	663443.31	4198912.47	UCART3	149.65
393	664443.31	4198912.47	UCART3	152.58
394	665443.31	4198912.47	UCART3	152.28
395	666443.31	4198912.47	UCART3	152.14
396	667443.31	4198912.47	UCART3	158.24
397	668443.31	4198912.47	UCART3	158.21
398	669443.31	4198912.47	UCART3	165.61
399	670443.31	4198912.47	UCART3	163.82
400	671443.31	4198912.47	UCART3	161.08
401	672443.31	4198912.47	UCART3	160.20
402	673443.31	4198912.47	UCART3	156.90

403	674443.31	4198912.47	UCART3	150.41
404	675443.31	4198912.47	UCART3	150.53
405	660443.31	4199912.47	UCART3	132.85
406	661443.31	4199912.47	UCART3	133.47
407	662443.31	4199912.47	UCART3	137.09
408	663443.31	4199912.47	UCART3	139.40
409	664443.31	4199912.47	UCART3	142.70
410	665443.31	4199912.47	UCART3	143.92
411	666443.31	4199912.47	UCART3	145.84
412	667443.31	4199912.47	UCART3	148.89
413	668443.31	4199912.47	UCART3	150.43
414	669443.31	4199912.47	UCART3	154.94
415	670443.31	4199912.47	UCART3	155.01
416	671443.31	4199912.47	UCART3	154.30
417	672443.31	4199912.47	UCART3	150.76
418	673443.31	4199912.47	UCART3	149.41
419	674443.31	4199912.47	UCART3	149.03
420	675443.31	4199912.47	UCART3	146.76
421	660443.31	4200912.47	UCART3	134.00
422	661443.31	4200912.47	UCART3	134.76
423	662443.31	4200912.47	UCART3	135.27
424	663443.31	4200912.47	UCART3	137.95
425	664443.31	4200912.47	UCART3	139.00
426	665443.31	4200912.47	UCART3	139.66
427	666443.31	4200912.47	UCART3	141.29
428	667443.31	4200912.47	UCART3	141.49
429	668443.31	4200912.47	UCART3	145.12
430	669443.31	4200912.47	UCART3	147.93
431	670443.31	4200912.47	UCART3	147.66
432	671443.31	4200912.47	UCART3	146.47
433	672443.31	4200912.47	UCART3	145.71
434	673443.31	4200912.47	UCART3	144.95
435	674443.31	4200912.47	UCART3	147.15
436	675443.31	4200912.47	UCART3	148.11
437	631529.04	4189779.39	UCART1	642.91
438	632529.04	4189779.39	UCART1	751.87
439	633529.04	4189779.39	UCART1	597.09
440	634529.04	4189779.39	UCART1	450.02
441	635529.04	4189779.39	UCART1	315.49
442	636529.04	4189779.39	UCART1	165.90
443	637529.04	4189779.39	UCART1	132.21

444	638529.04	4189779.39	UCART1	154.13
445	639529.04	4189779.39	UCART1	235.50
446	640529.04	4189779.39	UCART1	289.65
447	641529.04	4189779.39	UCART1	410.14
448	642529.04	4189779.39	UCART1	606.61
449	643529.04	4189779.39	UCART1	572.55
450	644529.04	4189779.39	UCART1	570.59
451	645529.04	4189779.39	UCART1	616.99
452	646529.04	4189779.39	UCART1	645.48
453	647529.04	4189779.39	UCART1	589.20
454	648529.04	4189779.39	UCART1	689.19
455	631529.04	4190779.39	UCART1	382.81
456	632529.04	4190779.39	UCART1	404.29
457	633529.04	4190779.39	UCART1	442.40
458	634529.04	4190779.39	UCART1	284.01
459	635529.04	4190779.39	UCART1	166.38
460	636529.04	4190779.39	UCART1	113.18
461	637529.04	4190779.39	UCART1	148.23
462	638529.04	4190779.39	UCART1	207.82
463	639529.04	4190779.39	UCART1	217.70
464	640529.04	4190779.39	UCART1	299.83
465	641529.04	4190779.39	UCART1	448.54
466	642529.04	4190779.39	UCART1	481.56
467	643529.04	4190779.39	UCART1	402.31
468	644529.04	4190779.39	UCART1	477.99
469	645529.04	4190779.39	UCART1	474.21
470	646529.04	4190779.39	UCART1	488.30
471	647529.04	4190779.39	UCART1	397.80
472	648529.04	4190779.39	UCART1	522.47
473	631529.04	4191779.39	UCART1	237.74
474	632529.04	4191779.39	UCART1	296.56
475	633529.04	4191779.39	UCART1	310.55
476	634529.04	4191779.39	UCART1	164.98
477	635529.04	4191779.39	UCART1	120.88
478	636529.04	4191779.39	UCART1	102.88
479	637529.04	4191779.39	UCART1	111.59
480	638529.04	4191779.39	UCART1	142.57
481	639529.04	4191779.39	UCART1	192.79
482	640529.04	4191779.39	UCART1	282.43
483	641529.04	4191779.39	UCART1	283.49
484	642529.04	4191779.39	UCART1	342.82

485	643529.04	4191779.39	UCART1	353.42
486	644529.04	4191779.39	UCART1	396.00
487	645529.04	4191779.39	UCART1	462.49
488	646529.04	4191779.39	UCART1	365.86
489	647529.04	4191779.39	UCART1	386.48
490	648529.04	4191779.39	UCART1	454.79
491	631529.04	4192779.39	UCART1	142.94
492	632529.04	4192779.39	UCART1	132.64
493	633529.04	4192779.39	UCART1	193.24
494	635529.04	4192779.39	UCART1	89.01
495	636529.04	4192779.39	UCART1	108.71
496	638529.04	4192779.39	UCART1	163.21
497	639529.04	4192779.39	UCART1	183.35
498	640529.04	4192779.39	UCART1	187.34
499	641529.04	4192779.39	UCART1	194.90
500	642529.04	4192779.39	UCART1	251.62
501	643529.04	4192779.39	UCART1	333.82
502	644529.04	4192779.39	UCART1	419.92
503	645529.04	4192779.39	UCART1	277.26
504	646529.04	4192779.39	UCART1	335.65
505	647529.04	4192779.39	UCART1	441.98
506	648529.04	4192779.39	UCART1	393.26
507	631529.04	4193779.39	UCART1	83.28
508	632529.04	4193779.39	UCART1	79.20
509	633529.04	4193779.39	UCART1	76.08
510	634529.04	4193779.39	UCART1	83.82
511	635529.04	4193779.39	UCART1	82.28
512	636529.04	4193779.39	UCART1	82.92
513	637529.04	4193779.39	UCART1	88.25
514	638529.04	4193779.39	UCART1	105.05
515	640529.04	4193779.39	UCART1	132.59
516	641529.04	4193779.39	UCART1	209.46
517	642529.04	4193779.39	UCART1	293.73
518	643529.04	4193779.39	UCART1	285.42
519	644529.04	4193779.39	UCART1	280.28
520	645529.04	4193779.39	UCART1	207.46
521	646529.04	4193779.39	UCART1	267.57
522	647529.04	4193779.39	UCART1	298.16
523	648529.04	4193779.39	UCART1	451.32
524	631529.04	4194779.39	UCART1	75.25
525	632529.04	4194779.39	UCART1	75.94

526	633529.04	4194779.39	UCART1	77.46
527	634529.04	4194779.39	UCART1	80.34
528	635529.04	4194779.39	UCART1	80.39
529	636529.04	4194779.39	UCART1	80.50
530	637529.04	4194779.39	UCART1	82.09
531	638529.04	4194779.39	UCART1	85.49
532	639529.04	4194779.39	UCART1	93.86
533	640529.04	4194779.39	UCART1	104.93
534	644529.04	4194779.39	UCART1	174.46
535	645529.04	4194779.39	UCART1	204.17
536	646529.04	4194779.39	UCART1	263.22
537	647529.04	4194779.39	UCART1	401.31
538	648068.07	4194385.65	UCART1	453.87
539	631529.04	4195779.39	UCART1	75.04
540	632529.04	4195779.39	UCART1	74.09
541	633529.04	4195779.39	UCART1	84.56
542	634529.04	4195779.39	UCART1	88.69
543	635529.04	4195779.39	UCART1	88.90
544	636529.04	4195779.39	UCART1	82.31
545	637529.04	4195779.39	UCART1	83.00
546	638529.04	4195779.39	UCART1	83.66
547	639529.04	4195779.39	UCART1	86.62
548	640529.04	4195779.39	UCART1	89.59
549	641529.04	4195779.39	UCART1	94.00
550	642529.04	4195779.39	UCART1	104.10
551	643529.04	4195779.39	UCART1	122.22
552	644529.04	4195779.39	UCART1	138.51
553	645529.04	4195134.49	UCART1	182.80
554	646529.04	4195779.39	UCART1	203.17
555	647529.04	4195779.39	UCART1	327.52
556	631529.04	4196779.39	UCART1	96.71
557	632529.04	4196779.39	UCART1	92.77
558	633529.04	4196779.39	UCART1	102.39
559	634529.04	4196779.39	UCART1	106.26
560	635529.04	4196779.39	UCART1	103.86
561	636529.04	4196779.39	UCART1	98.93
562	637529.04	4196779.39	UCART1	88.08
563	638529.04	4196779.39	UCART1	90.22
564	639529.04	4196779.39	UCART1	85.00
565	640529.04	4196779.39	UCART1	88.55
566	641529.04	4196779.39	UCART1	91.00

567	642529.04	4196779.39	UCART1	97.49
568	643529.04	4196779.39	UCART1	107.72
569	644529.04	4196779.39	UCART1	116.92
570	645529.04	4196779.39	UCART1	130.30
571	646529.04	4196779.39	UCART1	167.26
572	647529.04	4196779.39	UCART1	217.36
573	648529.04	4196779.39	UCART1	267.49
574	631529.04	4197779.39	UCART1	169.73
575	632529.04	4197779.39	UCART1	146.51
576	633529.04	4197779.39	UCART1	130.21
577	634529.04	4197779.39	UCART1	140.87
578	635529.04	4197779.39	UCART1	127.62
579	636529.04	4197779.39	UCART1	109.71
580	637529.04	4197779.39	UCART1	107.70
581	638529.04	4197779.39	UCART1	112.62
582	639529.04	4197779.39	UCART1	113.56
583	640529.04	4197779.39	UCART1	109.65
584	641529.04	4197779.39	UCART1	116.23
585	642529.04	4197779.39	UCART1	116.25
586	643529.04	4197779.39	UCART1	105.95
587	644529.04	4197779.39	UCART1	102.20
588	645529.04	4197779.39	UCART1	112.43
589	646529.04	4197779.39	UCART1	143.43
590	647529.04	4197779.39	UCART1	205.98
591	648529.04	4197779.39	UCART1	280.60
592	631529.04	4198779.39	UCART1	255.31
593	632529.04	4198779.39	UCART1	204.75
594	633529.04	4198779.39	UCART1	199.96
595	634529.04	4198779.39	UCART1	183.83
596	635529.04	4198779.39	UCART1	161.11
597	636529.04	4198779.39	UCART1	179.19
598	637529.04	4198779.39	UCART1	164.39
599	638529.04	4198779.39	UCART1	154.41
600	639529.04	4198779.39	UCART1	157.24
601	640529.04	4198779.39	UCART1	152.51
602	641529.04	4198779.39	UCART1	168.16
603	642529.04	4198779.39	UCART1	161.51
604	643529.04	4198779.39	UCART1	152.54
605	644529.04	4198779.39	UCART1	130.61
606	645529.04	4198779.39	UCART1	120.77
607	646529.04	4198779.39	UCART1	109.19

608	648529.04	4198779.39	UCART1	238.56
609	647074.24	4195469.20	UCART2	276.93
610	648074.24	4195469.20	UCART2	314.88
611	650074.24	4195469.20	UCART2	450.45
612	651074.24	4195469.20	UCART2	615.32
613	652074.24	4195469.20	UCART2	879.25
614	653074.24	4195469.20	UCART2	942.03
615	654074.24	4195469.20	UCART2	669.70
616	655074.24	4195469.20	UCART2	567.33
617	656074.24	4195469.20	UCART2	640.61
618	657074.24	4195469.20	UCART2	687.96
619	658074.24	4195469.20	UCART2	552.21
620	659074.24	4195469.20	UCART2	399.37
621	660074.24	4195469.20	UCART2	369.05
622	647074.24	4196469.20	UCART2	218.67
623	648074.24	4196469.20	UCART2	250.00
624	649074.24	4196469.20	UCART2	314.56
625	650074.24	4196469.20	UCART2	409.76
626	651074.24	4196469.20	UCART2	608.04
627	652074.24	4196469.20	UCART2	756.00
628	653074.24	4196469.20	UCART2	785.89
629	654074.24	4196469.20	UCART2	623.41
630	655074.24	4196469.20	UCART2	461.16
631	656074.24	4196469.20	UCART2	463.56
632	657074.24	4196469.20	UCART2	577.55
633	658074.24	4196469.20	UCART2	481.58
634	659074.24	4196469.20	UCART2	451.93
635	660074.24	4196469.20	UCART2	382.31
636	647074.24	4197469.20	UCART2	190.84
637	648074.24	4197469.20	UCART2	260.93
638	649074.24	4197469.20	UCART2	309.61
639	650074.24	4197469.20	UCART2	498.23
640	651074.24	4197469.20	UCART2	609.38
641	652074.24	4197469.20	UCART2	600.10
642	653074.24	4197469.20	UCART2	546.27
643	654074.24	4197469.20	UCART2	501.66
644	655074.24	4197469.20	UCART2	490.31
645	656074.24	4197469.20	UCART2	312.30
646	657074.24	4197469.20	UCART2	401.25
647	658074.24	4197469.20	UCART2	464.65
648	659074.24	4197469.20	UCART2	389.32

649	660074.24	4197469.20	UCART2	269.52
650	647074.24	4198469.20	UCART2	135.06
651	648074.24	4198469.20	UCART2	205.50
652	649074.24	4198469.20	UCART2	334.21
653	650074.24	4198469.20	UCART2	477.27
654	651074.24	4198469.20	UCART2	587.73
655	652074.24	4198469.20	UCART2	624.27
656	653074.24	4198469.20	UCART2	439.80
657	654074.24	4198469.20	UCART2	299.08
658	655074.24	4198469.20	UCART2	463.63
659	656074.24	4198469.20	UCART2	264.78
660	657074.24	4198469.20	UCART2	206.43
661	647074.24	4199469.20	UCART2	118.70
662	649074.24	4199469.20	UCART2	213.59
663	650074.24	4199469.20	UCART2	377.29
664	651074.24	4199469.20	UCART2	464.67
665	652074.24	4199469.20	UCART2	463.02
666	653074.24	4199469.20	UCART2	472.02
667	654074.24	4199469.20	UCART2	247.70
668	655074.24	4199469.20	UCART2	200.09
669	657074.24	4199469.20	UCART2	190.50
670	658074.24	4199469.20	UCART2	142.52
671	659074.24	4199469.20	UCART2	133.35
672	660074.24	4199469.20	UCART2	134.55
673	647074.24	4200469.20	UCART2	158.57
674	648074.24	4200469.20	UCART2	131.75
675	650074.24	4200469.20	UCART2	209.88
676	651074.24	4200469.20	UCART2	307.04
677	652074.24	4200469.20	UCART2	341.82
678	653074.24	4200469.20	UCART2	292.54
679	654074.24	4200469.20	UCART2	240.99
680	656074.24	4200469.20	UCART2	129.70
681	657074.24	4200469.20	UCART2	130.89
682	658074.24	4200469.20	UCART2	132.81
683	659074.24	4200469.20	UCART2	134.09
684	660074.24	4200469.20	UCART2	133.98
685	647074.24	4201469.20	UCART2	206.95
686	648074.24	4201469.20	UCART2	161.67
687	649074.24	4201469.20	UCART2	150.93
688	650074.24	4201469.20	UCART2	129.67
689	654074.24	4201469.20	UCART2	128.78

690	655074.24	4201469.20	UCART2	128.94
691	656074.24	4201469.20	UCART2	133.30
692	657074.24	4201469.20	UCART2	143.02
693	658074.24	4201469.20	UCART2	166.28
694	659074.24	4201469.20	UCART2	161.32
695	660074.24	4201469.20	UCART2	147.80
696	647074.24	4202469.20	UCART2	235.17
697	648074.24	4202469.20	UCART2	205.58
698	649074.24	4202469.20	UCART2	194.19
699	650074.24	4202469.20	UCART2	158.13
700	651074.24	4202469.20	UCART2	133.94
701	652074.24	4202469.20	UCART2	135.88
702	653074.24	4202469.20	UCART2	145.25
703	654074.24	4202469.20	UCART2	148.63
704	655074.24	4202469.20	UCART2	157.02
705	656074.24	4202469.20	UCART2	156.86
706	657074.24	4202469.20	UCART2	167.03
707	658074.24	4202469.20	UCART2	198.62
708	659074.24	4202469.20	UCART2	196.70
709	660074.24	4202469.20	UCART2	196.67
710	647074.24	4203469.20	UCART2	327.93
711	648074.24	4203469.20	UCART2	258.06
712	649074.24	4203469.20	UCART2	229.21
713	650074.24	4203469.20	UCART2	176.25
714	651074.24	4203469.20	UCART2	146.78
715	652074.24	4203469.20	UCART2	152.66
716	653074.24	4203469.20	UCART2	176.42
717	654074.24	4203469.20	UCART2	182.54
718	655074.24	4203469.20	UCART2	206.32
719	656074.24	4203469.20	UCART2	189.87
720	657074.24	4203469.20	UCART2	208.43
721	658074.24	4203469.20	UCART2	225.72
722	659074.24	4203469.20	UCART2	313.27
723	660074.24	4203469.20	UCART2	355.12
724	647074.24	4204469.20	UCART2	396.92
725	648074.24	4204469.20	UCART2	304.67
726	649074.24	4204469.20	UCART2	371.23
727	650074.24	4204469.20	UCART2	331.98
728	651074.24	4204469.20	UCART2	279.81
729	652074.24	4204469.20	UCART2	209.25
730	653074.24	4204469.20	UCART2	218.18

731	654074.24	4204469.20	UCART2	223.36
732	655074.24	4204469.20	UCART2	240.54
733	656074.24	4204469.20	UCART2	275.55
734	657074.24	4204469.20	UCART2	334.49
735	658074.24	4204469.20	UCART2	471.98
736	659074.24	4204469.20	UCART2	374.67
737	660074.24	4204469.20	UCART2	507.00
738	699388.00	4188032.00		372.33
739	693023.00	4190525.00		290.05
740	678692.00	4192804.00		256.83
741	679309.00	4190519.00		337.05
742	674023.00	4194530.00		252.91
743	671553.00	4196745.00		184.09
744	670327.00	4199829.00		155.32
745	654789.00	4200696.00		141.83
746	654966.00	4202308.00		150.35
747	653098.00	4202601.00		148.80
748	649097.00	4196063.00		345.86
749	669993.00	4199783.00		155.60
750	649110.00	4196043.00		350.29
751	700793.00	4187746.00		431.66
752	693174.80	4190223.74		285.73
753	673976.00	4194352.00		266.21
754	678657.00	4192640.98		264.17
755	679245.00	4190295.00		345.99
756	654800.00	4200475.00		148.62
757	671422.00	4196466.00		197.80
758	653213.00	4202815.00		155.26
759	655010.00	4202257.00		148.99

Plant Boundary Receptors

Receptor Pathway

Receptor Groups

Record Number	Group ID	Group Description
1	UPOL1	
2	NPOL1	
3	NPOL2	
4	UCART5	Receptors generated from Uniform Cartesian Grid
5	UCART4	Receptors generated from Uniform Cartesian Grid
6	UCART3	Receptors generated from Uniform Cartesian Grid
7	UCART1	Receptors generated from Uniform Cartesian Grid
8	UCART2	Receptors generated from Uniform Cartesian Grid

Results Summary

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NO2 - Concentration - Source Group: HIGHWAY

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	221.77387	ug/m^3	666443.31	4196912.47	181.41	0.00	2299.00	
1-HR	19TH	183.29006	ug/m^3	636529.04	4191779.39	102.88	0.00	1694.00	
ANNUAL		17.33234	ug/m^3	654800.00	4200475.00	148.62	0.00	1390.00	
1		7.00000	COUNT	666443.31	4196912.47	181.41	0.00	2299.00	

Source Pathway - Source Inputs

AERMOD

Source Pathway - Source Inputs

Line Area Sources

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	632721.04	4193329.80	93.15	2.55
			633372.68	4193292.92	84.14	2.55
			633663.14	4193192.50	85.95	2.55
			634044.77	4193047.25	85.03	2.55
			634426.40	4192890.61	93.15	2.55
			634766.53	4192738.60	96.76	2.55
			635182.05	4192493.98	91.66	2.55
			635590.87	4192282.87	93.32	2.55
			635691.39	4192256.07	95.16	2.55
			635990.61	4192185.44	97.08	2.55
			636167.37	4192158.80	96.01	2.55
			636407.08	4192168.49	96.99	2.55
			636736.38	4192202.38	99.30	2.55
			637005.15	4192284.71	101.28	2.55
			637436.14	4192509.89	111.59	2.55
			637970.37	4192916.43	134.93	2.55
			638557.04	4193251.14	140.72	2.55
			639294.81	4193482.25	162.97	2.55
			639863.69	4193695.58	150.50	2.55
			640530.34	4194104.46	126.78	2.55
			641161.44	4194753.34	113.12	2.55
			641641.43	4195020.00	119.03	2.55
			642130.31	4195073.33	161.57	2.55
			642921.41	4194984.44	158.31	2.55
			643765.62	4194964.89	207.99	2.55
			644581.39	4195247.27	150.12	2.55
			645167.07	4195770.20	145.69	2.55
			645585.42	4196334.97	138.85	2.55
			646028.07	4196859.04	148.22	2.55
			646671.78	4197426.87	155.64	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	647211.37	4198127.06	144.61	2.55
			648115.10	4199373.95	121.73	2.55
			649226.63	4200476.58	126.60	2.55
			650587.13	4201241.31	126.32	2.55
			651271.83	4201516.97	142.55	2.55
			652001.87	4201607.16	130.70	2.55
			652689.77	4201501.33	132.72	2.55
			653503.67	4201278.21	130.17	2.55
			654473.17	4200477.71	178.48	2.55
			654647.42	4200355.13	184.74	2.55
			654801.52	4200262.32	175.76	2.55
			655884.74	4199450.48	163.61	2.55
			656809.84	4198851.95	203.39	2.55
			657279.08	4198652.69	192.89	2.55
			658031.14	4198421.28	184.95	2.55
			658924.63	4198344.15	247.05	2.55
			659644.55	4198292.72	181.97	2.55
			660884.10	4197987.55	157.78	2.55
			661362.51	4197783.18	176.61	2.55
			662003.49	4197569.52	167.91	2.55
			663104.49	4197407.33	170.20	2.55
			664028.29	4197407.33	187.97	2.55
			664915.14	4197222.57	172.01	2.55
			665838.93	4196692.93	189.33	2.55
			666504.07	4196298.77	197.43	2.55
			667230.79	4196064.74	208.51	2.55
			667834.34	4195966.21	197.77	2.55
			668634.96	4195990.84	198.35	2.55
			669429.91	4196048.99	225.86	2.55
			670275.44	4195951.09	209.08	2.55
			670987.46	4195799.78	209.56	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	671654.98	4195523.87	224.54	2.55
			672108.90	4195256.86	217.63	2.55
			673572.48	4194273.47	280.92	2.55
			674484.16	4193854.59	227.17	2.55
			675506.72	4193497.31	224.52	2.55
			676258.24	4193016.83	223.32	2.55
			676919.78	4192538.39	233.44	2.55
			677863.43	4192298.03	240.24	2.55
			678424.28	4192333.64	234.68	2.55
			679617.19	4192698.63	272.82	2.55
			680988.16	4193259.48	305.80	2.55
			681381.01	4193501.00	303.57	2.55
			681916.85	4193621.30	284.62	2.55
			682507.38	4193670.51	247.37	2.55
			683048.70	4193604.89	239.67	2.55
			683436.91	4193490.07	220.24	2.55
			683901.68	4193347.90	208.00	2.55
			686416.84	4192308.74	190.97	2.55
			689276.83	4191627.79	211.01	2.55
			690313.97	4191460.17	225.19	2.55
			691078.73	4191030.64	236.00	2.55
			692388.25	4190244.93	268.79	2.55
			693153.01	4190024.93	280.46	2.55
			694846.68	4189185.34	289.92	2.55
			695367.87	4188902.23	308.96	2.55
			695869.76	4188677.02	322.35	2.55
			696358.01	4188590.07	332.99	2.55
			697735.78	4188807.61	368.64	2.55
			698620.45	4188981.64	412.63	2.55
			699798.00	4188749.49	424.87	2.55
			700463.79	4188901.78	452.05	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	0,00002	2.37	701084.68	4189393.95	480.34	2.55
			701751.01	4189742.26	486.85	2.55
			702385.70	4189803.57	519.96	2.55
			702946.97	4189571.93	483.46	2.55
			703036.07	4189465.02	486.10	2.55
			701726.21	4187633.82	424.15	2.55

Source Pathway - Source Inputs

Area Sources Generated from Line Sources

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000053	632720.59	4193321.82	2.55	652.68	3.24	92.69	2.37
	A0000054	633370.07	4193285.36	2.55	307.33	19.07	85.89	2.37
	A0000055	633660.29	4193185.02	2.55	408.34	20.84	89.73	2.37
	A0000056	634041.73	4193039.85	2.55	412.53	22.32	84.97	2.37
	A0000057	634423.14	4192883.31	2.55	372.56	24.08	92.86	2.37
	A0000058	634762.48	4192731.71	2.55	482.18	30.49	99.10	2.37
	A0000059	635178.38	4192486.88	2.55	460.11	27.31	91.85	2.37
	A0000060	635588.80	4192275.14	2.55	104.04	14.93	93.02	2.37
	A0000061	635689.56	4192248.28	2.55	307.44	13.28	95.33	2.37
	A0000062	635989.42	4192177.52	2.55	178.75	8.57	96.25	2.37
	A0000063	636167.69	4192150.81	2.55	239.91	357.69	96.00	2.37
	A0000064	636407.90	4192160.53	2.55	331.04	354.12	96.96	2.37
	A0000065	636738.72	4192194.74	2.55	281.09	342.97	99.00	2.37
	A0000066	637008.85	4192277.62	2.55	486.28	332.41	101.13	2.37
	A0000067	637440.99	4192503.53	2.55	671.32	322.73	110.48	2.37
	A0000068	637974.34	4192909.48	2.55	675.44	330.29	135.21	2.37
	A0000069	638559.43	4193243.51	2.55	773.12	342.61	136.74	2.37
	A0000070	639297.62	4193474.76	2.55	607.56	339.44	159.14	2.37
	A0000071	639867.87	4193688.76	2.55	782.06	328.48	149.98	2.37
	A0000072	640536.08	4194098.88	2.55	905.17	314.20	125.94	2.37
	A0000073	641165.33	4194746.34	2.55	549.09	330.95	113.35	2.37
	A0000074	641642.30	4195012.05	2.55	491.78	353.77	120.27	2.37
	A0000075	642129.42	4195065.38	2.55	796.08	6.41	154.40	2.37
	A0000076	642921.22	4194976.45	2.55	844.43	1.33	154.12	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000077	643768.23	4194957.33	2.55	863.26	340.91	207.11	2.37
	A0000078	644586.72	4195241.30	2.55	785.16	318.24	151.31	2.37
	A0000079	645173.50	4195765.44	2.55	702.83	306.53	146.57	2.37
	A0000080	645591.53	4196329.80	2.55	686.00	310.19	138.91	2.37
	A0000081	646033.36	4196853.04	2.55	858.37	318.58	149.17	2.37
	A0000082	646678.12	4197421.99	2.55	883.98	307.62	156.07	2.37
	A0000083	647217.85	4198122.36	2.55	1539.96	305.93	149.36	2.37
	A0000084	648120.74	4199368.27	2.55	1565.66	315.23	126.44	2.37
	A0000085	649230.55	4200469.61	2.55	1560.70	330.66	125.47	2.37
	A0000086	650590.12	4201233.89	2.55	738.11	338.07	126.08	2.37
	A0000087	651272.81	4201509.03	2.55	735.59	352.96	142.07	2.37
	A0000088	652000.66	4201599.25	2.55	695.99	8.75	129.62	2.37
	A0000089	652687.66	4201493.61	2.55	843.92	15.33	133.33	2.37
	A0000090	653498.57	4201272.04	2.55	1257.28	39.55	129.27	2.37
	A0000091	654468.57	4200471.16	2.55	213.04	35.12	177.73	2.37
	A0000092	654643.29	4200348.28	2.55	179.89	31.06	189.76	2.37
	A0000093	654796.72	4200255.92	2.55	1353.69	36.85	178.37	2.37
	A0000094	655880.40	4199443.76	2.55	1101.83	32.90	163.53	2.37
	A0000095	656806.71	4198844.59	2.55	509.80	23.01	201.70	2.37
	A0000096	657276.72	4198645.04	2.55	786.86	17.10	192.32	2.37
	A0000097	658030.46	4198413.31	2.55	896.80	4.93	185.49	2.37
	A0000098	658924.06	4198336.17	2.55	721.76	4.09	241.97	2.37
	A0000099	659642.64	4198284.96	2.55	1276.56	13.83	183.03	2.37
	A0000100	660880.96	4197980.19	2.55	520.23	23.13	158.26	2.37
	A0000101	661359.98	4197775.59	2.55	675.65	18.43	176.18	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000102	662002.32	4197561.61	2.55	1112.89	8.38	168.75	2.37
	A0000103	663104.49	4197399.33	2.55	923.80	0.00	170.41	2.37
	A0000104	664026.66	4197399.50	2.55	905.89	11.77	188.70	2.37
	A0000105	664911.16	4197215.63	2.55	1064.86	29.83	171.94	2.37
	A0000106	665834.85	4196686.04	2.55	773.15	30.65	188.67	2.37
	A0000107	666501.62	4196291.16	2.55	763.47	17.85	197.96	2.37
	A0000108	667229.50	4196056.85	2.55	611.54	9.27	208.58	2.37
	A0000109	667834.58	4195958.21	2.55	801.00	358.24	198.00	2.37
	A0000110	668635.54	4195982.86	2.55	797.07	355.82	198.19	2.37
	A0000111	669428.99	4196041.04	2.55	851.18	6.60	225.89	2.37
	A0000112	670273.77	4195943.26	2.55	727.92	12.00	208.89	2.37
	A0000113	670984.40	4195792.39	2.55	722.30	22.46	215.43	2.37
	A0000114	671650.93	4195516.98	2.55	526.62	30.47	223.40	2.37
	A0000115	672104.44	4195250.22	2.55	881.63	33.90	217.40	2.37
	A0000116	672836.23	4194758.53	2.55	881.63	33.90	271.26	2.37
	A0000117	673569.14	4194266.20	2.55	1003.31	24.68	282.35	2.37
	A0000118	674481.52	4193847.04	2.55	1083.18	19.26	227.83	2.37
	A0000119	675502.41	4193490.57	2.55	891.99	32.59	226.25	2.37
	A0000120	676253.56	4193010.34	2.55	816.41	35.88	223.68	2.37
	A0000121	676917.80	4192530.64	2.55	973.78	14.29	234.26	2.37
	A0000122	677863.94	4192290.04	2.55	561.98	356.37	239.61	2.37
	A0000123	678426.62	4192325.99	2.55	1247.51	342.99	233.93	2.37
	A0000124	679620.22	4192691.23	2.55	1481.25	337.75	271.85	2.37
	A0000125	680992.35	4193252.67	2.55	461.15	328.42	307.98	2.37
	A0000126	681382.76	4193493.20	2.55	549.18	347.35	302.24	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000127	681917.52	4193613.32	2.55	592.57	355.24	283.63	2.37
	A0000128	682506.42	4193662.57	2.55	545.28	6.91	248.85	2.37
	A0000129	683046.43	4193597.22	2.55	404.84	16.48	239.24	2.37
	A0000130	683434.57	4193482.42	2.55	486.02	17.01	221.32	2.37
	A0000131	683898.62	4193340.51	2.55	1360.69	22.45	208.56	2.37
	A0000132	685156.21	4192820.93	2.55	1360.69	22.45	188.12	2.37
	A0000133	686414.99	4192300.95	2.55	1469.97	13.39	190.63	2.37
	A0000134	687844.99	4191960.48	2.55	1469.97	13.39	201.86	2.37
	A0000135	689275.56	4191619.89	2.55	1050.60	9.18	211.04	2.37
	A0000136	690310.06	4191453.19	2.55	877.12	29.32	225.10	2.37
	A0000137	691074.62	4191023.78	2.55	1527.15	30.96	236.00	2.37
	A0000138	692386.04	4190237.25	2.55	795.77	16.05	268.82	2.37
	A0000139	693149.46	4190017.77	2.55	945.17	26.37	279.43	2.37
	A0000140	693996.29	4189597.97	2.55	945.17	26.37	273.87	2.37
	A0000141	694842.86	4189178.32	2.55	593.12	28.51	289.44	2.37
	A0000142	695364.59	4188894.93	2.55	550.10	24.17	307.77	2.37
	A0000143	695868.35	4188669.15	2.55	495.93	10.10	325.43	2.37
	A0000144	696359.26	4188582.17	2.55	1394.84	351.03	332.56	2.37
	A0000145	697737.32	4188799.76	2.55	901.63	348.87	369.93	2.37
	A0000146	698618.91	4188973.80	2.55	1200.21	11.15	411.93	2.37
	A0000147	699799.78	4188741.69	2.55	682.98	347.12	424.53	2.37
	A0000148	700468.76	4188895.51	2.55	792.30	321.60	451.15	2.37
	A0000149	701088.39	4189386.86	2.55	751.87	332.40	479.54	2.37
	A0000150	701751.78	4189734.30	2.55	637.65	354.48	477.49	2.37
	A0000151	702382.65	4189796.17	2.55	607.19	22.43	519.12	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000152	702940.83	4189566.81	2.55	139.16	50.19	482.53	2.37
	A0000153	703029.56	4189469.68	2.55	1125.72	125.58	485.59	2.37
	A0000154	702374.63	4188554.07	2.55	1125.72	125.58	450.11	2.37

Meteorology Pathway

Met Input Data

Surface Met Data

Filename: ..\..\met veri\Denizli Meteorolojik Veriler\Denizli_2015.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: ..\..\met veri\Denizli Meteorolojik Veriler\Denizli_2015.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 425,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2015			
Upper Air		2015			

Data Period

Data Period to Process

Start Date: 1.01.2015 Start Hour: 1 End Date: 31.12.2015 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Control Pathway

Dispersion Options

Titles

C:\Users\DELL\Desktop\aydindenizli1-TVOC\aydindenizli1-TVOC.isc

Dispersion Options

- [x] Regulatory Default
- [ ] Non-Default Options

Dispersion Coefficient

Rural

Output Type

- [x] Concentration
- [ ] Total Deposition (Dry & Wet)
- [ ] Dry Deposition
- [ ] Wet Deposition

Plume Depletion

- [ ] Dry Removal
- [ ] Wet Removal

Output Warnings

- [ ] No Output Warnings
- [ ] Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

OTHER - TVOC

Averaging Time Options

Hours

1	2	3	4	6	8	12	24
■	☐	☐	☐	☐	☐	☐	■

- [ ] Month
- [ ] Period
- [ ] Annual

Exponential Decay

Option not available

Terrain Height Options

- [ ] Flat
- [x] Elevated

SO: Meters

RE: Meters

TG: Meters

Flagpole Receptors

- [ ] Yes
- [x] No

Default Height = 0.00 m

Meteorology Pathway

Met Input Data

Surface Met Data

Filename: Aydin_2019.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: Aydin_2019.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 56,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2019			
Upper Air		2019			

Data Period

Data Period to Process

Start Date: 1.01.2019 Start Hour: 1 End Date: 31.12.2019 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Output Pathway

Tabular Printed Outputs

Short Term Averaging Period	RECTABLE Highest Values Table										MAXTABLE Maximum Values Table	DAYTABLE Daily Values Table
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		
1	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No
24	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No

Threshold Violation Files (MAXIFILE)

Path for MAXIFILES: AYDINDENIZLI1-TVOC.AD

Averaging Period	Source Group ID	Treshhold Value	File Unit (Optional)	File Name
1	ALL	70,00		highwayho.MAX

Contour Plot Files (PLOTFILE)

Path for PLOTFILES: AYDINDENIZLI1-TVOC.AD

Averaging Period	Source Group ID	High Value	File Name
1	ALL	1st	01H1GALL.PLT
24	ALL	1st	24H1GALL.PLT

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m (Optional)
1	626175.13	4191351.30		245.92	
2	597469.05	4184521.45		104.82	
3	591155.72	4183514.82		209.02	
4	609680.65	4187391.53		227.40	
5	576522.48	4186209.06		29.41	
6	583957.82	4183876.52		158.93	
7	585789.80	4183829.05		209.45	
8	594165.65	4183637.08		66.46	
9	626199.12	4191394.61		241.70	
10	624039.05	4190762.16		213.47	
11	609707.38	4187416.33		222.09	
12	602000.50	4185284.76		109.15	
13	597498.23	4184538.22		104.54	
14	594205.72	4183793.17		67.07	
15	601059.34	4185145.31		87.34	
16	585669.57	4183775.15		233.27	
17	584111.80	4183909.34		166.37	
18	576345.41	4186168.74		29.00	
19	573726.51	4180808.96	UCART1	50.72	
20	574726.51	4180808.96	UCART1	102.67	
21	575726.51	4180808.96	UCART1	138.07	
22	576726.51	4180808.96	UCART1	156.55	
23	577726.51	4180808.96	UCART1	200.15	
24	578726.51	4180808.96	UCART1	263.44	
25	579726.51	4180808.96	UCART1	263.42	
26	580726.51	4180808.96	UCART1	287.99	
27	581726.51	4180808.96	UCART1	317.26	
28	582726.51	4180808.96	UCART1	326.61	
29	573726.51	4181808.96	UCART1	32.21	
30	574726.51	4181808.96	UCART1	43.46	
31	575726.51	4181808.96	UCART1	50.78	
32	576726.51	4181808.96	UCART1	63.81	
33	577726.51	4181808.96	UCART1	96.28	

Receptor Pathway

34	578726.51	4181808.96	UCART1	159.27
35	579726.51	4181808.96	UCART1	223.44
36	580726.51	4181808.96	UCART1	296.93
37	581726.51	4181808.96	UCART1	294.45
38	582726.51	4181808.96	UCART1	252.50
39	573726.51	4182808.96	UCART1	27.00
40	574726.51	4182808.96	UCART1	27.00
41	575726.51	4182808.96	UCART1	28.00
42	576726.51	4182808.96	UCART1	31.21
43	577726.51	4182808.96	UCART1	50.78
44	578726.51	4182808.96	UCART1	90.58
45	579726.51	4182808.96	UCART1	164.72
46	580726.51	4182808.96	UCART1	238.02
47	581726.51	4182808.96	UCART1	209.86
48	582726.51	4182808.96	UCART1	186.68
49	573726.51	4183808.96	UCART1	27.00
50	574726.51	4183808.96	UCART1	27.00
51	575726.51	4183808.96	UCART1	28.00
52	576726.51	4183808.96	UCART1	29.00
53	577726.51	4183808.96	UCART1	30.98
54	578726.51	4183808.96	UCART1	35.91
55	579726.51	4183808.96	UCART1	60.89
56	580726.51	4183808.96	UCART1	96.57
57	573726.51	4184808.96	UCART1	27.00
58	574726.51	4184808.96	UCART1	28.00
59	575726.51	4184808.96	UCART1	28.00
60	576726.51	4184808.96	UCART1	28.00
61	579726.51	4184808.96	UCART1	31.48
62	580726.51	4184808.96	UCART1	38.43
63	581726.51	4184808.96	UCART1	47.59
64	582726.51	4184808.96	UCART1	57.66
65	573726.51	4185808.96	UCART1	29.00
66	575726.51	4185808.96	UCART1	29.00
67	576726.51	4185808.96	UCART1	28.00
68	577726.51	4185808.96	UCART1	28.00
69	578726.51	4185808.96	UCART1	29.00
70	579726.51	4185808.96	UCART1	30.00
71	580726.51	4185808.96	UCART1	30.60
72	581726.51	4185808.96	UCART1	33.00
73	573726.51	4186808.96	UCART1	37.47
74	574726.51	4186808.96	UCART1	34.53

Receptor Pathway

75	575726.51	4186808.96	UCART1	32.95
76	576726.51	4186808.96	UCART1	30.56
77	577726.51	4186808.96	UCART1	29.00
78	578726.51	4186808.96	UCART1	29.00
79	579726.51	4186808.96	UCART1	30.00
80	580726.51	4186808.96	UCART1	31.00
81	581726.51	4186808.96	UCART1	31.00
82	582726.51	4186808.96	UCART1	32.00
83	573726.51	4187808.96	UCART1	44.00
84	574726.51	4187808.96	UCART1	43.00
85	575726.51	4187808.96	UCART1	37.31
86	576726.51	4187808.96	UCART1	32.80
87	577726.51	4187808.96	UCART1	31.00
88	578726.51	4187808.96	UCART1	30.00
89	579726.51	4187808.96	UCART1	31.00
90	580726.51	4187808.96	UCART1	31.00
91	581726.51	4187808.96	UCART1	31.51
92	573726.51	4188808.96	UCART1	55.00
93	574726.51	4188808.96	UCART1	52.82
94	575726.51	4188808.96	UCART1	40.37
95	576726.51	4188808.96	UCART1	36.00
96	577726.51	4188808.96	UCART1	36.00
97	578726.51	4188808.96	UCART1	33.27
98	579726.51	4188808.96	UCART1	33.00
99	580726.51	4188808.96	UCART1	32.00
100	581726.51	4188808.96	UCART1	34.00
101	584768.64	4179791.46	UCART2	486.87
102	585768.64	4179791.46	UCART2	463.66
103	586768.64	4179791.46	UCART2	414.29
104	587768.64	4179791.46	UCART2	413.10
105	588768.64	4179791.46	UCART2	399.50
106	589768.64	4179791.46	UCART2	338.01
107	590768.64	4179791.46	UCART2	251.82
108	591768.64	4179791.46	UCART2	248.57
109	583768.64	4180791.46	UCART2	406.64
110	584768.64	4180791.46	UCART2	501.09
111	585768.64	4180791.46	UCART2	544.58
112	586768.64	4180791.46	UCART2	551.32
113	587768.64	4180791.46	UCART2	527.90
114	588768.64	4180791.46	UCART2	500.36
115	589768.64	4180791.46	UCART2	454.46

116	583768.64	4181791.46	UCART2	315.59
117	584768.64	4181791.46	UCART2	439.49
118	585768.64	4181791.46	UCART2	564.67
119	586768.64	4181791.46	UCART2	540.82
120	587768.64	4181791.46	UCART2	558.52
121	588768.64	4181791.46	UCART2	543.50
122	589768.64	4181791.46	UCART2	475.24
123	590768.64	4181791.46	UCART2	420.17
124	583768.64	4182791.46	UCART2	245.50
125	584768.64	4182791.46	UCART2	353.94
126	585768.64	4182791.46	UCART2	414.00
127	586768.64	4182791.46	UCART2	372.85
128	587768.64	4182791.46	UCART2	381.32
129	588768.64	4182791.46	UCART2	389.81
130	589768.64	4182791.46	UCART2	354.34
131	590768.64	4182791.46	UCART2	340.88
132	591768.64	4182791.46	UCART2	295.55
133	585768.64	4183791.46	UCART2	232.89
134	586768.64	4183791.46	UCART2	170.03
135	587768.64	4183791.46	UCART2	167.27
136	588768.64	4183791.46	UCART2	170.53
137	589768.64	4183791.46	UCART2	158.63
138	590768.64	4183791.46	UCART2	152.84
139	591768.64	4183791.46	UCART2	150.88
140	583768.64	4184791.46	UCART2	57.86
141	584768.64	4184791.46	UCART2	62.23
142	585768.64	4184791.46	UCART2	61.26
143	586768.64	4184791.46	UCART2	66.69
144	587768.64	4184791.46	UCART2	64.19
145	588768.64	4184791.46	UCART2	58.72
146	589768.64	4184791.46	UCART2	50.27
147	590768.64	4184791.46	UCART2	46.73
148	591768.64	4184791.46	UCART2	44.92
149	583768.64	4185791.46	UCART2	35.00
150	584768.64	4185791.46	UCART2	35.00
151	585768.64	4185791.46	UCART2	35.00
152	586768.64	4185791.46	UCART2	36.00
153	587768.64	4185791.46	UCART2	37.00
154	588768.64	4185791.46	UCART2	36.00
155	589768.64	4185791.46	UCART2	35.00
156	590768.64	4185791.46	UCART2	36.00

157	582762.23	4185843.05	UCART2	35.49
158	583768.64	4186791.46	UCART2	32.00
159	584768.64	4186791.46	UCART2	33.00
160	585768.64	4186791.46	UCART2	33.00
161	586768.64	4186791.46	UCART2	33.03
162	587768.64	4186791.46	UCART2	35.00
163	588768.64	4186791.46	UCART2	36.00
164	589768.64	4186791.46	UCART2	36.00
165	590768.64	4186791.46	UCART2	38.83
166	582768.64	4187791.46	UCART2	33.00
167	583768.64	4187791.46	UCART2	32.00
168	584768.64	4187791.46	UCART2	33.00
169	585768.64	4187791.46	UCART2	34.00
170	586768.64	4187791.46	UCART2	36.00
171	587768.64	4187791.46	UCART2	37.00
172	588768.64	4187791.46	UCART2	39.00
173	589768.64	4187791.46	UCART2	41.80
174	590768.64	4187791.46	UCART2	43.93
175	582768.64	4188791.46	UCART2	37.00
176	583768.64	4188791.46	UCART2	36.00
177	584768.64	4188791.46	UCART2	38.00
178	585768.64	4188791.46	UCART2	39.00
179	586768.64	4188791.46	UCART2	39.40
180	587768.64	4188791.46	UCART2	41.00
181	588768.64	4188791.46	UCART2	43.00
182	589768.64	4188791.46	UCART2	46.00
183	590768.64	4188791.46	UCART2	49.95
184	592772.54	4180731.94	UCART3	191.16
185	593772.54	4180731.94	UCART3	249.03
186	594772.54	4180731.94	UCART3	264.72
187	595772.54	4180731.94	UCART3	264.62
188	596772.54	4180731.94	UCART3	274.00
189	597772.54	4180731.94	UCART3	333.82
190	598772.54	4180731.94	UCART3	421.54
191	599772.54	4180731.94	UCART3	474.88
192	600772.54	4180731.94	UCART3	486.68
193	601772.54	4180731.94	UCART3	560.87
194	602772.54	4180731.94	UCART3	631.68
195	603772.54	4180731.94	UCART3	625.20
196	604772.54	4180731.94	UCART3	590.51
197	592772.54	4181731.94	UCART3	199.26

198	593772.54	4181731.94	UCART3	176.30
199	594772.54	4181731.94	UCART3	222.02
200	595772.54	4181731.94	UCART3	287.94
201	596772.54	4181731.94	UCART3	307.88
202	597772.54	4181731.94	UCART3	333.48
203	598772.54	4181731.94	UCART3	353.32
204	599772.54	4181731.94	UCART3	379.75
205	600772.54	4181731.94	UCART3	352.82
206	601772.54	4181731.94	UCART3	456.56
207	602772.54	4181731.94	UCART3	523.60
208	603772.54	4181731.94	UCART3	542.01
209	604772.54	4181731.94	UCART3	501.16
210	592772.54	4182731.94	UCART3	160.20
211	593772.54	4182731.94	UCART3	93.00
212	594772.54	4182731.94	UCART3	133.60
213	596772.54	4182731.94	UCART3	291.81
214	597772.54	4182731.94	UCART3	321.00
215	598772.54	4182731.94	UCART3	273.48
216	599772.54	4182731.94	UCART3	260.06
217	600772.54	4182731.94	UCART3	276.35
218	601772.54	4182731.94	UCART3	352.28
219	602772.54	4182731.94	UCART3	408.67
220	603772.54	4182731.94	UCART3	427.94
221	604772.54	4182731.94	UCART3	450.26
222	605772.54	4182731.94	UCART3	553.90
223	606772.54	4182731.94	UCART3	643.78
224	607772.54	4182731.94	UCART3	727.42
225	608772.54	4182731.94	UCART3	841.74
226	609772.54	4182731.94	UCART3	905.57
227	610772.54	4182731.94	UCART3	891.81
228	593772.54	4183731.94	UCART3	60.30
229	594772.54	4183731.94	UCART3	85.22
230	595772.54	4183731.94	UCART3	129.86
231	596772.54	4183731.94	UCART3	194.90
232	597772.54	4183731.94	UCART3	241.43
233	598772.54	4183731.94	UCART3	223.50
234	599772.54	4183731.94	UCART3	182.39
235	600772.54	4183731.94	UCART3	245.01
236	601772.54	4183731.94	UCART3	249.54
237	602772.54	4183731.94	UCART3	312.48
238	603772.54	4183731.94	UCART3	362.31

239	604772.54	4183731.94	UCART3	390.25
240	605772.54	4183731.94	UCART3	492.19
241	606772.54	4183731.94	UCART3	586.77
242	607772.54	4183731.94	UCART3	685.32
243	608772.54	4183731.94	UCART3	804.32
244	609772.54	4183731.94	UCART3	802.28
245	610772.54	4183731.94	UCART3	757.02
246	591772.54	4184731.94	UCART3	51.75
247	592772.54	4184731.94	UCART3	40.68
248	593772.54	4184731.94	UCART3	42.81
249	594772.54	4184731.94	UCART3	49.86
250	596772.54	4184731.94	UCART3	71.33
251	597772.54	4184731.94	UCART3	93.40
252	598772.54	4184731.94	UCART3	114.81
253	600772.54	4184731.94	UCART3	141.22
254	601772.54	4184731.94	UCART3	138.23
255	602772.54	4184731.94	UCART3	211.62
256	603772.54	4184731.94	UCART3	285.53
257	604772.54	4184731.94	UCART3	263.49
258	605772.54	4184731.94	UCART3	363.68
259	606772.54	4184731.94	UCART3	475.88
260	607772.54	4184731.94	UCART3	563.30
261	608772.54	4184731.94	UCART3	649.19
262	609772.54	4184731.94	UCART3	603.22
263	610772.54	4184731.94	UCART3	588.13
264	591772.54	4185731.94	UCART3	36.00
265	592772.54	4185731.94	UCART3	36.00
266	593772.54	4185731.94	UCART3	38.00
267	594772.54	4185731.94	UCART3	37.00
268	595772.54	4185731.94	UCART3	38.00
269	596772.54	4185731.94	UCART3	39.37
270	597772.54	4185731.94	UCART3	42.47
271	598772.54	4185731.94	UCART3	51.17
272	600772.54	4185731.94	UCART3	62.00
273	601772.54	4185731.94	UCART3	70.94
274	602772.54	4185731.94	UCART3	119.57
275	604772.54	4185731.94	UCART3	180.80
276	605772.54	4185731.94	UCART3	257.70
277	606772.54	4185731.94	UCART3	337.34
278	607772.54	4185731.94	UCART3	438.47
279	608772.54	4185731.94	UCART3	478.68

280	609772.54	4185731.94	UCART3	416.00
281	610772.54	4185731.94	UCART3	473.80
282	591772.54	4186731.94	UCART3	37.06
283	592772.54	4186731.94	UCART3	37.00
284	593772.54	4186731.94	UCART3	37.00
285	594772.54	4186731.94	UCART3	37.00
286	595772.54	4186731.94	UCART3	37.85
287	596772.54	4186731.94	UCART3	38.00
288	597772.54	4186731.94	UCART3	39.00
289	598772.54	4186731.94	UCART3	40.00
290	599772.54	4186731.94	UCART3	42.94
291	600772.54	4186731.94	UCART3	43.00
292	601772.54	4186731.94	UCART3	45.00
293	602772.54	4186731.94	UCART3	60.00
294	603772.54	4186731.94	UCART3	87.43
295	604772.54	4186731.94	UCART3	113.26
296	605772.54	4186731.94	UCART3	145.84
297	606772.54	4186731.94	UCART3	206.98
298	607772.54	4186731.94	UCART3	293.71
299	608772.54	4186731.94	UCART3	321.84
300	609772.54	4186731.94	UCART3	302.68
301	610772.54	4186731.94	UCART3	374.13
302	591772.54	4187731.94	UCART3	42.76
303	592772.54	4187731.94	UCART3	40.65
304	593772.54	4187731.94	UCART3	37.00
305	594772.54	4187731.94	UCART3	37.51
306	595772.54	4187731.94	UCART3	38.00
307	596772.54	4187731.94	UCART3	38.00
308	597772.54	4187731.94	UCART3	39.00
309	598772.54	4187731.94	UCART3	40.00
310	599772.54	4187731.94	UCART3	41.00
311	600772.54	4187731.94	UCART3	42.00
312	601772.54	4187731.94	UCART3	43.00
313	602772.54	4187731.94	UCART3	44.00
314	603772.54	4187731.94	UCART3	48.66
315	604772.54	4187731.94	UCART3	58.74
316	605772.54	4187731.94	UCART3	65.86
317	606772.54	4187731.94	UCART3	78.85
318	607772.54	4187731.94	UCART3	127.08
319	608772.54	4187731.94	UCART3	160.12
320	609772.54	4187731.94	UCART3	198.11

321	591772.54	4188731.94	UCART3	51.00
322	592772.54	4188731.94	UCART3	46.48
323	593772.54	4188731.94	UCART3	38.60
324	594772.54	4188731.94	UCART3	38.00
325	595772.54	4188731.94	UCART3	38.17
326	596772.54	4188731.94	UCART3	39.00
327	597772.54	4188731.94	UCART3	39.00
328	598772.54	4188731.94	UCART3	40.00
329	599772.54	4188731.94	UCART3	41.00
330	600772.54	4188731.94	UCART3	42.00
331	601772.54	4188731.94	UCART3	44.00
332	602772.54	4188731.94	UCART3	45.00
333	603772.54	4188731.94	UCART3	46.00
334	604772.54	4188731.94	UCART3	49.00
335	605772.54	4188731.94	UCART3	49.00
336	606772.54	4188731.94	UCART3	49.00
337	607772.54	4188731.94	UCART3	58.20
338	608772.54	4188731.94	UCART3	74.55
339	609772.54	4188731.94	UCART3	89.18
340	600772.54	4189731.94	UCART3	43.00
341	601772.54	4189731.94	UCART3	44.00
342	602772.54	4189731.94	UCART3	44.00
343	603772.54	4189731.94	UCART3	46.00
344	604772.54	4189731.94	UCART3	47.00
345	605772.54	4189731.94	UCART3	47.00
346	606772.54	4189731.94	UCART3	47.00
347	607772.54	4189731.94	UCART3	49.97
348	608772.54	4189731.94	UCART3	53.68
349	609772.54	4189731.94	UCART3	54.86
350	611821.14	4184138.72	UCART4	617.26
351	612821.14	4184138.72	UCART4	376.95
352	613821.14	4184138.72	UCART4	187.67
353	614821.14	4184138.72	UCART4	98.41
354	615821.14	4184138.72	UCART4	65.61
355	616821.14	4184138.72	UCART4	61.41
356	617821.14	4184138.72	UCART4	69.91
357	618821.14	4184138.72	UCART4	140.37
358	619821.14	4184138.72	UCART4	223.10
359	611821.14	4185138.72	UCART4	500.93
360	612821.14	4185138.72	UCART4	311.07
361	613821.14	4185138.72	UCART4	153.12

362	614821.14	4185138.72	UCART4	88.23
363	615821.14	4185138.72	UCART4	64.00
364	616821.14	4185138.72	UCART4	61.00
365	617821.14	4185138.72	UCART4	73.00
366	618821.14	4185138.72	UCART4	177.94
367	619821.14	4185138.72	UCART4	277.78
368	620821.14	4185138.72	UCART4	307.50
369	621821.14	4185138.72	UCART4	423.08
370	622821.14	4185138.72	UCART4	534.94
371	623821.14	4185138.72	UCART4	750.68
372	624821.14	4185138.72	UCART4	940.25
373	611821.14	4186138.72	UCART4	394.42
374	612821.14	4186138.72	UCART4	243.99
375	613821.14	4186138.72	UCART4	127.40
376	614821.14	4186138.72	UCART4	79.31
377	615821.14	4186138.72	UCART4	61.35
378	616821.14	4186138.72	UCART4	60.00
379	617821.14	4186138.72	UCART4	67.16
380	618821.14	4186138.72	UCART4	138.53
381	619821.14	4186138.72	UCART4	244.47
382	620821.14	4186138.72	UCART4	316.82
383	621821.14	4186138.72	UCART4	441.09
384	622821.14	4186138.72	UCART4	549.47
385	623821.14	4186138.72	UCART4	743.43
386	624821.14	4186138.72	UCART4	915.68
387	611821.14	4187138.72	UCART4	279.08
388	612821.14	4187138.72	UCART4	178.42
389	613821.14	4187138.72	UCART4	100.46
390	614821.14	4187138.72	UCART4	64.94
391	615821.14	4187138.72	UCART4	58.00
392	616821.14	4187138.72	UCART4	59.00
393	617821.14	4187138.72	UCART4	62.06
394	618821.14	4187138.72	UCART4	122.37
395	619821.14	4187138.72	UCART4	208.72
396	620821.14	4187138.72	UCART4	312.62
397	621821.14	4187138.72	UCART4	412.38
398	622821.14	4187138.72	UCART4	547.81
399	623821.14	4187138.72	UCART4	734.47
400	610821.14	4188138.72	UCART4	173.31
401	613821.14	4188138.72	UCART4	75.53
402	614821.14	4188138.72	UCART4	57.00

403	615821.14	4188138.72	UCART4	58.00
404	616821.14	4188138.72	UCART4	57.00
405	618821.14	4188138.72	UCART4	88.76
406	619821.14	4188138.72	UCART4	162.73
407	620821.14	4188138.72	UCART4	291.54
408	621821.14	4188138.72	UCART4	431.62
409	622821.14	4188138.72	UCART4	536.57
410	623821.14	4188138.72	UCART4	694.39
411	624821.14	4188138.72	UCART4	843.46
412	610821.14	4189138.72	UCART4	71.12
413	611821.14	4189138.72	UCART4	74.41
414	612821.14	4189138.72	UCART4	72.21
415	613821.14	4189138.72	UCART4	58.14
416	614821.14	4189138.72	UCART4	55.00
417	615821.14	4189138.72	UCART4	56.00
418	616821.14	4189138.72	UCART4	56.00
419	617821.14	4189138.72	UCART4	57.00
420	619821.14	4189138.72	UCART4	114.76
421	620821.14	4189138.72	UCART4	237.79
422	621821.14	4189138.72	UCART4	360.19
423	622821.14	4189138.72	UCART4	449.62
424	623821.14	4189138.72	UCART4	590.59
425	624821.14	4189138.72	UCART4	710.71
426	610821.14	4190138.72	UCART4	51.00
427	611821.14	4190138.72	UCART4	52.00
428	612821.14	4190138.72	UCART4	53.00
429	613821.14	4190138.72	UCART4	53.04
430	614821.14	4190138.72	UCART4	54.00
431	615821.14	4190138.72	UCART4	55.00
432	616821.14	4190138.72	UCART4	56.00
433	617821.14	4190138.72	UCART4	57.00
434	618821.14	4190138.72	UCART4	60.00
435	620821.14	4190138.72	UCART4	143.15
436	621821.14	4190138.72	UCART4	196.55
437	622821.14	4190138.72	UCART4	294.06
438	623821.14	4190138.72	UCART4	340.12
439	624821.14	4190138.72	UCART4	439.43
440	610821.14	4191138.72	UCART4	52.00
441	611821.14	4191138.72	UCART4	53.00
442	612821.14	4191138.72	UCART4	53.00
443	613821.14	4191138.72	UCART4	53.00

444	614821.14	4191138.72	UCART4	54.00
445	615821.14	4191138.72	UCART4	55.00
446	616821.14	4191138.72	UCART4	55.64
447	617821.14	4191138.72	UCART4	57.00
448	618821.14	4191138.72	UCART4	58.00
449	619821.14	4191138.72	UCART4	60.66
450	620821.14	4191138.72	UCART4	71.41
451	621821.14	4191138.72	UCART4	87.25
452	622821.14	4191138.72	UCART4	104.88
453	623821.14	4191138.72	UCART4	133.61
454	624821.14	4191138.72	UCART4	200.16
455	610821.14	4192138.72	UCART4	51.00
456	611821.14	4192138.72	UCART4	52.00
457	612821.14	4192138.72	UCART4	53.00
458	613821.14	4192138.72	UCART4	53.91
459	614821.14	4192138.72	UCART4	54.00
460	615821.14	4192138.72	UCART4	55.05
461	616821.14	4192138.72	UCART4	56.85
462	617821.14	4192138.72	UCART4	57.00
463	618821.14	4192138.72	UCART4	58.00
464	619821.14	4192138.72	UCART4	60.00
465	620821.14	4192138.72	UCART4	62.00
466	621821.14	4192138.72	UCART4	63.00
467	622821.14	4192138.72	UCART4	64.00
468	623821.14	4192138.72	UCART4	65.98
469	624821.14	4192138.72	UCART4	75.72
470	619821.14	4193138.72	UCART4	60.97
471	620821.14	4193138.72	UCART4	62.00
472	621821.14	4193138.72	UCART4	63.00
473	622821.14	4193138.72	UCART4	64.00
474	623821.14	4193138.72	UCART4	64.00
475	624821.14	4193138.72	UCART4	65.37
476	624856.81	4188506.02	UCART5	812.11
477	625856.81	4188506.02	UCART5	896.38
478	626856.81	4188506.02	UCART5	939.14
479	627856.81	4188506.02	UCART5	928.91
480	628856.81	4188506.02	UCART5	863.08
481	629856.81	4188506.02	UCART5	1017.07
482	630856.81	4188506.02	UCART5	1078.98
483	631856.81	4188506.02	UCART5	998.79
484	632856.81	4188506.02	UCART5	857.23

485	633856.81	4188506.02	UCART5	674.47
486	624856.81	4189506.02	UCART5	626.05
487	625856.81	4189506.02	UCART5	752.67
488	626856.81	4189506.02	UCART5	724.49
489	627856.81	4189506.02	UCART5	752.73
490	628856.81	4189506.02	UCART5	620.78
491	629856.81	4189506.02	UCART5	815.64
492	630856.81	4189506.02	UCART5	833.76
493	631856.81	4189506.02	UCART5	904.52
494	632856.81	4189506.02	UCART5	767.36
495	633856.81	4189506.02	UCART5	583.63
496	624856.81	4190506.02	UCART5	352.59
497	625856.81	4190506.02	UCART5	444.68
498	626856.81	4190506.02	UCART5	454.46
499	627856.81	4190506.02	UCART5	539.03
500	628856.81	4190506.02	UCART5	437.99
501	629856.81	4190506.02	UCART5	562.27
502	630856.81	4190506.02	UCART5	583.58
503	631856.81	4190506.02	UCART5	641.82
504	632856.81	4190506.02	UCART5	633.92
505	633856.81	4190506.02	UCART5	472.75
506	624856.81	4191506.02	UCART5	161.23
507	625856.81	4191506.02	UCART5	232.83
508	626856.81	4191506.02	UCART5	244.50
509	627856.81	4191506.02	UCART5	307.39
510	628856.81	4191506.02	UCART5	307.25
511	629856.81	4191506.02	UCART5	360.88
512	630856.81	4191506.02	UCART5	405.54
513	631856.81	4191506.02	UCART5	424.42
514	632856.81	4191506.02	UCART5	485.12
515	633856.81	4191506.02	UCART5	339.78
516	624856.81	4192506.02	UCART5	69.65
517	625856.81	4192506.02	UCART5	94.65
518	626856.81	4192506.02	UCART5	99.24
519	627856.81	4192506.02	UCART5	128.84
520	628856.81	4192506.02	UCART5	181.42
521	629856.81	4192506.02	UCART5	178.58
522	631856.81	4192506.02	UCART5	243.76
523	632856.81	4192506.02	UCART5	290.37
524	633856.81	4192506.02	UCART5	207.14
525	624856.81	4193506.02	UCART5	65.00

526	625856.81	4193506.02	UCART5	68.57	
527	626856.81	4193506.02	UCART5	69.00	
528	627856.81	4193506.02	UCART5	73.97	
529	628856.81	4193506.02	UCART5	93.17	
530	629856.81	4193506.02	UCART5	98.49	
531	630856.81	4193506.02	UCART5	118.15	
532	631843.65	4193748.62	UCART5	103.81	
533	632856.81	4193506.02	UCART5	125.25	
534	633856.81	4193506.02	UCART5	111.96	
535	624856.81	4194506.02	UCART5	66.00	
536	625856.81	4194506.02	UCART5	67.00	
537	626856.81	4194506.02	UCART5	68.00	
538	627856.81	4194506.02	UCART5	69.00	
539	628856.81	4194506.02	UCART5	73.00	
540	629856.81	4194506.02	UCART5	75.08	
541	630856.81	4194506.02	UCART5	80.00	
542	631856.81	4194506.02	UCART5	83.00	
543	632856.81	4194506.02	UCART5	79.12	
544	633856.81	4194506.02	UCART5	80.00	
545	624856.81	4195506.02	UCART5	69.44	
546	625856.81	4195506.02	UCART5	69.00	
547	626856.81	4195506.02	UCART5	68.00	
548	627856.81	4195506.02	UCART5	69.05	
549	628856.81	4195506.02	UCART5	70.87	
550	629856.81	4195506.02	UCART5	72.00	
551	630856.81	4195506.02	UCART5	73.00	
552	631856.81	4195506.02	UCART5	75.00	
553	632856.81	4195506.02	UCART5	77.00	
554	633856.81	4195506.02	UCART5	79.69	
555	624856.81	4196506.02	UCART5	81.02	
556	625856.81	4196506.02	UCART5	77.01	
557	626856.81	4196506.02	UCART5	76.00	
558	627856.81	4196506.02	UCART5	73.72	
559	628856.81	4196506.02	UCART5	72.00	
560	629856.81	4196506.02	UCART5	74.00	
561	630856.81	4196506.02	UCART5	78.22	
562	631856.81	4196506.02	UCART5	81.98	
563	632856.81	4196506.02	UCART5	86.00	
564	633856.81	4196506.02	UCART5	90.66	
565	593233.92	4182902.00		109.77	

Receptor Pathway

Plant Boundary Receptors

Receptor Groups

Record Number	Group ID	Group Description
1	UPOL1	
2	UCART1	Receptors generated from Uniform Cartesian Grid
3	UCART2	Receptors generated from Uniform Cartesian Grid
4	UCART3	Receptors generated from Uniform Cartesian Grid
5	UCART4	Receptors generated from Uniform Cartesian Grid
6	UCART5	Receptors generated from Uniform Cartesian Grid

Results Summary

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TVOC - Concentration - Source Group: _____

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
__		1.00000	COUNT	0.00	0.00	0.00	0.00	0.00	

TVOC - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	68.36202	ug/m^3	606772.54	4186731.94	206.98	0.00	939.00	1.12.2019, 5
24-HR	1ST	27.27465	ug/m^3	609680.65	4187391.53	227.40	0.00	939.00	17.12.2019, 24

Source Pathway - Source Inputs

Source Pathway - Source Inputs

Line Area Sources

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	9.09E-6	2.37	575203.95	4185846.54	29.34	2.55
			576133.71	4185423.92	28.53	2.55
			577158.57	4185128.09	28.15	2.55
			578331.34	4184789.99	29.00	2.55
			579662.59	4184557.55	35.99	2.55
			580877.62	4184346.24	64.52	2.55
			582134.91	4183849.67	87.42	2.55
			583674.21	4183750.35	164.33	2.55
			584780.60	4183688.20	234.17	2.55
			585451.90	4183675.77	233.59	2.55
			586384.25	4183315.26	264.67	2.55
			586918.80	4183302.83	253.82	2.55
			587903.83	4183213.08	263.45	2.55
			588836.28	4183163.35	313.60	2.55
			589818.46	4183312.54	232.95	2.55
			590824.08	4183393.53	225.32	2.55
			591816.16	4183332.79	223.73	2.55
			592747.49	4183130.33	147.84	2.55
			593456.12	4182421.71	120.45	2.55
			594356.22	4182028.54	167.98	2.55
			595332.94	4182528.81	210.25	2.55
			596166.72	4182957.62	231.64	2.55
			597167.26	4183386.42	251.97	2.55
			598024.86	4183719.93	251.08	2.55
			598882.47	4184244.02	163.29	2.55
			599741.48	4184714.66	112.21	2.55
			600674.72	4184517.24	180.23	2.55
			601625.89	4184283.93	189.69	2.55
			602505.28	4184696.71	209.65	2.55
			603223.15	4185414.58	174.99	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	9.09E-6	2.37	604120.49	4185863.25	201.76	2.55
			605057.54	4186101.11	159.95	2.55
			606020.27	4186413.37	204.36	2.55
			606681.68	4186799.19	210.25	2.55
			606847.03	4186986.59	166.84	2.55
			607276.94	4187581.86	124.20	2.55
			607497.41	4187769.26	101.59	2.55
			607971.42	4187890.52	120.32	2.55
			608291.10	4187846.42	128.26	2.55
			608445.43	4187747.21	143.99	2.55
			608919.43	4187383.44	226.24	2.55
			609287.26	4187254.92	231.84	2.55
			609663.41	4187241.95	252.03	2.55
			610260.04	4187514.33	239.93	2.55
			611129.06	4187929.38	226.51	2.55
			612166.70	4188149.88	135.41	2.55
			613126.51	4188085.03	107.91	2.55
			613891.76	4187812.65	80.13	2.55
			615611.61	4187691.44	57.97	2.55
			617173.63	4187960.76	57.01	2.55
			618268.83	4188499.38	64.19	2.55
			619040.86	4189397.09	73.00	2.55
			619884.71	4190097.30	87.08	2.55
			620871.42	4190431.47	116.67	2.55
			622596.14	4190370.42	238.61	2.55
			623832.44	4190568.84	249.43	2.55
			624992.43	4190935.15	290.97	2.55
			625954.00	4191179.36	286.03	2.55
			627266.62	4191331.99	275.17	2.55
			628130.23	4191979.15	194.12	2.55
			628612.04	4192170.21	217.28	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN16 (Highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
11.00	9.09E-6	2.37	629600.59	4192120.37	233.85	2.55
			630024.26	4192253.28	231.74	2.55
			631223.80	4192922.57	172.68	2.55
			631427.89	4192982.59	171.40	2.55
			631966.26	4193134.48	149.90	2.55
			632600.60	4193209.21	155.61	2.55
			632768.99	4193265.34	157.03	2.55

Source Pathway - Source Inputs

Area Sources Generated from Line Sources

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000001	575201.68	4185841.54	2.55	102.13	24.44	29.25	2.37
	A0000002	575294.65	4185799.27	2.55	102.13	24.44	29.00	2.37
	A0000003	575387.63	4185757.01	2.55	102.13	24.44	29.00	2.37
	A0000004	575480.60	4185714.75	2.55	102.13	24.44	29.87	2.37
	A0000005	575573.58	4185672.49	2.55	102.13	24.44	29.79	2.37
	A0000006	575666.56	4185630.23	2.55	102.13	24.44	29.00	2.37
	A0000007	575759.53	4185587.96	2.55	102.13	24.44	29.00	2.37
	A0000008	575852.51	4185545.70	2.55	102.13	24.44	29.00	2.37
	A0000009	575945.49	4185503.44	2.55	102.13	24.44	29.00	2.37
	A0000010	576038.46	4185461.18	2.55	102.13	24.44	29.00	2.37
	A0000011	576132.19	4185418.64	2.55	106.67	16.10	29.00	2.37
	A0000012	576234.67	4185389.06	2.55	106.67	16.10	28.92	2.37
	A0000013	576337.16	4185359.47	2.55	106.67	16.10	28.34	2.37
	A0000014	576439.64	4185329.89	2.55	106.67	16.10	28.40	2.37
	A0000015	576542.13	4185300.31	2.55	106.67	16.10	28.37	2.37
	A0000016	576644.62	4185270.72	2.55	106.67	16.10	28.00	2.37
	A0000017	576747.10	4185241.14	2.55	106.67	16.10	28.00	2.37
	A0000018	576849.59	4185211.56	2.55	106.67	16.10	28.00	2.37
	A0000019	576952.07	4185181.97	2.55	106.67	16.10	28.00	2.37
	A0000020	577054.56	4185152.39	2.55	106.67	16.10	28.00	2.37
	A0000021	577157.04	4185122.81	2.55	101.71	16.08	28.00	2.37
	A0000022	577254.77	4185094.63	2.55	101.71	16.08	28.00	2.37
	A0000023	577352.50	4185066.46	2.55	101.71	16.08	28.00	2.37
	A0000024	577450.24	4185038.28	2.55	101.71	16.08	28.00	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000025	577547.97	4185010.11	2.55	101.71	16.08	29.00	2.37
	A0000026	577645.70	4184981.93	2.55	101.71	16.08	29.00	2.37
	A0000027	577743.43	4184953.76	2.55	101.71	16.08	29.00	2.37
	A0000028	577841.16	4184925.58	2.55	101.71	16.08	29.00	2.37
	A0000029	577938.89	4184897.41	2.55	101.71	16.08	29.00	2.37
	A0000030	578036.62	4184869.23	2.55	101.71	16.08	29.00	2.37
	A0000031	578134.35	4184841.06	2.55	101.71	16.08	29.00	2.37
	A0000032	578232.08	4184812.88	2.55	101.71	16.08	29.00	2.37
	A0000033	578330.39	4184784.58	2.55	103.95	9.90	29.00	2.37
	A0000034	578432.79	4184766.70	2.55	103.95	9.90	29.00	2.37
	A0000035	578535.20	4184748.82	2.55	103.95	9.90	29.00	2.37
	A0000036	578637.60	4184730.94	2.55	103.95	9.90	29.00	2.37
	A0000037	578740.01	4184713.06	2.55	103.95	9.90	29.00	2.37
	A0000038	578842.41	4184695.18	2.55	103.95	9.90	29.00	2.37
	A0000039	578944.81	4184677.30	2.55	103.95	9.90	29.12	2.37
	A0000040	579047.22	4184659.42	2.55	103.95	9.90	29.92	2.37
	A0000041	579149.62	4184641.54	2.55	103.95	9.90	29.88	2.37
	A0000042	579252.03	4184623.66	2.55	103.95	9.90	30.46	2.37
	A0000043	579354.43	4184605.78	2.55	103.95	9.90	31.88	2.37
	A0000044	579456.83	4184587.90	2.55	103.95	9.90	32.13	2.37
	A0000045	579559.24	4184570.02	2.55	103.95	9.90	33.53	2.37
	A0000046	579661.64	4184552.14	2.55	102.77	9.87	35.84	2.37
	A0000047	579762.90	4184534.53	2.55	102.77	9.87	36.35	2.37
	A0000048	579864.15	4184516.92	2.55	102.77	9.87	37.22	2.37
	A0000049	579965.40	4184499.31	2.55	102.77	9.87	40.04	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000050	580066.65	4184481.70	2.55	102.77	9.87	40.95	2.37
	A0000051	580167.91	4184464.09	2.55	102.77	9.87	43.15	2.37
	A0000052	580269.16	4184446.48	2.55	102.77	9.87	48.22	2.37
	A0000053	580370.41	4184428.87	2.55	102.77	9.87	50.83	2.37
	A0000054	580471.67	4184411.26	2.55	102.77	9.87	54.22	2.37
	A0000055	580572.92	4184393.65	2.55	102.77	9.87	60.45	2.37
	A0000056	580674.17	4184376.04	2.55	102.77	9.87	61.59	2.37
	A0000057	580775.42	4184358.43	2.55	102.77	9.87	62.80	2.37
	A0000058	580875.60	4184341.13	2.55	103.98	21.55	64.45	2.37
	A0000059	580972.31	4184302.93	2.55	103.98	21.55	64.02	2.37
	A0000060	581069.03	4184264.73	2.55	103.98	21.55	66.09	2.37
	A0000061	581165.74	4184226.53	2.55	103.98	21.55	67.51	2.37
	A0000062	581262.46	4184188.34	2.55	103.98	21.55	67.99	2.37
	A0000063	581359.17	4184150.14	2.55	103.98	21.55	70.35	2.37
	A0000064	581455.89	4184111.94	2.55	103.98	21.55	73.61	2.37
	A0000065	581552.60	4184073.74	2.55	103.98	21.55	79.73	2.37
	A0000066	581649.32	4184035.54	2.55	103.98	21.55	85.24	2.37
	A0000067	581746.03	4183997.34	2.55	103.98	21.55	85.65	2.37
	A0000068	581842.75	4183959.15	2.55	103.98	21.55	84.21	2.37
	A0000069	581939.46	4183920.95	2.55	103.98	21.55	86.21	2.37
	A0000070	582036.18	4183882.75	2.55	103.98	21.55	87.01	2.37
	A0000071	582134.56	4183844.18	2.55	102.83	3.69	88.44	2.37
	A0000072	582237.18	4183837.56	2.55	102.83	3.69	92.03	2.37
	A0000073	582339.80	4183830.94	2.55	102.83	3.69	100.53	2.37
	A0000074	582442.42	4183824.32	2.55	102.83	3.69	103.08	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000075	582545.04	4183817.69	2.55	102.83	3.69	108.55	2.37
	A0000076	582647.66	4183811.07	2.55	102.83	3.69	117.96	2.37
	A0000077	582750.28	4183804.45	2.55	102.83	3.69	120.75	2.37
	A0000078	582852.90	4183797.83	2.55	102.83	3.69	127.14	2.37
	A0000079	582955.52	4183791.21	2.55	102.83	3.69	135.30	2.37
	A0000080	583058.14	4183784.59	2.55	102.83	3.69	138.03	2.37
	A0000081	583160.76	4183777.97	2.55	102.83	3.69	141.72	2.37
	A0000082	583263.38	4183771.35	2.55	102.83	3.69	149.98	2.37
	A0000083	583366.00	4183764.73	2.55	102.83	3.69	152.23	2.37
	A0000084	583468.62	4183758.11	2.55	102.83	3.69	154.31	2.37
	A0000085	583571.24	4183751.49	2.55	102.83	3.69	163.08	2.37
	A0000086	583673.91	4183744.86	2.55	100.74	3.22	164.53	2.37
	A0000087	583774.49	4183739.21	2.55	100.74	3.22	169.90	2.37
	A0000088	583875.07	4183733.56	2.55	100.74	3.22	183.95	2.37
	A0000089	583975.65	4183727.91	2.55	100.74	3.22	186.38	2.37
	A0000090	584076.23	4183722.26	2.55	100.74	3.22	193.83	2.37
	A0000091	584176.81	4183716.61	2.55	100.74	3.22	211.82	2.37
	A0000092	584277.39	4183710.96	2.55	100.74	3.22	215.64	2.37
	A0000093	584377.97	4183705.31	2.55	100.74	3.22	219.76	2.37
	A0000094	584478.55	4183699.66	2.55	100.74	3.22	228.05	2.37
	A0000095	584579.13	4183694.01	2.55	100.74	3.22	228.09	2.37
	A0000096	584679.71	4183688.36	2.55	100.74	3.22	231.83	2.37
	A0000097	584780.50	4183682.70	2.55	95.92	1.06	234.52	2.37
	A0000098	584876.40	4183680.92	2.55	95.92	1.06	234.11	2.37
	A0000099	584972.30	4183679.15	2.55	95.92	1.06	237.68	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000100	585068.20	4183677.37	2.55	95.92	1.06	238.31	2.37
	A0000101	585164.10	4183675.60	2.55	95.92	1.06	237.22	2.37
	A0000102	585260.00	4183673.82	2.55	95.92	1.06	239.29	2.37
	A0000103	585355.90	4183672.04	2.55	95.92	1.06	236.51	2.37
	A0000104	585449.91	4183670.64	2.55	99.96	21.14	235.00	2.37
	A0000105	585543.15	4183634.59	2.55	99.96	21.14	237.30	2.37
	A0000106	585636.38	4183598.53	2.55	99.96	21.14	236.45	2.37
	A0000107	585729.62	4183562.48	2.55	99.96	21.14	239.81	2.37
	A0000108	585822.85	4183526.43	2.55	99.96	21.14	244.34	2.37
	A0000109	585916.09	4183490.38	2.55	99.96	21.14	253.79	2.37
	A0000110	586009.33	4183454.33	2.55	99.96	21.14	271.75	2.37
	A0000111	586102.56	4183418.28	2.55	99.96	21.14	283.91	2.37
	A0000112	586195.80	4183382.23	2.55	99.96	21.14	272.91	2.37
	A0000113	586289.03	4183346.18	2.55	99.96	21.14	263.27	2.37
	A0000114	586384.12	4183309.76	2.55	106.94	1.33	265.99	2.37
	A0000115	586491.03	4183307.27	2.55	106.94	1.33	259.38	2.37
	A0000116	586597.94	4183304.79	2.55	106.94	1.33	251.26	2.37
	A0000117	586704.85	4183302.30	2.55	106.94	1.33	252.06	2.37
	A0000118	586811.76	4183299.81	2.55	106.94	1.33	255.91	2.37
	A0000119	586918.30	4183297.35	2.55	109.90	5.21	256.27	2.37
	A0000120	587027.75	4183287.38	2.55	109.90	5.21	256.44	2.37
	A0000121	587137.19	4183277.41	2.55	109.90	5.21	261.92	2.37
	A0000122	587246.64	4183267.43	2.55	109.90	5.21	262.93	2.37
	A0000123	587356.09	4183257.46	2.55	109.90	5.21	264.51	2.37
	A0000124	587465.54	4183247.49	2.55	109.90	5.21	266.97	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000125	587574.98	4183237.52	2.55	109.90	5.21	270.16	2.37
	A0000126	587684.43	4183227.55	2.55	109.90	5.21	275.64	2.37
	A0000127	587793.88	4183217.58	2.55	109.90	5.21	274.79	2.37
	A0000128	587903.53	4183207.59	2.55	103.75	3.05	279.31	2.37
	A0000129	588007.14	4183202.06	2.55	103.75	3.05	282.13	2.37
	A0000130	588110.74	4183196.54	2.55	103.75	3.05	282.44	2.37
	A0000131	588214.35	4183191.01	2.55	103.75	3.05	286.64	2.37
	A0000132	588317.95	4183185.49	2.55	103.75	3.05	293.56	2.37
	A0000133	588421.56	4183179.96	2.55	103.75	3.05	297.57	2.37
	A0000134	588525.17	4183174.44	2.55	103.75	3.05	303.07	2.37
	A0000135	588628.77	4183168.91	2.55	103.75	3.05	310.72	2.37
	A0000136	588732.38	4183163.39	2.55	103.75	3.05	313.19	2.37
	A0000137	588837.10	4183157.91	2.55	99.34	351.36	313.95	2.37
	A0000138	588935.32	4183172.83	2.55	99.34	351.36	310.78	2.37
	A0000139	589033.54	4183187.75	2.55	99.34	351.36	305.56	2.37
	A0000140	589131.76	4183202.67	2.55	99.34	351.36	295.45	2.37
	A0000141	589229.97	4183217.59	2.55	99.34	351.36	281.17	2.37
	A0000142	589328.19	4183232.51	2.55	99.34	351.36	269.91	2.37
	A0000143	589426.41	4183247.43	2.55	99.34	351.36	261.09	2.37
	A0000144	589524.63	4183262.35	2.55	99.34	351.36	248.16	2.37
	A0000145	589622.85	4183277.27	2.55	99.34	351.36	237.11	2.37
	A0000146	589721.06	4183292.19	2.55	99.34	351.36	235.98	2.37
	A0000147	589818.90	4183307.06	2.55	100.89	355.40	233.85	2.37
	A0000148	589919.46	4183315.16	2.55	100.89	355.40	229.17	2.37
	A0000149	590020.02	4183323.26	2.55	100.89	355.40	229.36	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000150	590120.59	4183331.36	2.55	100.89	355.40	229.46	2.37
	A0000151	590221.15	4183339.46	2.55	100.89	355.40	224.95	2.37
	A0000152	590321.71	4183347.56	2.55	100.89	355.40	223.25	2.37
	A0000153	590422.28	4183355.66	2.55	100.89	355.40	225.42	2.37
	A0000154	590522.84	4183363.75	2.55	100.89	355.40	222.71	2.37
	A0000155	590623.40	4183371.85	2.55	100.89	355.40	222.10	2.37
	A0000156	590723.96	4183379.95	2.55	100.89	355.40	225.69	2.37
	A0000157	590823.75	4183388.04	2.55	99.39	3.50	225.15	2.37
	A0000158	590922.96	4183381.97	2.55	99.39	3.50	225.77	2.37
	A0000159	591022.16	4183375.90	2.55	99.39	3.50	228.27	2.37
	A0000160	591121.37	4183369.82	2.55	99.39	3.50	226.36	2.37
	A0000161	591220.58	4183363.75	2.55	99.39	3.50	227.74	2.37
	A0000162	591319.79	4183357.67	2.55	99.39	3.50	230.37	2.37
	A0000163	591418.99	4183351.60	2.55	99.39	3.50	229.46	2.37
	A0000164	591518.20	4183345.53	2.55	99.39	3.50	230.04	2.37
	A0000165	591617.41	4183339.45	2.55	99.39	3.50	228.44	2.37
	A0000166	591716.62	4183333.38	2.55	99.39	3.50	224.99	2.37
	A0000167	591814.99	4183327.42	2.55	105.90	12.26	222.76	2.37
	A0000168	591918.47	4183304.92	2.55	105.90	12.26	204.34	2.37
	A0000169	592021.95	4183282.43	2.55	105.90	12.26	195.39	2.37
	A0000170	592125.44	4183259.93	2.55	105.90	12.26	193.48	2.37
	A0000171	592228.92	4183237.44	2.55	105.90	12.26	169.64	2.37
	A0000172	592332.40	4183214.94	2.55	105.90	12.26	166.03	2.37
	A0000173	592435.88	4183192.44	2.55	105.90	12.26	166.37	2.37
	A0000174	592539.36	4183169.95	2.55	105.90	12.26	149.99	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000175	592642.84	4183147.45	2.55	105.90	12.26	150.00	2.37
	A0000176	592743.60	4183126.44	2.55	100.21	45.00	147.97	2.37
	A0000177	592814.47	4183055.58	2.55	100.21	45.00	131.90	2.37
	A0000178	592885.33	4182984.72	2.55	100.21	45.00	127.25	2.37
	A0000179	592956.19	4182913.85	2.55	100.21	45.00	131.79	2.37
	A0000180	593027.05	4182842.99	2.55	100.21	45.00	137.00	2.37
	A0000181	593097.92	4182772.13	2.55	100.21	45.00	124.61	2.37
	A0000182	593168.78	4182701.27	2.55	100.21	45.00	118.49	2.37
	A0000183	593239.64	4182630.40	2.55	100.21	45.00	125.41	2.37
	A0000184	593310.50	4182559.54	2.55	100.21	45.00	132.47	2.37
	A0000185	593381.37	4182488.68	2.55	100.21	45.00	126.23	2.37
	A0000186	593453.92	4182416.67	2.55	109.14	23.60	121.28	2.37
	A0000187	593553.93	4182372.98	2.55	109.14	23.60	121.18	2.37
	A0000188	593653.94	4182329.30	2.55	109.14	23.60	120.89	2.37
	A0000189	593753.95	4182285.61	2.55	109.14	23.60	123.30	2.37
	A0000190	593853.96	4182241.93	2.55	109.14	23.60	131.89	2.37
	A0000191	593953.97	4182198.24	2.55	109.14	23.60	141.97	2.37
	A0000192	594053.99	4182154.56	2.55	109.14	23.60	146.71	2.37
	A0000193	594154.00	4182110.87	2.55	109.14	23.60	146.38	2.37
	A0000194	594254.01	4182067.19	2.55	109.14	23.60	153.37	2.37
	A0000195	594358.73	4182023.65	2.55	109.74	332.88	170.52	2.37
	A0000196	594456.40	4182073.68	2.55	109.74	332.88	166.67	2.37
	A0000197	594554.07	4182123.70	2.55	109.74	332.88	167.54	2.37
	A0000198	594651.74	4182173.73	2.55	109.74	332.88	179.92	2.37
	A0000199	594749.41	4182223.76	2.55	109.74	332.88	184.33	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000200	594847.09	4182273.78	2.55	109.74	332.88	178.41	2.37
	A0000201	594944.76	4182323.81	2.55	109.74	332.88	182.96	2.37
	A0000202	595042.43	4182373.84	2.55	109.74	332.88	185.71	2.37
	A0000203	595140.10	4182423.86	2.55	109.74	332.88	188.33	2.37
	A0000204	595237.77	4182473.89	2.55	109.74	332.88	204.70	2.37
	A0000205	595335.45	4182523.92	2.55	104.18	332.78	208.04	2.37
	A0000206	595428.10	4182571.57	2.55	104.18	332.78	201.38	2.37
	A0000207	595520.74	4182619.21	2.55	104.18	332.78	206.78	2.37
	A0000208	595613.38	4182666.86	2.55	104.18	332.78	211.26	2.37
	A0000209	595706.02	4182714.50	2.55	104.18	332.78	211.85	2.37
	A0000210	595798.67	4182762.15	2.55	104.18	332.78	224.88	2.37
	A0000211	595891.31	4182809.79	2.55	104.18	332.78	233.52	2.37
	A0000212	595983.95	4182857.44	2.55	104.18	332.78	236.80	2.37
	A0000213	596076.59	4182905.08	2.55	104.18	332.78	241.81	2.37
	A0000214	596168.89	4182952.56	2.55	108.86	336.80	238.25	2.37
	A0000215	596268.94	4182995.44	2.55	108.86	336.80	230.78	2.37
	A0000216	596368.99	4183038.32	2.55	108.86	336.80	238.01	2.37
	A0000217	596469.05	4183081.20	2.55	108.86	336.80	243.77	2.37
	A0000218	596569.10	4183124.08	2.55	108.86	336.80	245.46	2.37
	A0000219	596669.16	4183166.96	2.55	108.86	336.80	254.59	2.37
	A0000220	596769.21	4183209.84	2.55	108.86	336.80	253.02	2.37
	A0000221	596869.26	4183252.72	2.55	108.86	336.80	242.04	2.37
	A0000222	596969.32	4183295.60	2.55	108.86	336.80	240.35	2.37
	A0000223	597069.37	4183338.48	2.55	108.86	336.80	252.40	2.37
	A0000224	597169.25	4183381.29	2.55	102.24	338.75	252.22	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000225	597264.54	4183418.35	2.55	102.24	338.75	256.32	2.37
	A0000226	597359.83	4183455.41	2.55	102.24	338.75	267.68	2.37
	A0000227	597455.12	4183492.46	2.55	102.24	338.75	258.96	2.37
	A0000228	597550.41	4183529.52	2.55	102.24	338.75	247.27	2.37
	A0000229	597645.70	4183566.58	2.55	102.24	338.75	244.48	2.37
	A0000230	597740.99	4183603.63	2.55	102.24	338.75	243.14	2.37
	A0000231	597836.28	4183640.69	2.55	102.24	338.75	243.15	2.37
	A0000232	597931.57	4183677.75	2.55	102.24	338.75	249.74	2.37
	A0000233	598027.73	4183715.24	2.55	100.51	328.57	250.77	2.37
	A0000234	598113.49	4183767.65	2.55	100.51	328.57	244.15	2.37
	A0000235	598199.25	4183820.06	2.55	100.51	328.57	225.34	2.37
	A0000236	598285.01	4183872.47	2.55	100.51	328.57	216.27	2.37
	A0000237	598370.77	4183924.88	2.55	100.51	328.57	212.69	2.37
	A0000238	598456.53	4183977.28	2.55	100.51	328.57	211.57	2.37
	A0000239	598542.29	4184029.69	2.55	100.51	328.57	203.50	2.37
	A0000240	598628.05	4184082.10	2.55	100.51	328.57	184.98	2.37
	A0000241	598713.82	4184134.51	2.55	100.51	328.57	172.40	2.37
	A0000242	598799.58	4184186.92	2.55	100.51	328.57	167.10	2.37
	A0000243	598885.11	4184239.20	2.55	108.83	331.28	163.44	2.37
	A0000244	598980.56	4184291.49	2.55	108.83	331.28	163.67	2.37
	A0000245	599076.00	4184343.78	2.55	108.83	331.28	153.71	2.37
	A0000246	599171.45	4184396.08	2.55	108.83	331.28	139.70	2.37
	A0000247	599266.90	4184448.37	2.55	108.83	331.28	133.46	2.37
	A0000248	599362.34	4184500.66	2.55	108.83	331.28	130.66	2.37
	A0000249	599457.79	4184552.95	2.55	108.83	331.28	128.00	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000250	599553.23	4184605.25	2.55	108.83	331.28	126.26	2.37
	A0000251	599648.68	4184657.54	2.55	108.83	331.28	129.12	2.37
	A0000252	599740.35	4184709.27	2.55	105.99	11.94	127.96	2.37
	A0000253	599844.04	4184687.34	2.55	105.99	11.94	134.91	2.37
	A0000254	599947.73	4184665.40	2.55	105.99	11.94	137.91	2.37
	A0000255	600051.42	4184643.47	2.55	105.99	11.94	150.85	2.37
	A0000256	600155.12	4184621.53	2.55	105.99	11.94	155.48	2.37
	A0000257	600258.81	4184599.60	2.55	105.99	11.94	160.04	2.37
	A0000258	600362.50	4184577.67	2.55	105.99	11.94	176.15	2.37
	A0000259	600466.19	4184555.73	2.55	105.99	11.94	179.48	2.37
	A0000260	600569.88	4184533.80	2.55	105.99	11.94	180.72	2.37
	A0000261	600673.40	4184511.90	2.55	108.82	13.78	180.70	2.37
	A0000262	600779.09	4184485.98	2.55	108.82	13.78	180.54	2.37
	A0000263	600884.78	4184460.05	2.55	108.82	13.78	180.64	2.37
	A0000264	600990.46	4184434.13	2.55	108.82	13.78	174.97	2.37
	A0000265	601096.15	4184408.21	2.55	108.82	13.78	181.54	2.37
	A0000266	601201.84	4184382.28	2.55	108.82	13.78	187.71	2.37
	A0000267	601307.52	4184356.36	2.55	108.82	13.78	192.32	2.37
	A0000268	601413.21	4184330.44	2.55	108.82	13.78	195.92	2.37
	A0000269	601518.90	4184304.52	2.55	108.82	13.78	193.33	2.37
	A0000270	601628.23	4184278.96	2.55	107.94	334.86	190.29	2.37
	A0000271	601725.94	4184324.82	2.55	107.94	334.86	190.91	2.37
	A0000272	601823.65	4184370.68	2.55	107.94	334.86	184.45	2.37
	A0000273	601921.36	4184416.55	2.55	107.94	334.86	173.08	2.37
	A0000274	602019.07	4184462.41	2.55	107.94	334.86	169.67	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000275	602116.78	4184508.27	2.55	107.94	334.86	181.73	2.37
	A0000276	602214.49	4184554.14	2.55	107.94	334.86	183.11	2.37
	A0000277	602312.20	4184600.00	2.55	107.94	334.86	187.97	2.37
	A0000278	602409.91	4184645.87	2.55	107.94	334.86	201.24	2.37
	A0000279	602509.17	4184692.82	2.55	101.52	315.00	192.98	2.37
	A0000280	602580.96	4184764.61	2.55	101.52	315.00	184.74	2.37
	A0000281	602652.75	4184836.39	2.55	101.52	315.00	191.89	2.37
	A0000282	602724.53	4184908.18	2.55	101.52	315.00	204.61	2.37
	A0000283	602796.32	4184979.97	2.55	101.52	315.00	190.83	2.37
	A0000284	602868.11	4185051.75	2.55	101.52	315.00	182.10	2.37
	A0000285	602939.89	4185123.54	2.55	101.52	315.00	181.46	2.37
	A0000286	603011.68	4185195.33	2.55	101.52	315.00	191.97	2.37
	A0000287	603083.47	4185267.12	2.55	101.52	315.00	205.44	2.37
	A0000288	603155.25	4185338.90	2.55	101.52	315.00	191.13	2.37
	A0000289	603225.61	4185409.66	2.55	100.33	333.43	176.78	2.37
	A0000290	603315.35	4185454.53	2.55	100.33	333.43	186.57	2.37
	A0000291	603405.08	4185499.39	2.55	100.33	333.43	195.48	2.37
	A0000292	603494.81	4185544.26	2.55	100.33	333.43	198.30	2.37
	A0000293	603584.55	4185589.13	2.55	100.33	333.43	198.72	2.37
	A0000294	603674.28	4185633.99	2.55	100.33	333.43	195.17	2.37
	A0000295	603764.01	4185678.86	2.55	100.33	333.43	185.84	2.37
	A0000296	603853.75	4185723.73	2.55	100.33	333.43	188.59	2.37
	A0000297	603943.48	4185768.59	2.55	100.33	333.43	199.07	2.37
	A0000298	604033.21	4185813.46	2.55	100.33	333.43	201.30	2.37
	A0000299	604121.84	4185857.92	2.55	107.42	345.76	201.27	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000300	604225.96	4185884.35	2.55	107.42	345.76	192.36	2.37
	A0000301	604330.08	4185910.77	2.55	107.42	345.76	184.08	2.37
	A0000302	604434.19	4185937.20	2.55	107.42	345.76	176.10	2.37
	A0000303	604538.31	4185963.63	2.55	107.42	345.76	163.21	2.37
	A0000304	604642.43	4185990.06	2.55	107.42	345.76	160.08	2.37
	A0000305	604746.54	4186016.49	2.55	107.42	345.76	158.85	2.37
	A0000306	604850.66	4186042.92	2.55	107.42	345.76	153.80	2.37
	A0000307	604954.78	4186069.35	2.55	107.42	345.76	152.57	2.37
	A0000308	605059.24	4186095.88	2.55	101.21	342.03	161.56	2.37
	A0000309	605155.51	4186127.11	2.55	101.21	342.03	168.39	2.37
	A0000310	605251.78	4186158.33	2.55	101.21	342.03	168.60	2.37
	A0000311	605348.06	4186189.56	2.55	101.21	342.03	166.97	2.37
	A0000312	605444.33	4186220.78	2.55	101.21	342.03	169.48	2.37
	A0000313	605540.60	4186252.01	2.55	101.21	342.03	167.65	2.37
	A0000314	605636.88	4186283.24	2.55	101.21	342.03	168.12	2.37
	A0000315	605733.15	4186314.46	2.55	101.21	342.03	179.40	2.37
	A0000316	605829.42	4186345.69	2.55	101.21	342.03	185.93	2.37
	A0000317	605925.69	4186376.92	2.55	101.21	342.03	189.02	2.37
	A0000318	606023.04	4186408.62	2.55	109.39	329.74	201.61	2.37
	A0000319	606117.53	4186463.74	2.55	109.39	329.74	201.31	2.37
	A0000320	606212.01	4186518.86	2.55	109.39	329.74	185.34	2.37
	A0000321	606306.50	4186573.98	2.55	109.39	329.74	188.47	2.37
	A0000322	606400.99	4186629.09	2.55	109.39	329.74	193.71	2.37
	A0000323	606495.47	4186684.21	2.55	109.39	329.74	195.34	2.37
	A0000324	606589.96	4186739.33	2.55	109.39	329.74	194.10	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000325	606685.80	4186795.56	2.55	83.31	311.42	180.24	2.37
	A0000326	606740.92	4186858.02	2.55	83.31	311.42	169.18	2.37
	A0000327	606796.03	4186920.49	2.55	83.31	311.42	164.66	2.37
	A0000328	606851.49	4186983.37	2.55	104.90	305.84	167.82	2.37
	A0000329	606912.90	4187068.41	2.55	104.90	305.84	175.58	2.37
	A0000330	606974.32	4187153.45	2.55	104.90	305.84	154.93	2.37
	A0000331	607035.73	4187238.49	2.55	104.90	305.84	138.75	2.37
	A0000332	607097.15	4187323.52	2.55	104.90	305.84	139.96	2.37
	A0000333	607158.57	4187408.56	2.55	104.90	305.84	136.28	2.37
	A0000334	607219.98	4187493.60	2.55	104.90	305.84	126.19	2.37
	A0000335	607280.50	4187577.67	2.55	96.45	319.64	124.14	2.37
	A0000336	607353.99	4187640.13	2.55	96.45	319.64	126.36	2.37
	A0000337	607427.48	4187702.60	2.55	96.45	319.64	114.86	2.37
	A0000338	607498.77	4187763.93	2.55	97.85	345.65	108.85	2.37
	A0000339	607593.57	4187788.18	2.55	97.85	345.65	109.34	2.37
	A0000340	607688.38	4187812.43	2.55	97.85	345.65	108.49	2.37
	A0000341	607783.18	4187836.68	2.55	97.85	345.65	113.43	2.37
	A0000342	607877.98	4187860.94	2.55	97.85	345.65	120.79	2.37
	A0000343	607970.67	4187885.07	2.55	107.57	7.85	120.75	2.37
	A0000344	608077.23	4187870.37	2.55	107.57	7.85	124.23	2.37
	A0000345	608183.79	4187855.67	2.55	107.57	7.85	129.77	2.37
	A0000346	608288.12	4187841.79	2.55	91.73	32.74	129.64	2.37
	A0000347	608365.29	4187792.19	2.55	91.73	32.74	135.30	2.37
	A0000348	608442.08	4187742.85	2.55	99.58	37.50	148.74	2.37
	A0000349	608521.08	4187682.22	2.55	99.58	37.50	173.29	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000350	608600.08	4187621.59	2.55	99.58	37.50	177.88	2.37
	A0000351	608679.08	4187560.96	2.55	99.58	37.50	180.64	2.37
	A0000352	608758.08	4187500.33	2.55	99.58	37.50	184.45	2.37
	A0000353	608837.08	4187439.70	2.55	99.58	37.50	206.39	2.37
	A0000354	608917.62	4187378.24	2.55	97.41	19.26	225.78	2.37
	A0000355	609009.58	4187346.12	2.55	97.41	19.26	227.26	2.37
	A0000356	609101.53	4187313.99	2.55	97.41	19.26	226.08	2.37
	A0000357	609193.49	4187281.86	2.55	97.41	19.26	227.33	2.37
	A0000358	609287.07	4187249.42	2.55	94.09	1.97	232.60	2.37
	A0000359	609381.11	4187246.18	2.55	94.09	1.97	236.81	2.37
	A0000360	609475.15	4187242.94	2.55	94.09	1.97	237.23	2.37
	A0000361	609569.18	4187239.69	2.55	94.09	1.97	242.19	2.37
	A0000362	609665.69	4187236.95	2.55	109.31	335.46	251.39	2.37
	A0000363	609765.13	4187282.34	2.55	109.31	335.46	253.33	2.37
	A0000364	609864.57	4187327.74	2.55	109.31	335.46	255.07	2.37
	A0000365	609964.01	4187373.13	2.55	109.31	335.46	249.31	2.37
	A0000366	610063.45	4187418.53	2.55	109.31	335.46	238.24	2.37
	A0000367	610162.89	4187463.93	2.55	109.31	335.46	237.85	2.37
	A0000368	610262.41	4187509.36	2.55	107.01	334.47	239.47	2.37
	A0000369	610358.97	4187555.48	2.55	107.01	334.47	239.85	2.37
	A0000370	610455.53	4187601.60	2.55	107.01	334.47	244.05	2.37
	A0000371	610552.09	4187647.72	2.55	107.01	334.47	249.70	2.37
	A0000372	610648.64	4187693.83	2.55	107.01	334.47	251.69	2.37
	A0000373	610745.20	4187739.95	2.55	107.01	334.47	233.82	2.37
	A0000374	610841.76	4187786.07	2.55	107.01	334.47	217.38	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000375	610938.32	4187832.18	2.55	107.01	334.47	215.59	2.37
	A0000376	611034.88	4187878.30	2.55	107.01	334.47	218.84	2.37
	A0000377	611130.21	4187924.00	2.55	106.08	348.00	224.92	2.37
	A0000378	611233.97	4187946.05	2.55	106.08	348.00	228.00	2.37
	A0000379	611337.73	4187968.10	2.55	106.08	348.00	228.73	2.37
	A0000380	611441.50	4187990.15	2.55	106.08	348.00	224.31	2.37
	A0000381	611545.26	4188012.20	2.55	106.08	348.00	212.52	2.37
	A0000382	611649.02	4188034.25	2.55	106.08	348.00	201.11	2.37
	A0000383	611752.79	4188056.30	2.55	106.08	348.00	178.24	2.37
	A0000384	611856.55	4188078.35	2.55	106.08	348.00	164.02	2.37
	A0000385	611960.31	4188100.40	2.55	106.08	348.00	158.85	2.37
	A0000386	612064.08	4188122.45	2.55	106.08	348.00	142.79	2.37
	A0000387	612166.32	4188144.39	2.55	106.89	3.87	137.36	2.37
	A0000388	612272.97	4188137.18	2.55	106.89	3.87	137.12	2.37
	A0000389	612379.62	4188129.98	2.55	106.89	3.87	128.67	2.37
	A0000390	612486.26	4188122.77	2.55	106.89	3.87	126.71	2.37
	A0000391	612592.91	4188115.57	2.55	106.89	3.87	124.44	2.37
	A0000392	612699.55	4188108.36	2.55	106.89	3.87	119.29	2.37
	A0000393	612806.20	4188101.16	2.55	106.89	3.87	118.68	2.37
	A0000394	612912.84	4188093.95	2.55	106.89	3.87	112.77	2.37
	A0000395	613019.49	4188086.74	2.55	106.89	3.87	109.23	2.37
	A0000396	613124.66	4188079.84	2.55	101.54	19.59	107.91	2.37
	A0000397	613220.32	4188045.80	2.55	101.54	19.59	100.67	2.37
	A0000398	613315.97	4188011.75	2.55	101.54	19.59	98.79	2.37
	A0000399	613411.63	4187977.70	2.55	101.54	19.59	100.19	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000400	613507.29	4187943.65	2.55	101.54	19.59	95.44	2.37
	A0000401	613602.95	4187909.61	2.55	101.54	19.59	92.73	2.37
	A0000402	613698.60	4187875.56	2.55	101.54	19.59	91.13	2.37
	A0000403	613794.26	4187841.51	2.55	101.54	19.59	84.87	2.37
	A0000404	613891.37	4187807.16	2.55	107.76	4.03	80.30	2.37
	A0000405	613998.86	4187799.59	2.55	107.76	4.03	79.37	2.37
	A0000406	614106.35	4187792.01	2.55	107.76	4.03	71.66	2.37
	A0000407	614213.85	4187784.43	2.55	107.76	4.03	68.93	2.37
	A0000408	614321.34	4187776.86	2.55	107.76	4.03	68.69	2.37
	A0000409	614428.83	4187769.28	2.55	107.76	4.03	63.18	2.37
	A0000410	614536.32	4187761.71	2.55	107.76	4.03	61.15	2.37
	A0000411	614643.81	4187754.13	2.55	107.76	4.03	61.00	2.37
	A0000412	614751.30	4187746.56	2.55	107.76	4.03	59.74	2.37
	A0000413	614858.79	4187738.98	2.55	107.76	4.03	59.37	2.37
	A0000414	614966.28	4187731.41	2.55	107.76	4.03	59.37	2.37
	A0000415	615073.77	4187723.83	2.55	107.76	4.03	58.23	2.37
	A0000416	615181.26	4187716.26	2.55	107.76	4.03	57.48	2.37
	A0000417	615288.75	4187708.68	2.55	107.76	4.03	57.58	2.37
	A0000418	615396.25	4187701.11	2.55	107.76	4.03	57.68	2.37
	A0000419	615503.74	4187693.53	2.55	107.76	4.03	58.00	2.37
	A0000420	615612.55	4187686.02	2.55	105.67	350.22	58.00	2.37
	A0000421	615716.68	4187703.98	2.55	105.67	350.22	58.00	2.37
	A0000422	615820.82	4187721.93	2.55	105.67	350.22	58.00	2.37
	A0000423	615924.95	4187739.89	2.55	105.67	350.22	58.00	2.37
	A0000424	616029.09	4187757.84	2.55	105.67	350.22	58.00	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000425	616133.22	4187775.79	2.55	105.67	350.22	58.00	2.37
	A0000426	616237.35	4187793.75	2.55	105.67	350.22	58.00	2.37
	A0000427	616341.49	4187811.70	2.55	105.67	350.22	58.00	2.37
	A0000428	616445.62	4187829.66	2.55	105.67	350.22	58.00	2.37
	A0000429	616549.76	4187847.61	2.55	105.67	350.22	58.00	2.37
	A0000430	616653.89	4187865.57	2.55	105.67	350.22	58.00	2.37
	A0000431	616758.03	4187883.52	2.55	105.67	350.22	58.00	2.37
	A0000432	616862.16	4187901.47	2.55	105.67	350.22	58.00	2.37
	A0000433	616966.29	4187919.43	2.55	105.67	350.22	58.00	2.37
	A0000434	617070.43	4187937.38	2.55	105.67	350.22	57.00	2.37
	A0000435	617176.06	4187955.82	2.55	101.71	333.81	57.00	2.37
	A0000436	617267.32	4188000.71	2.55	101.71	333.81	57.00	2.37
	A0000437	617358.59	4188045.59	2.55	101.71	333.81	57.09	2.37
	A0000438	617449.86	4188090.48	2.55	101.71	333.81	57.00	2.37
	A0000439	617541.12	4188135.36	2.55	101.71	333.81	57.00	2.37
	A0000440	617632.39	4188180.25	2.55	101.71	333.81	57.12	2.37
	A0000441	617723.66	4188225.13	2.55	101.71	333.81	58.38	2.37
	A0000442	617814.93	4188270.02	2.55	101.71	333.81	58.96	2.37
	A0000443	617906.19	4188314.90	2.55	101.71	333.81	59.37	2.37
	A0000444	617997.46	4188359.79	2.55	101.71	333.81	59.41	2.37
	A0000445	618088.73	4188404.68	2.55	101.71	333.81	62.19	2.37
	A0000446	618179.99	4188449.56	2.55	101.71	333.81	62.65	2.37
	A0000447	618273.00	4188495.80	2.55	107.64	310.70	64.36	2.37
	A0000448	618343.19	4188577.41	2.55	107.64	310.70	68.43	2.37
	A0000449	618413.37	4188659.02	2.55	107.64	310.70	67.65	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000450	618483.56	4188740.63	2.55	107.64	310.70	67.07	2.37
	A0000451	618553.74	4188822.24	2.55	107.64	310.70	68.80	2.37
	A0000452	618623.93	4188903.85	2.55	107.64	310.70	68.81	2.37
	A0000453	618694.11	4188985.46	2.55	107.64	310.70	68.13	2.37
	A0000454	618764.30	4189067.07	2.55	107.64	310.70	68.00	2.37
	A0000455	618834.48	4189148.68	2.55	107.64	310.70	69.85	2.37
	A0000456	618904.66	4189230.29	2.55	107.64	310.70	71.72	2.37
	A0000457	618974.85	4189311.90	2.55	107.64	310.70	72.58	2.37
	A0000458	619044.38	4189392.86	2.55	109.65	320.31	73.03	2.37
	A0000459	619128.76	4189462.88	2.55	109.65	320.31	74.73	2.37
	A0000460	619213.15	4189532.90	2.55	109.65	320.31	77.42	2.37
	A0000461	619297.53	4189602.92	2.55	109.65	320.31	75.08	2.37
	A0000462	619381.91	4189672.94	2.55	109.65	320.31	75.57	2.37
	A0000463	619466.30	4189742.97	2.55	109.65	320.31	79.18	2.37
	A0000464	619550.68	4189812.99	2.55	109.65	320.31	79.48	2.37
	A0000465	619635.07	4189883.01	2.55	109.65	320.31	76.74	2.37
	A0000466	619719.45	4189953.03	2.55	109.65	320.31	76.94	2.37
	A0000467	619803.84	4190023.05	2.55	109.65	320.31	80.67	2.37
	A0000468	619886.48	4190092.10	2.55	104.18	341.29	83.84	2.37
	A0000469	619985.15	4190125.51	2.55	104.18	341.29	82.77	2.37
	A0000470	620083.82	4190158.93	2.55	104.18	341.29	83.69	2.37
	A0000471	620182.49	4190192.35	2.55	104.18	341.29	91.25	2.37
	A0000472	620281.16	4190225.76	2.55	104.18	341.29	91.35	2.37
	A0000473	620379.83	4190259.18	2.55	104.18	341.29	97.18	2.37
	A0000474	620478.50	4190292.60	2.55	104.18	341.29	111.52	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000475	620577.17	4190326.01	2.55	104.18	341.29	114.61	2.37
	A0000476	620675.84	4190359.43	2.55	104.18	341.29	116.42	2.37
	A0000477	620774.51	4190392.85	2.55	104.18	341.29	123.17	2.37
	A0000478	620871.22	4190425.98	2.55	107.86	2.03	118.02	2.37
	A0000479	620979.02	4190422.16	2.55	107.86	2.03	124.25	2.37
	A0000480	621086.81	4190418.34	2.55	107.86	2.03	132.88	2.37
	A0000481	621194.61	4190414.53	2.55	107.86	2.03	135.98	2.37
	A0000482	621302.40	4190410.71	2.55	107.86	2.03	143.19	2.37
	A0000483	621410.20	4190406.90	2.55	107.86	2.03	147.62	2.37
	A0000484	621517.99	4190403.08	2.55	107.86	2.03	151.76	2.37
	A0000485	621625.79	4190399.27	2.55	107.86	2.03	162.18	2.37
	A0000486	621733.58	4190395.45	2.55	107.86	2.03	164.60	2.37
	A0000487	621841.38	4190391.63	2.55	107.86	2.03	170.44	2.37
	A0000488	621949.17	4190387.82	2.55	107.86	2.03	182.57	2.37
	A0000489	622056.97	4190384.00	2.55	107.86	2.03	186.77	2.37
	A0000490	622164.76	4190380.19	2.55	107.86	2.03	196.59	2.37
	A0000491	622272.56	4190376.37	2.55	107.86	2.03	206.95	2.37
	A0000492	622380.35	4190372.56	2.55	107.86	2.03	212.92	2.37
	A0000493	622488.15	4190368.74	2.55	107.86	2.03	229.38	2.37
	A0000494	622597.01	4190364.99	2.55	104.34	350.88	238.14	2.37
	A0000495	622700.03	4190381.52	2.55	104.34	350.88	235.10	2.37
	A0000496	622803.06	4190398.06	2.55	104.34	350.88	237.38	2.37
	A0000497	622906.09	4190414.59	2.55	104.34	350.88	245.02	2.37
	A0000498	623009.11	4190431.13	2.55	104.34	350.88	237.75	2.37
	A0000499	623112.14	4190447.66	2.55	104.34	350.88	237.66	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000500	623215.16	4190464.20	2.55	104.34	350.88	237.37	2.37
	A0000501	623318.19	4190480.73	2.55	104.34	350.88	236.09	2.37
	A0000502	623421.21	4190497.27	2.55	104.34	350.88	241.86	2.37
	A0000503	623524.24	4190513.80	2.55	104.34	350.88	241.92	2.37
	A0000504	623627.26	4190530.34	2.55	104.34	350.88	242.89	2.37
	A0000505	623730.29	4190546.87	2.55	104.34	350.88	251.45	2.37
	A0000506	623834.10	4190563.60	2.55	101.37	342.47	250.42	2.37
	A0000507	623930.76	4190594.12	2.55	101.37	342.47	255.05	2.37
	A0000508	624027.43	4190624.65	2.55	101.37	342.47	270.81	2.37
	A0000509	624124.10	4190655.17	2.55	101.37	342.47	275.04	2.37
	A0000510	624220.76	4190685.70	2.55	101.37	342.47	267.52	2.37
	A0000511	624317.43	4190716.23	2.55	101.37	342.47	263.46	2.37
	A0000512	624414.09	4190746.75	2.55	101.37	342.47	247.79	2.37
	A0000513	624510.76	4190777.28	2.55	101.37	342.47	240.44	2.37
	A0000514	624607.42	4190807.80	2.55	101.37	342.47	255.49	2.37
	A0000515	624704.09	4190838.33	2.55	101.37	342.47	256.55	2.37
	A0000516	624800.76	4190868.86	2.55	101.37	342.47	260.11	2.37
	A0000517	624897.42	4190899.38	2.55	101.37	342.47	282.07	2.37
	A0000518	624993.78	4190929.82	2.55	99.21	345.75	290.57	2.37
	A0000519	625089.94	4190954.24	2.55	99.21	345.75	296.86	2.37
	A0000520	625186.10	4190978.66	2.55	99.21	345.75	302.32	2.37
	A0000521	625282.26	4191003.08	2.55	99.21	345.75	299.02	2.37
	A0000522	625378.41	4191027.50	2.55	99.21	345.75	286.06	2.37
	A0000523	625474.57	4191051.93	2.55	99.21	345.75	281.94	2.37
	A0000524	625570.73	4191076.35	2.55	99.21	345.75	285.88	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000525	625666.88	4191100.77	2.55	99.21	345.75	281.28	2.37
	A0000526	625763.04	4191125.19	2.55	99.21	345.75	283.52	2.37
	A0000527	625859.20	4191149.61	2.55	99.21	345.75	289.78	2.37
	A0000528	625954.64	4191173.90	2.55	101.65	353.37	286.76	2.37
	A0000529	626055.61	4191185.64	2.55	101.65	353.37	290.19	2.37
	A0000530	626156.58	4191197.38	2.55	101.65	353.37	294.90	2.37
	A0000531	626257.55	4191209.12	2.55	101.65	353.37	293.24	2.37
	A0000532	626358.52	4191220.86	2.55	101.65	353.37	296.15	2.37
	A0000533	626459.49	4191232.60	2.55	101.65	353.37	297.82	2.37
	A0000534	626560.46	4191244.34	2.55	101.65	353.37	297.06	2.37
	A0000535	626661.43	4191256.08	2.55	101.65	353.37	299.71	2.37
	A0000536	626762.40	4191267.82	2.55	101.65	353.37	299.73	2.37
	A0000537	626863.37	4191279.56	2.55	101.65	353.37	293.81	2.37
	A0000538	626964.34	4191291.30	2.55	101.65	353.37	293.18	2.37
	A0000539	627065.31	4191303.05	2.55	101.65	353.37	296.55	2.37
	A0000540	627166.28	4191314.79	2.55	101.65	353.37	292.10	2.37
	A0000541	627269.92	4191327.59	2.55	107.92	323.15	292.62	2.37
	A0000542	627356.28	4191392.30	2.55	107.92	323.15	278.16	2.37
	A0000543	627442.64	4191457.02	2.55	107.92	323.15	271.04	2.37
	A0000544	627529.00	4191521.74	2.55	107.92	323.15	278.97	2.37
	A0000545	627615.36	4191586.45	2.55	107.92	323.15	271.14	2.37
	A0000546	627701.72	4191651.17	2.55	107.92	323.15	235.60	2.37
	A0000547	627788.08	4191715.88	2.55	107.92	323.15	232.43	2.37
	A0000548	627874.44	4191780.60	2.55	107.92	323.15	243.74	2.37
	A0000549	627960.80	4191845.31	2.55	107.92	323.15	245.51	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000550	628047.16	4191910.03	2.55	107.92	323.15	208.07	2.37
	A0000551	628132.25	4191974.03	2.55	103.66	338.37	196.97	2.37
	A0000552	628228.62	4192012.25	2.55	103.66	338.37	205.34	2.37
	A0000553	628324.98	4192050.46	2.55	103.66	338.37	208.89	2.37
	A0000554	628421.34	4192088.67	2.55	103.66	338.37	210.79	2.37
	A0000555	628517.71	4192126.89	2.55	103.66	338.37	211.99	2.37
	A0000556	628611.76	4192164.72	2.55	109.98	2.89	201.61	2.37
	A0000557	628721.60	4192159.18	2.55	109.98	2.89	205.26	2.37
	A0000558	628831.44	4192153.64	2.55	109.98	2.89	211.04	2.37
	A0000559	628941.28	4192148.10	2.55	109.98	2.89	215.38	2.37
	A0000560	629051.12	4192142.57	2.55	109.98	2.89	218.96	2.37
	A0000561	629160.96	4192137.03	2.55	109.98	2.89	224.90	2.37
	A0000562	629270.80	4192131.49	2.55	109.98	2.89	227.63	2.37
	A0000563	629380.64	4192125.95	2.55	109.98	2.89	230.53	2.37
	A0000564	629490.48	4192120.41	2.55	109.98	2.89	233.16	2.37
	A0000565	629602.24	4192115.12	2.55	88.80	342.58	233.97	2.37
	A0000566	629686.97	4192141.70	2.55	88.80	342.58	239.41	2.37
	A0000567	629771.70	4192168.29	2.55	88.80	342.58	236.22	2.37
	A0000568	629856.44	4192194.87	2.55	88.80	342.58	228.21	2.37
	A0000569	629941.17	4192221.45	2.55	88.80	342.58	223.28	2.37
	A0000570	630026.94	4192248.48	2.55	105.66	330.84	232.98	2.37
	A0000571	630119.21	4192299.96	2.55	105.66	330.84	231.30	2.37
	A0000572	630211.48	4192351.45	2.55	105.66	330.84	233.80	2.37
	A0000573	630303.76	4192402.93	2.55	105.66	330.84	245.81	2.37
	A0000574	630396.03	4192454.41	2.55	105.66	330.84	239.30	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN16	A0000575	630488.30	4192505.90	2.55	105.66	330.84	218.54	2.37
	A0000576	630580.57	4192557.38	2.55	105.66	330.84	210.85	2.37
	A0000577	630672.85	4192608.86	2.55	105.66	330.84	208.56	2.37
	A0000578	630765.12	4192660.35	2.55	105.66	330.84	208.66	2.37
	A0000579	630857.39	4192711.83	2.55	105.66	330.84	210.00	2.37
	A0000580	630949.67	4192763.31	2.55	105.66	330.84	191.97	2.37
	A0000581	631041.94	4192814.80	2.55	105.66	330.84	178.30	2.37
	A0000582	631134.21	4192866.28	2.55	105.66	330.84	173.23	2.37
	A0000583	631225.36	4192917.29	2.55	106.37	343.61	172.31	2.37
	A0000584	631327.40	4192947.30	2.55	106.37	343.61	171.21	2.37
	A0000585	631429.39	4192977.30	2.55	93.23	344.24	171.55	2.37
	A0000586	631519.11	4193002.62	2.55	93.23	344.24	172.50	2.37
	A0000587	631608.84	4193027.93	2.55	93.23	344.24	171.97	2.37
	A0000588	631698.57	4193053.24	2.55	93.23	344.24	172.09	2.37
	A0000589	631788.30	4193078.56	2.55	93.23	344.24	174.34	2.37
	A0000590	631878.03	4193103.87	2.55	93.23	344.24	175.57	2.37
	A0000591	631966.91	4193129.02	2.55	106.45	353.28	157.31	2.37
	A0000592	632072.63	4193141.48	2.55	106.45	353.28	150.73	2.37
	A0000593	632178.35	4193153.93	2.55	106.45	353.28	154.12	2.37
	A0000594	632284.07	4193166.38	2.55	106.45	353.28	153.02	2.37
	A0000595	632389.80	4193178.84	2.55	106.45	353.28	155.72	2.37
	A0000596	632495.52	4193191.29	2.55	106.45	353.28	156.15	2.37
	A0000597	632602.34	4193203.99	2.55	88.75	341.57	155.93	2.37
	A0000598	632686.54	4193232.06	2.55	88.75	341.57	158.16	2.37

Control Pathway

Dispersion Options

Titles

C:\Users\DELL\Desktop\aydindenizli2\aydindenizli2.isc

Dispersion Options

☑ Regulatory Default ☐ Non-Default Options

Dispersion Coefficient

Rural

Output Type

☑ Concentration
☐ Total Deposition (Dry & Wet)
☐ Dry Deposition
☐ Wet Deposition

Plume Depletion

☐ Dry Removal
☐ Wet Removal

Output Warnings

☐ No Output Warnings
☐ Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

OTHER - VOC

Averaging Time Options

Hours: ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 6 ☐ 8 ☐ 12 ☑ 24

☐ Month ☐ Period ☐ Annual

Exponential Decay

Option not available

Terrain Height Options

☐ Flat ☑ Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

☐ Yes ☑ No

Default Height = 0.00 m

Output Pathway

Tabular Printed Outputs

Short Term Averaging Period	RECTABLE Highest Values Table										MAXTABLE Maximum Values Table	DAYTABLE Daily Values Table
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th		
1	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No
24	■	☐	☐	☐	☐	☐	☐	☐	☐	☐		No

Threshold Violation Files (MAXIFILE)

Path for MAXIFILES: AYDINDENIZLI2-TVOC.AD

Averaging Period	Source Group ID	Treshhold Value	File Unit (Optional)	File Name
1	highway	280,00		highwayho.MAX
24	highway	70,00		highwayda.MAX

Contour Plot Files (PLOTFILE)

Path for PLOTFILES: AYDINDENIZLI2-TVOC.AD

Averaging Period	Source Group ID	High Value	File Name
1	highway	1st	01H1G001.PLT
24	highway	1st	24H1G001.PLT

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m (Optional)
1	690318.57	4186097.53	UCART5	293.66	
2	691318.57	4186097.53	UCART5	280.71	
3	692318.57	4186097.53	UCART5	270.09	
4	693318.57	4186097.53	UCART5	272.29	
5	694318.57	4186097.53	UCART5	274.00	
6	695318.57	4186097.53	UCART5	319.43	
7	696318.57	4186097.53	UCART5	290.24	
8	697318.57	4186097.53	UCART5	350.50	
9	698318.57	4186097.53	UCART5	363.91	
10	699318.57	4186097.53	UCART5	365.33	
11	700318.57	4186097.53	UCART5	378.59	
12	701318.57	4186097.53	UCART5	393.23	
13	702318.57	4186097.53	UCART5	398.93	
14	703318.57	4186097.53	UCART5	406.55	
15	704318.57	4186097.53	UCART5	420.37	
16	690318.57	4187097.53	UCART5	268.77	
17	691318.57	4187097.53	UCART5	260.47	
18	692318.57	4187097.53	UCART5	250.52	
19	693318.57	4187097.53	UCART5	252.37	
20	694318.57	4187097.53	UCART5	262.24	
21	695318.57	4187097.53	UCART5	277.52	
22	696318.57	4187097.53	UCART5	290.06	
23	697318.57	4187097.53	UCART5	346.29	
24	698318.57	4187097.53	UCART5	363.97	
25	699318.57	4187097.53	UCART5	376.82	
26	700318.57	4187097.53	UCART5	386.73	
27	701318.57	4187097.53	UCART5	397.16	
28	702318.57	4187097.53	UCART5	407.09	
29	703318.57	4187097.53	UCART5	417.87	
30	704318.57	4187097.53	UCART5	447.56	
31	690318.57	4188097.53	UCART5	240.80	
32	691318.57	4188097.53	UCART5	241.10	
33	692318.57	4188097.53	UCART5	239.03	

34	693318.57	4188097.53	UCART5	248.83
35	694318.57	4188097.53	UCART5	264.29
36	695318.57	4188097.53	UCART5	283.15
37	696318.57	4188097.53	UCART5	295.58
38	697318.57	4188097.53	UCART5	337.21
39	698318.57	4188097.53	UCART5	358.77
40	699318.57	4188097.53	UCART5	370.94
41	700318.57	4188097.53	UCART5	392.29
42	701318.57	4188097.53	UCART5	434.24
43	703318.57	4188097.53	UCART5	460.71
44	704318.57	4188097.53	UCART5	456.96
45	690318.57	4189097.53	UCART5	225.67
46	691318.57	4189097.53	UCART5	230.75
47	692318.57	4189097.53	UCART5	243.91
48	693318.57	4189097.53	UCART5	253.57
49	694318.57	4189097.53	UCART5	272.54
50	696318.57	4189097.53	UCART5	343.60
51	697318.57	4189097.53	UCART5	387.92
52	700318.57	4189097.53	UCART5	467.62
53	701318.57	4189097.53	UCART5	462.13
54	702318.57	4189097.53	UCART5	483.36
55	703318.57	4189097.53	UCART5	476.21
56	704318.57	4189097.53	UCART5	501.09
57	690318.57	4190097.53	UCART5	219.51
58	691318.57	4190097.53	UCART5	235.15
59	692318.57	4190097.53	UCART5	264.32
60	694318.57	4190097.53	UCART5	316.78
61	695318.57	4190097.53	UCART5	384.19
62	696318.57	4190097.53	UCART5	400.22
63	697318.57	4190097.53	UCART5	417.30
64	698318.57	4190097.53	UCART5	519.54
65	699318.57	4190097.53	UCART5	408.71
66	700318.57	4190097.53	UCART5	457.82
67	701318.57	4190097.53	UCART5	446.87
68	702318.57	4190097.53	UCART5	502.12
69	703318.57	4190097.53	UCART5	507.49
70	704318.57	4190097.53	UCART5	501.24
71	690318.57	4191097.53	UCART5	222.42
72	692318.57	4191097.53	UCART5	269.08
73	693318.57	4191097.53	UCART5	320.81
74	694318.57	4191097.53	UCART5	364.34

Receptor Pathway

75	695318.57	4191097.53	UCART5	439.06
76	696318.57	4191097.53	UCART5	499.15
77	697318.57	4191097.53	UCART5	523.12
78	698318.57	4191097.53	UCART5	522.03
79	699318.57	4191097.53	UCART5	471.19
80	700318.57	4191097.53	UCART5	565.85
81	701318.57	4191097.53	UCART5	466.78
82	702318.57	4191097.53	UCART5	512.13
83	703318.57	4191097.53	UCART5	498.56
84	704318.57	4191097.53	UCART5	490.88
85	690318.57	4192097.53	UCART5	233.82
86	691318.57	4192097.53	UCART5	256.25
87	692318.57	4192097.53	UCART5	293.47
88	693318.57	4192097.53	UCART5	347.08
89	694318.57	4192097.53	UCART5	378.01
90	695318.57	4192097.53	UCART5	416.58
91	696318.57	4192097.53	UCART5	435.38
92	697318.57	4192097.53	UCART5	574.61
93	698318.57	4192097.53	UCART5	548.16
94	699318.57	4192097.53	UCART5	581.39
95	700318.57	4192097.53	UCART5	476.75
96	701318.57	4192097.53	UCART5	519.01
97	702318.57	4192097.53	UCART5	523.92
98	703318.57	4192097.53	UCART5	504.05
99	704318.57	4192097.53	UCART5	504.27
100	690318.57	4193097.53	UCART5	250.89
101	691318.57	4193097.53	UCART5	272.93
102	692318.57	4193097.53	UCART5	306.67
103	693318.57	4193097.53	UCART5	348.65
104	694318.57	4193097.53	UCART5	412.82
105	695318.57	4193097.53	UCART5	551.63
106	696318.57	4193097.53	UCART5	570.27
107	697318.57	4193097.53	UCART5	607.47
108	698318.57	4193097.53	UCART5	622.34
109	699318.57	4193097.53	UCART5	619.20
110	700318.57	4193097.53	UCART5	563.51
111	701318.57	4193097.53	UCART5	495.12
112	702318.57	4193097.53	UCART5	525.20
113	703318.57	4193097.53	UCART5	525.56
114	704318.57	4193097.53	UCART5	523.17
115	690318.57	4194097.53	UCART5	262.54

116	691318.57	4194097.53	UCART5	297.79
117	692318.57	4194097.53	UCART5	337.01
118	693318.57	4194097.53	UCART5	379.67
119	694318.57	4194097.53	UCART5	510.61
120	695318.57	4194097.53	UCART5	502.55
121	696318.57	4194097.53	UCART5	572.07
122	697318.57	4194097.53	UCART5	519.48
123	698318.57	4194097.53	UCART5	628.86
124	699318.57	4194097.53	UCART5	706.57
125	700318.57	4194097.53	UCART5	593.89
126	701318.57	4194097.53	UCART5	553.04
127	702318.57	4194097.53	UCART5	565.32
128	703318.57	4194097.53	UCART5	560.56
129	704318.57	4194097.53	UCART5	635.38
130	690318.57	4195097.53	UCART5	261.97
131	691318.57	4195097.53	UCART5	305.91
132	692318.57	4195097.53	UCART5	382.18
133	693318.57	4195097.53	UCART5	475.35
134	694318.57	4195097.53	UCART5	470.43
135	695318.57	4195097.53	UCART5	655.66
136	696318.57	4195097.53	UCART5	584.11
137	697318.57	4195097.53	UCART5	592.67
138	698318.57	4195097.53	UCART5	638.57
139	699318.57	4195097.53	UCART5	686.02
140	700318.57	4195097.53	UCART5	633.27
141	701318.57	4195097.53	UCART5	561.72
142	702318.57	4195097.53	UCART5	638.00
143	703318.57	4195097.53	UCART5	568.55
144	704318.57	4195097.53	UCART5	724.16
145	675824.47	4188157.32	UCART4	469.08
146	676824.47	4188157.32	UCART4	438.17
147	677824.47	4188157.32	UCART4	399.91
148	678824.47	4188157.32	UCART4	413.11
149	679824.47	4188157.32	UCART4	435.68
150	680824.47	4188157.32	UCART4	344.03
151	681824.47	4188157.32	UCART4	328.34
152	682824.47	4188157.32	UCART4	327.28
153	683824.47	4188157.32	UCART4	312.50
154	684824.47	4188157.32	UCART4	311.26
155	685824.47	4188157.32	UCART4	276.72
156	686824.47	4188157.32	UCART4	269.22

157	687824.47	4188157.32	UCART4	247.12
158	688824.47	4188157.32	UCART4	233.16
159	689824.47	4188157.32	UCART4	238.14
160	675824.47	4189157.32	UCART4	424.42
161	676824.47	4189157.32	UCART4	380.23
162	677824.47	4189157.32	UCART4	335.71
163	678824.47	4189157.32	UCART4	370.01
164	679824.47	4189157.32	UCART4	349.32
165	680824.47	4189157.32	UCART4	328.87
166	681824.47	4189157.32	UCART4	326.83
167	682824.47	4189157.32	UCART4	337.17
168	683824.47	4189157.32	UCART4	301.76
169	684824.47	4189157.32	UCART4	260.93
170	685824.47	4189157.32	UCART4	253.25
171	686824.47	4189157.32	UCART4	237.47
172	687824.47	4189157.32	UCART4	223.91
173	688824.47	4189157.32	UCART4	218.31
174	689824.47	4189157.32	UCART4	221.87
175	675824.47	4190157.32	UCART4	350.88
176	676824.47	4190157.32	UCART4	328.14
177	677824.47	4190157.32	UCART4	324.46
178	678824.47	4190157.32	UCART4	329.20
179	679824.47	4190157.32	UCART4	349.59
180	680824.47	4190157.32	UCART4	344.05
181	681824.47	4190157.32	UCART4	320.33
182	682824.47	4190157.32	UCART4	303.30
183	683824.47	4190157.32	UCART4	260.99
184	684824.47	4190157.32	UCART4	232.22
185	685824.47	4190157.32	UCART4	240.98
186	686824.47	4190157.32	UCART4	212.38
187	687824.47	4190157.32	UCART4	214.59
188	688824.47	4190157.32	UCART4	212.95
189	689824.47	4190157.32	UCART4	214.50
190	675824.47	4191157.32	UCART4	301.75
191	676824.47	4191157.32	UCART4	278.16
192	677824.47	4191157.32	UCART4	274.63
193	678824.47	4191157.32	UCART4	297.23
194	679824.47	4191157.32	UCART4	334.72
195	680824.47	4191157.32	UCART4	336.41
196	681824.47	4191157.32	UCART4	304.56
197	682824.47	4191157.32	UCART4	287.63

198	683824.47	4191157.32	UCART4	309.13
199	684824.47	4191157.32	UCART4	242.53
200	685824.47	4191157.32	UCART4	208.48
201	686824.47	4191157.32	UCART4	199.55
202	687824.47	4191157.32	UCART4	201.85
203	688824.47	4191157.32	UCART4	209.63
204	689824.47	4191157.32	UCART4	215.02
205	675824.47	4192157.32	UCART4	254.13
206	676824.47	4192157.32	UCART4	252.21
207	679824.47	4192157.32	UCART4	329.94
208	680824.47	4192157.32	UCART4	356.88
209	681824.47	4192157.32	UCART4	315.27
210	682824.47	4192157.32	UCART4	323.24
211	683824.47	4192157.32	UCART4	263.00
212	684824.47	4192157.32	UCART4	221.18
213	685824.47	4192157.32	UCART4	197.72
214	688824.47	4192157.32	UCART4	206.20
215	689824.47	4192157.32	UCART4	223.02
216	676824.47	4193157.32	UCART4	211.11
217	677824.47	4193157.32	UCART4	228.79
218	678824.47	4193157.32	UCART4	263.29
219	679824.47	4193157.32	UCART4	272.03
220	682824.47	4193157.32	UCART4	254.91
221	685824.47	4193157.32	UCART4	184.87
222	686824.47	4193157.32	UCART4	193.92
223	687824.47	4193157.32	UCART4	198.23
224	688824.47	4193157.32	UCART4	212.23
225	689824.47	4193157.32	UCART4	234.18
226	675824.47	4194157.32	UCART4	203.43
227	676824.47	4194157.32	UCART4	192.43
228	677824.47	4194157.32	UCART4	206.92
229	678824.47	4194157.32	UCART4	210.16
230	679824.47	4194157.32	UCART4	227.00
231	680824.47	4194157.32	UCART4	258.14
232	681824.47	4194157.32	UCART4	263.73
233	682824.47	4194157.32	UCART4	228.75
234	683824.47	4194157.32	UCART4	201.87
235	684824.47	4194157.32	UCART4	183.73
236	685824.47	4194157.32	UCART4	184.72
237	686824.47	4194157.32	UCART4	188.05
238	687824.47	4194157.32	UCART4	199.02

239	688824.47	4194157.32	UCART4	218.58
240	689824.47	4194157.32	UCART4	243.28
241	675824.47	4195157.32	UCART4	181.43
242	676824.47	4195157.32	UCART4	180.86
243	677824.47	4195157.32	UCART4	182.75
244	678824.47	4195157.32	UCART4	194.28
245	679824.47	4195157.32	UCART4	253.68
246	680824.47	4195157.32	UCART4	222.83
247	681824.47	4195157.32	UCART4	201.60
248	682824.47	4195157.32	UCART4	189.40
249	683824.47	4195157.32	UCART4	182.88
250	684824.47	4195157.32	UCART4	179.76
251	685824.47	4195157.32	UCART4	182.04
252	686824.47	4195157.32	UCART4	189.18
253	687824.47	4195157.32	UCART4	208.46
254	688824.47	4195157.32	UCART4	232.21
255	689824.47	4195157.32	UCART4	251.80
256	675824.47	4196157.32	UCART4	166.25
257	676824.47	4196157.32	UCART4	167.07
258	677824.47	4196157.32	UCART4	160.53
259	678824.47	4196157.32	UCART4	163.18
260	679824.47	4196157.32	UCART4	169.66
261	680824.47	4196157.32	UCART4	182.17
262	681824.47	4196157.32	UCART4	173.56
263	682824.47	4196157.32	UCART4	171.55
264	683824.47	4196157.32	UCART4	173.74
265	684824.47	4196157.32	UCART4	176.40
266	685824.47	4196157.32	UCART4	181.04
267	686824.47	4196157.32	UCART4	188.04
268	687824.47	4196157.32	UCART4	213.42
269	688824.47	4196157.32	UCART4	240.96
270	689824.47	4196157.32	UCART4	281.23
271	675824.47	4197157.32	UCART4	156.21
272	676824.47	4197157.32	UCART4	160.40
273	677824.47	4197157.32	UCART4	156.10
274	678824.47	4197157.32	UCART4	157.77
275	679824.47	4197157.32	UCART4	160.49
276	680824.47	4197157.32	UCART4	163.87
277	681824.47	4197157.32	UCART4	166.10
278	682824.47	4197157.32	UCART4	167.78
279	683824.47	4197157.32	UCART4	171.07

280	684824.47	4197157.32	UCART4	184.73
281	685824.47	4197157.32	UCART4	205.58
282	686824.47	4197157.32	UCART4	203.34
283	687824.47	4197157.32	UCART4	266.64
284	688824.47	4197157.32	UCART4	316.37
285	689824.47	4197157.32	UCART4	360.95
286	660443.31	4191912.47	UCART3	492.89
287	661443.31	4191912.47	UCART3	478.80
288	662443.31	4191912.47	UCART3	523.81
289	663443.31	4191912.47	UCART3	455.96
290	664443.31	4191912.47	UCART3	408.60
291	665443.31	4191912.47	UCART3	305.29
292	666443.31	4191912.47	UCART3	285.21
293	667443.31	4191912.47	UCART3	378.07
294	668443.31	4191912.47	UCART3	367.70
295	669443.31	4191912.47	UCART3	454.94
296	670443.31	4191912.47	UCART3	394.52
297	671443.31	4191912.47	UCART3	376.11
298	672443.31	4191912.47	UCART3	398.58
299	673443.31	4191912.47	UCART3	384.12
300	674443.31	4191912.47	UCART3	315.93
301	675443.31	4191912.47	UCART3	279.78
302	660443.31	4192912.47	UCART3	471.24
303	661443.31	4192912.47	UCART3	413.58
304	662443.31	4192912.47	UCART3	341.86
305	663443.31	4192912.47	UCART3	362.80
306	664443.31	4192912.47	UCART3	320.74
307	665443.31	4192912.47	UCART3	375.29
308	666443.31	4192912.47	UCART3	373.35
309	667443.31	4192912.47	UCART3	311.90
310	668443.31	4192912.47	UCART3	300.23
311	669443.31	4192912.47	UCART3	346.96
312	670443.31	4192912.47	UCART3	327.19
313	671443.31	4192912.47	UCART3	322.98
314	672443.31	4192912.47	UCART3	296.78
315	673443.31	4192912.47	UCART3	289.02
316	674443.31	4192912.47	UCART3	269.50
317	675443.31	4192912.47	UCART3	241.25
318	660443.31	4193912.47	UCART3	498.16
319	661443.31	4193912.47	UCART3	439.45
320	662443.31	4193912.47	UCART3	402.64

321	663443.31	4193912.47	UCART3	375.06
322	664443.31	4193912.47	UCART3	284.37
323	665443.31	4193912.47	UCART3	329.77
324	666443.31	4193912.47	UCART3	277.06
325	667443.31	4193912.47	UCART3	236.48
326	668443.31	4193912.47	UCART3	310.09
327	669443.31	4193912.47	UCART3	303.17
328	670443.31	4193912.47	UCART3	272.09
329	671443.31	4193912.47	UCART3	271.81
330	672443.31	4193912.47	UCART3	349.54
331	673443.31	4193912.47	UCART3	277.69
332	675443.31	4193912.47	UCART3	214.02
333	660443.31	4194912.47	UCART3	377.48
334	661443.31	4194912.47	UCART3	305.99
335	662443.31	4194912.47	UCART3	341.51
336	663443.31	4194912.47	UCART3	255.98
337	664443.31	4194912.47	UCART3	313.16
338	665443.31	4194912.47	UCART3	255.16
339	666443.31	4194912.47	UCART3	233.72
340	667443.31	4194912.47	UCART3	223.40
341	668443.31	4194912.47	UCART3	237.36
342	669443.31	4194912.47	UCART3	252.02
343	670443.31	4194912.47	UCART3	241.97
344	671443.31	4194912.47	UCART3	254.72
345	673443.31	4194912.47	UCART3	249.50
346	674443.31	4194912.47	UCART3	212.24
347	675443.31	4194912.47	UCART3	187.28
348	660443.31	4195912.47	UCART3	256.98
349	661443.31	4195912.47	UCART3	259.12
350	662443.31	4195912.47	UCART3	212.44
351	663443.31	4195912.47	UCART3	254.19
352	664443.31	4195912.47	UCART3	230.51
353	665443.31	4195912.47	UCART3	220.64
354	666443.31	4195912.47	UCART3	213.87
355	672443.31	4195912.47	UCART3	199.11
356	673443.31	4195912.47	UCART3	188.02
357	674443.31	4195912.47	UCART3	177.57
358	675443.31	4195912.47	UCART3	168.67
359	660443.31	4196912.47	UCART3	278.22
360	661443.31	4196912.47	UCART3	191.33
361	662443.31	4196912.47	UCART3	227.57

Receptor Pathway

362	663443.31	4196912.47	UCART3	196.09
363	664443.31	4196912.47	UCART3	201.86
364	666443.31	4196912.47	UCART3	181.41
365	667443.31	4196912.47	UCART3	204.06
366	668443.31	4196912.47	UCART3	183.84
367	669443.31	4196912.47	UCART3	206.18
368	670443.31	4196912.47	UCART3	215.21
369	671443.31	4196912.47	UCART3	181.35
370	672443.31	4196912.47	UCART3	175.95
371	673443.31	4196912.47	UCART3	163.52
372	674443.31	4196912.47	UCART3	162.36
373	675443.31	4196912.47	UCART3	159.55
374	660443.31	4197912.47	UCART3	206.84
375	662443.31	4197912.47	UCART3	158.39
376	663443.31	4197912.47	UCART3	165.56
377	664443.31	4197912.47	UCART3	180.08
378	665443.31	4197912.47	UCART3	164.02
379	666443.31	4197912.47	UCART3	163.59
380	667443.31	4197912.47	UCART3	192.11
381	668443.31	4197912.47	UCART3	169.03
382	669443.31	4197912.47	UCART3	168.91
383	670443.31	4197912.47	UCART3	173.66
384	671443.31	4197912.47	UCART3	171.83
385	672443.31	4197912.47	UCART3	168.00
386	673443.31	4197912.47	UCART3	157.19
387	674443.31	4197912.47	UCART3	155.14
388	675443.31	4197912.47	UCART3	154.03
389	660443.31	4198912.47	UCART3	151.48
390	661443.31	4198912.47	UCART3	140.75
391	662443.31	4198912.47	UCART3	145.73
392	663443.31	4198912.47	UCART3	149.65
393	664443.31	4198912.47	UCART3	152.58
394	665443.31	4198912.47	UCART3	152.28
395	666443.31	4198912.47	UCART3	152.14
396	667443.31	4198912.47	UCART3	158.24
397	668443.31	4198912.47	UCART3	158.21
398	669443.31	4198912.47	UCART3	165.61
399	670443.31	4198912.47	UCART3	163.82
400	671443.31	4198912.47	UCART3	161.08
401	672443.31	4198912.47	UCART3	160.20
402	673443.31	4198912.47	UCART3	156.90

403	674443.31	4198912.47	UCART3	150.41
404	675443.31	4198912.47	UCART3	150.53
405	660443.31	4199912.47	UCART3	132.85
406	661443.31	4199912.47	UCART3	133.47
407	662443.31	4199912.47	UCART3	137.09
408	663443.31	4199912.47	UCART3	139.40
409	664443.31	4199912.47	UCART3	142.70
410	665443.31	4199912.47	UCART3	143.92
411	666443.31	4199912.47	UCART3	145.84
412	667443.31	4199912.47	UCART3	148.89
413	668443.31	4199912.47	UCART3	150.43
414	669443.31	4199912.47	UCART3	154.94
415	670443.31	4199912.47	UCART3	155.01
416	671443.31	4199912.47	UCART3	154.30
417	672443.31	4199912.47	UCART3	150.76
418	673443.31	4199912.47	UCART3	149.41
419	674443.31	4199912.47	UCART3	149.03
420	675443.31	4199912.47	UCART3	146.76
421	660443.31	4200912.47	UCART3	134.00
422	661443.31	4200912.47	UCART3	134.76
423	662443.31	4200912.47	UCART3	135.27
424	663443.31	4200912.47	UCART3	137.95
425	664443.31	4200912.47	UCART3	139.00
426	665443.31	4200912.47	UCART3	139.66
427	666443.31	4200912.47	UCART3	141.29
428	667443.31	4200912.47	UCART3	141.49
429	668443.31	4200912.47	UCART3	145.12
430	669443.31	4200912.47	UCART3	147.93
431	670443.31	4200912.47	UCART3	147.66
432	671443.31	4200912.47	UCART3	146.47
433	672443.31	4200912.47	UCART3	145.71
434	673443.31	4200912.47	UCART3	144.95
435	674443.31	4200912.47	UCART3	147.15
436	675443.31	4200912.47	UCART3	148.11
437	631529.04	4189779.39	UCART1	642.91
438	632529.04	4189779.39	UCART1	751.87
439	633529.04	4189779.39	UCART1	597.09
440	634529.04	4189779.39	UCART1	450.02
441	635529.04	4189779.39	UCART1	315.49
442	636529.04	4189779.39	UCART1	165.90
443	637529.04	4189779.39	UCART1	132.21

444	638529.04	4189779.39	UCART1	154.13
445	639529.04	4189779.39	UCART1	235.50
446	640529.04	4189779.39	UCART1	289.65
447	641529.04	4189779.39	UCART1	410.14
448	642529.04	4189779.39	UCART1	606.61
449	643529.04	4189779.39	UCART1	572.55
450	644529.04	4189779.39	UCART1	570.59
451	645529.04	4189779.39	UCART1	616.99
452	646529.04	4189779.39	UCART1	645.48
453	647529.04	4189779.39	UCART1	589.20
454	648529.04	4189779.39	UCART1	689.19
455	631529.04	4190779.39	UCART1	382.81
456	632529.04	4190779.39	UCART1	404.29
457	633529.04	4190779.39	UCART1	442.40
458	634529.04	4190779.39	UCART1	284.01
459	635529.04	4190779.39	UCART1	166.38
460	636529.04	4190779.39	UCART1	113.18
461	637529.04	4190779.39	UCART1	148.23
462	638529.04	4190779.39	UCART1	207.82
463	639529.04	4190779.39	UCART1	217.70
464	640529.04	4190779.39	UCART1	299.83
465	641529.04	4190779.39	UCART1	448.54
466	642529.04	4190779.39	UCART1	481.56
467	643529.04	4190779.39	UCART1	402.31
468	644529.04	4190779.39	UCART1	477.99
469	645529.04	4190779.39	UCART1	474.21
470	646529.04	4190779.39	UCART1	488.30
471	647529.04	4190779.39	UCART1	397.80
472	648529.04	4190779.39	UCART1	522.47
473	631529.04	4191779.39	UCART1	237.74
474	632529.04	4191779.39	UCART1	296.56
475	633529.04	4191779.39	UCART1	310.55
476	634529.04	4191779.39	UCART1	164.98
477	635529.04	4191779.39	UCART1	120.88
478	636529.04	4191779.39	UCART1	102.88
479	637529.04	4191779.39	UCART1	111.59
480	638529.04	4191779.39	UCART1	142.57
481	639529.04	4191779.39	UCART1	192.79
482	640529.04	4191779.39	UCART1	282.43
483	641529.04	4191779.39	UCART1	283.49
484	642529.04	4191779.39	UCART1	342.82

485	643529.04	4191779.39	UCART1	353.42
486	644529.04	4191779.39	UCART1	396.00
487	645529.04	4191779.39	UCART1	462.49
488	646529.04	4191779.39	UCART1	365.86
489	647529.04	4191779.39	UCART1	386.48
490	648529.04	4191779.39	UCART1	454.79
491	631529.04	4192779.39	UCART1	142.94
492	632529.04	4192779.39	UCART1	132.64
493	633529.04	4192779.39	UCART1	193.24
494	635529.04	4192779.39	UCART1	89.01
495	636529.04	4192779.39	UCART1	108.71
496	638529.04	4192779.39	UCART1	163.21
497	639529.04	4192779.39	UCART1	183.35
498	640529.04	4192779.39	UCART1	187.34
499	641529.04	4192779.39	UCART1	194.90
500	642529.04	4192779.39	UCART1	251.62
501	643529.04	4192779.39	UCART1	333.82
502	644529.04	4192779.39	UCART1	419.92
503	645529.04	4192779.39	UCART1	277.26
504	646529.04	4192779.39	UCART1	335.65
505	647529.04	4192779.39	UCART1	441.98
506	648529.04	4192779.39	UCART1	393.26
507	631529.04	4193779.39	UCART1	83.28
508	632529.04	4193779.39	UCART1	79.20
509	633529.04	4193779.39	UCART1	76.08
510	634529.04	4193779.39	UCART1	83.82
511	635529.04	4193779.39	UCART1	82.28
512	636529.04	4193779.39	UCART1	82.92
513	637529.04	4193779.39	UCART1	88.25
514	638529.04	4193779.39	UCART1	105.05
515	639529.04	4193779.39	UCART1	120.72
516	640529.04	4193779.39	UCART1	132.59
517	641529.04	4193779.39	UCART1	209.46
518	642529.04	4193779.39	UCART1	293.73
519	643529.04	4193779.39	UCART1	285.42
520	644529.04	4193779.39	UCART1	280.28
521	645529.04	4193779.39	UCART1	207.46
522	646529.04	4193779.39	UCART1	267.57
523	647529.04	4193779.39	UCART1	298.16
524	648529.04	4193779.39	UCART1	451.32
525	631529.04	4194779.39	UCART1	75.25

526	632529.04	4194779.39	UCART1	75.94
527	633529.04	4194779.39	UCART1	77.46
528	634529.04	4194779.39	UCART1	80.34
529	635529.04	4194779.39	UCART1	80.39
530	636529.04	4194779.39	UCART1	80.50
531	637529.04	4194779.39	UCART1	82.09
532	638529.04	4194779.39	UCART1	85.49
533	639529.04	4194779.39	UCART1	93.86
534	640529.04	4194779.39	UCART1	104.93
535	644529.04	4194779.39	UCART1	174.46
536	645529.04	4194779.39	UCART1	204.17
537	646529.04	4194779.39	UCART1	263.22
538	647529.04	4194779.39	UCART1	401.31
539	648068.07	4194385.65	UCART1	453.87
540	631529.04	4195779.39	UCART1	75.04
541	632529.04	4195779.39	UCART1	74.09
542	633529.04	4195779.39	UCART1	84.56
543	634529.04	4195779.39	UCART1	88.69
544	635529.04	4195779.39	UCART1	88.90
545	636529.04	4195779.39	UCART1	82.31
546	637529.04	4195779.39	UCART1	83.00
547	638529.04	4195779.39	UCART1	83.66
548	639529.04	4195779.39	UCART1	86.62
549	640529.04	4195779.39	UCART1	89.59
550	641529.04	4195779.39	UCART1	94.00
551	642529.04	4195779.39	UCART1	104.10
552	643529.04	4195779.39	UCART1	122.22
553	644529.04	4195779.39	UCART1	138.51
554	645529.04	4195779.39	UCART1	165.30
555	646529.04	4195779.39	UCART1	203.17
556	647529.04	4195779.39	UCART1	327.52
557	631529.04	4196779.39	UCART1	96.71
558	632529.04	4196779.39	UCART1	92.77
559	633529.04	4196779.39	UCART1	102.39
560	634529.04	4196779.39	UCART1	106.26
561	635529.04	4196779.39	UCART1	103.86
562	636529.04	4196779.39	UCART1	98.93
563	637529.04	4196779.39	UCART1	88.08
564	638529.04	4196779.39	UCART1	90.22
565	639529.04	4196779.39	UCART1	85.00
566	640529.04	4196779.39	UCART1	88.55

567	641529.04	4196779.39	UCART1	91.00
568	642529.04	4196779.39	UCART1	97.49
569	643529.04	4196779.39	UCART1	107.72
570	644529.04	4196779.39	UCART1	116.92
571	645529.04	4196779.39	UCART1	130.30
572	646529.04	4196779.39	UCART1	167.26
573	647529.04	4196779.39	UCART1	217.36
574	648529.04	4196779.39	UCART1	267.49
575	631529.04	4197779.39	UCART1	169.73
576	632529.04	4197779.39	UCART1	146.51
577	633529.04	4197779.39	UCART1	130.21
578	634529.04	4197779.39	UCART1	140.87
579	635529.04	4197779.39	UCART1	127.62
580	636529.04	4197779.39	UCART1	109.71
581	637529.04	4197779.39	UCART1	107.70
582	638529.04	4197779.39	UCART1	112.62
583	639529.04	4197779.39	UCART1	113.56
584	640529.04	4197779.39	UCART1	109.65
585	641529.04	4197779.39	UCART1	116.23
586	642529.04	4197779.39	UCART1	116.25
587	643529.04	4197779.39	UCART1	105.95
588	644529.04	4197779.39	UCART1	102.20
589	645529.04	4197779.39	UCART1	112.43
590	646529.04	4197779.39	UCART1	143.43
591	647529.04	4197779.39	UCART1	205.98
592	648529.04	4197779.39	UCART1	280.60
593	631529.04	4198779.39	UCART1	255.31
594	632529.04	4198779.39	UCART1	204.75
595	633529.04	4198779.39	UCART1	199.96
596	634529.04	4198779.39	UCART1	183.83
597	635529.04	4198779.39	UCART1	161.11
598	636529.04	4198779.39	UCART1	179.19
599	637529.04	4198779.39	UCART1	164.39
600	638529.04	4198779.39	UCART1	154.41
601	639529.04	4198779.39	UCART1	157.24
602	640529.04	4198779.39	UCART1	152.51
603	641529.04	4198779.39	UCART1	168.16
604	642529.04	4198779.39	UCART1	161.51
605	643529.04	4198779.39	UCART1	152.54
606	644529.04	4198779.39	UCART1	130.61
607	645529.04	4198779.39	UCART1	120.77

608	646529.04	4198779.39	UCART1	109.19
609	648529.04	4198779.39	UCART1	238.56
610	647074.24	4195469.20	UCART2	276.93
611	648074.24	4195469.20	UCART2	314.88
612	650074.24	4195469.20	UCART2	450.45
613	651074.24	4195469.20	UCART2	615.32
614	652074.24	4195469.20	UCART2	879.25
615	653074.24	4195469.20	UCART2	942.03
616	654074.24	4195469.20	UCART2	669.70
617	655074.24	4195469.20	UCART2	567.33
618	656074.24	4195469.20	UCART2	640.61
619	657074.24	4195469.20	UCART2	687.96
620	658074.24	4195469.20	UCART2	552.21
621	659074.24	4195469.20	UCART2	399.37
622	660074.24	4195469.20	UCART2	369.05
623	647074.24	4196469.20	UCART2	218.67
624	648074.24	4196469.20	UCART2	250.00
625	649074.24	4196469.20	UCART2	314.56
626	650074.24	4196469.20	UCART2	409.76
627	651074.24	4196469.20	UCART2	608.04
628	652074.24	4196469.20	UCART2	756.00
629	653074.24	4196469.20	UCART2	785.89
630	654074.24	4196469.20	UCART2	623.41
631	655074.24	4196469.20	UCART2	461.16
632	656074.24	4196469.20	UCART2	463.56
633	657074.24	4196469.20	UCART2	577.55
634	658074.24	4196469.20	UCART2	481.58
635	659074.24	4196469.20	UCART2	451.93
636	660074.24	4196469.20	UCART2	382.31
637	647074.24	4197469.20	UCART2	190.84
638	648074.24	4197469.20	UCART2	260.93
639	649074.24	4197469.20	UCART2	309.61
640	650074.24	4197469.20	UCART2	498.23
641	651074.24	4197469.20	UCART2	609.38
642	652074.24	4197469.20	UCART2	600.10
643	653074.24	4197469.20	UCART2	546.27
644	654074.24	4197469.20	UCART2	501.66
645	655074.24	4197469.20	UCART2	490.31
646	656074.24	4197469.20	UCART2	312.30
647	657074.24	4197469.20	UCART2	401.25
648	658074.24	4197469.20	UCART2	464.65

649	659074.24	4197469.20	UCART2	389.32
650	660074.24	4197469.20	UCART2	269.52
651	647074.24	4198469.20	UCART2	135.06
652	648074.24	4198469.20	UCART2	205.50
653	649074.24	4198469.20	UCART2	334.21
654	650074.24	4198469.20	UCART2	477.27
655	651074.24	4198469.20	UCART2	587.73
656	652074.24	4198469.20	UCART2	624.27
657	653074.24	4198469.20	UCART2	439.80
658	654074.24	4198469.20	UCART2	299.08
659	655074.24	4198469.20	UCART2	463.63
660	656074.24	4198469.20	UCART2	264.78
661	657074.24	4198469.20	UCART2	206.43
662	647074.24	4199469.20	UCART2	118.70
663	649074.24	4199469.20	UCART2	213.59
664	650074.24	4199469.20	UCART2	377.29
665	651074.24	4199469.20	UCART2	464.67
666	652074.24	4199469.20	UCART2	463.02
667	653074.24	4199469.20	UCART2	472.02
668	654074.24	4199469.20	UCART2	247.70
669	655074.24	4199469.20	UCART2	200.09
670	657074.24	4199469.20	UCART2	190.50
671	658074.24	4199469.20	UCART2	142.52
672	659074.24	4199469.20	UCART2	133.35
673	660074.24	4199469.20	UCART2	134.55
674	647074.24	4200469.20	UCART2	158.57
675	648074.24	4200469.20	UCART2	131.75
676	650074.24	4200469.20	UCART2	209.88
677	651074.24	4200469.20	UCART2	307.04
678	652074.24	4200469.20	UCART2	341.82
679	653074.24	4200469.20	UCART2	292.54
680	654074.24	4200469.20	UCART2	240.99
681	656074.24	4200469.20	UCART2	129.70
682	657074.24	4200469.20	UCART2	130.89
683	658074.24	4200469.20	UCART2	132.81
684	659074.24	4200469.20	UCART2	134.09
685	660074.24	4200469.20	UCART2	133.98
686	647074.24	4201469.20	UCART2	206.95
687	648074.24	4201469.20	UCART2	161.67
688	649074.24	4201469.20	UCART2	150.93
689	650074.24	4201469.20	UCART2	129.67

690	654074.24	4201469.20	UCART2	128.78
691	655074.24	4201469.20	UCART2	128.94
692	656074.24	4201469.20	UCART2	133.30
693	657074.24	4201469.20	UCART2	143.02
694	658074.24	4201469.20	UCART2	166.28
695	659074.24	4201469.20	UCART2	161.32
696	660074.24	4201469.20	UCART2	147.80
697	647074.24	4202469.20	UCART2	235.17
698	648074.24	4202469.20	UCART2	205.58
699	649074.24	4202469.20	UCART2	194.19
700	650074.24	4202469.20	UCART2	158.13
701	651074.24	4202469.20	UCART2	133.94
702	652074.24	4202469.20	UCART2	135.88
703	653074.24	4202469.20	UCART2	145.25
704	654074.24	4202469.20	UCART2	148.63
705	655074.24	4202469.20	UCART2	157.02
706	656074.24	4202469.20	UCART2	156.86
707	657074.24	4202469.20	UCART2	167.03
708	658074.24	4202469.20	UCART2	198.62
709	659074.24	4202469.20	UCART2	196.70
710	660074.24	4202469.20	UCART2	196.67
711	647074.24	4203469.20	UCART2	327.93
712	648074.24	4203469.20	UCART2	258.06
713	649074.24	4203469.20	UCART2	229.21
714	650074.24	4203469.20	UCART2	176.25
715	651074.24	4203469.20	UCART2	146.78
716	652074.24	4203469.20	UCART2	152.66
717	653074.24	4203469.20	UCART2	176.42
718	654074.24	4203469.20	UCART2	182.54
719	655074.24	4203469.20	UCART2	206.32
720	656074.24	4203469.20	UCART2	189.87
721	657074.24	4203469.20	UCART2	208.43
722	658074.24	4203469.20	UCART2	225.72
723	659074.24	4203469.20	UCART2	313.27
724	660074.24	4203469.20	UCART2	355.12
725	647074.24	4204469.20	UCART2	396.92
726	648074.24	4204469.20	UCART2	304.67
727	649074.24	4204469.20	UCART2	371.23
728	650074.24	4204469.20	UCART2	331.98
729	651074.24	4204469.20	UCART2	279.81
730	652074.24	4204469.20	UCART2	209.25

731	653074.24	4204469.20	UCART2	218.18
732	654074.24	4204469.20	UCART2	223.36
733	655074.24	4204469.20	UCART2	240.54
734	656074.24	4204469.20	UCART2	275.55
735	657074.24	4204469.20	UCART2	334.49
736	658074.24	4204469.20	UCART2	471.98
737	659074.24	4204469.20	UCART2	374.67
738	660074.24	4204469.20	UCART2	507.00
739	699388.00	4188032.00		372.33
740	693023.00	4190525.00		290.05
741	683802.00	4193520.00		212.16
742	678692.00	4192804.00		256.83
743	679309.00	4190519.00		337.05
744	674023.00	4194530.00		252.91
745	671553.00	4196745.00		184.09
746	670327.00	4199829.00		155.32
747	668133.00	4196410.00		193.40
748	654789.00	4200696.00		141.83
749	654966.00	4202308.00		150.35
750	653098.00	4202601.00		148.80
751	649097.00	4196063.00		345.86
752	637852.60	4192943.52		128.67
753	635692.00	4191904.00		109.10
754	668118.00	4196151.00		207.81
755	669993.00	4199783.00		155.60
756	649110.00	4196043.00		350.29
757	700793.00	4187746.00		431.66
758	683737.00	4193304.00		217.60
759	693174.80	4190223.74		285.73
760	635870.00	4191870.00		104.02
761	637966.00	4193040.00		133.00
762	673976.00	4194352.00		266.21
763	678657.00	4192640.98		264.17
764	679245.00	4190295.00		345.99
765	654800.00	4200475.00		148.62
766	671422.00	4196466.00		197.80
767	653213.00	4202815.00		155.26
768	655010.00	4202257.00		148.99

Plant Boundary Receptors

Receptor Pathway

Receptor Groups

Record Number	Group ID	Group Description
1	UPOL1	
2	NPOL1	
3	NPOL2	
4	UCART5	Receptors generated from Uniform Cartesian Grid
5	UCART4	Receptors generated from Uniform Cartesian Grid
6	UCART3	Receptors generated from Uniform Cartesian Grid
7	UCART1	Receptors generated from Uniform Cartesian Grid
8	UCART2	Receptors generated from Uniform Cartesian Grid

Results Summary

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VOC - Concentration - Source Group: _____

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
__		1.00000	COUNT	0.00	0.00	0.00	0.00	0.00	
__		1.00000	COUNT	0.00	0.00	0.00	0.00	0.00	

VOC - Concentration - Source Group: HIGHWAY

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	80.20181	ug/m^3	637852.60	4192943.52	128.67	0.00	1538.00	9.03.2015, 5
24-HR	1ST	16.22651	ug/m^3	683802.00	4193520.00	212.16	0.00	212.16	15.01.2015, 24

Source Pathway - Source Inputs

Source Pathway - Source Inputs

Line Area Sources

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	4.79E-6	2.37	632721.04	4193329.80	93.15	2.55
			633372.68	4193292.92	84.14	2.55
			633663.14	4193192.50	85.95	2.55
			634044.77	4193047.25	85.03	2.55
			634426.40	4192890.61	93.15	2.55
			634766.53	4192738.60	96.76	2.55
			635182.05	4192493.98	91.66	2.55
			635590.87	4192282.87	93.32	2.55
			635691.39	4192256.07	95.16	2.55
			635990.61	4192185.44	97.08	2.55
			636167.37	4192158.80	96.01	2.55
			636407.08	4192168.49	96.99	2.55
			636736.38	4192202.38	99.30	2.55
			637005.15	4192284.71	101.28	2.55
			637436.14	4192509.89	111.59	2.55
			637970.37	4192916.43	134.93	2.55
			638557.04	4193251.14	140.72	2.55
			639294.81	4193482.25	162.97	2.55
			639863.69	4193695.58	150.50	2.55
			640530.34	4194104.46	126.78	2.55
			641161.44	4194753.34	113.12	2.55
			641641.43	4195020.00	119.03	2.55
			642130.31	4195073.33	161.57	2.55
			642921.41	4194984.44	158.31	2.55
			643765.62	4194964.89	207.99	2.55
			644581.39	4195247.27	150.12	2.55
			645167.07	4195770.20	145.69	2.55
			645585.42	4196334.97	138.85	2.55
			646028.07	4196859.04	148.22	2.55
			646671.78	4197426.87	155.64	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	4.79E-6	2.37	647211.37	4198127.06	144.61	2.55
			648115.10	4199373.95	121.73	2.55
			649226.63	4200476.58	126.60	2.55
			650587.13	4201241.31	126.32	2.55
			651271.83	4201516.97	142.55	2.55
			652001.87	4201607.16	130.70	2.55
			652689.77	4201501.33	132.72	2.55
			653503.67	4201278.21	130.17	2.55
			654473.17	4200477.71	178.48	2.55
			654647.42	4200355.13	184.74	2.55
			654801.52	4200262.32	175.76	2.55
			655884.74	4199450.48	163.61	2.55
			656809.84	4198851.95	203.39	2.55
			657279.08	4198652.69	192.89	2.55
			658031.14	4198421.28	184.95	2.55
			658924.63	4198344.15	247.05	2.55
			659644.55	4198292.72	181.97	2.55
			660884.10	4197987.55	157.78	2.55
			661362.51	4197783.18	176.61	2.55
			662003.49	4197569.52	167.91	2.55
			663104.49	4197407.33	170.20	2.55
			664028.29	4197407.33	187.97	2.55
			664915.14	4197222.57	172.01	2.55
			665838.93	4196692.93	189.33	2.55
			666504.07	4196298.77	197.43	2.55
			667230.79	4196064.74	208.51	2.55
			667834.34	4195966.21	197.77	2.55
			668634.96	4195990.84	198.35	2.55
			669429.91	4196048.99	225.86	2.55
			670275.44	4195951.09	209.08	2.55
			670987.46	4195799.78	209.56	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	4.79E-6	2.37	671654.98	4195523.87	224.54	2.55
			672108.90	4195256.86	217.63	2.55
			673572.48	4194273.47	280.92	2.55
			674484.16	4193854.59	227.17	2.55
			675506.72	4193497.31	224.52	2.55
			676258.24	4193016.83	223.32	2.55
			676919.78	4192538.39	233.44	2.55
			677863.43	4192298.03	240.24	2.55
			678424.28	4192333.64	234.68	2.55
			679617.19	4192698.63	272.82	2.55
			680988.16	4193259.48	305.80	2.55
			681381.01	4193501.00	303.57	2.55
			681916.85	4193621.30	284.62	2.55
			682507.38	4193670.51	247.37	2.55
			683048.70	4193604.89	239.67	2.55
			683436.91	4193490.07	220.24	2.55
			683901.68	4193347.90	208.00	2.55
			686416.84	4192308.74	190.97	2.55
			689276.83	4191627.79	211.01	2.55
			690313.97	4191460.17	225.19	2.55
			691078.73	4191030.64	236.00	2.55
			692388.25	4190244.93	268.79	2.55
			693153.01	4190024.93	280.46	2.55
			694846.68	4189185.34	289.92	2.55
			695367.87	4188902.23	308.96	2.55
			695869.76	4188677.02	322.35	2.55
			696358.01	4188590.07	332.99	2.55
			697735.78	4188807.61	368.64	2.55
			698620.45	4188981.64	412.63	2.55
			699798.00	4188749.49	424.87	2.55
			700463.79	4188901.78	452.05	2.55

Source Pathway - Source Inputs

Source Type: LINE AREA

Source: ARLN21 (highway)

Length of Side [m]	Emission Rate [g/ s]	Initial Vertical Dimension [m]	X Coordinate for Points [m]	Y Coordinate for points [m]	Base Elevation [m]	Release Height [m]
16.00	4.79E-6	2.37	701084.68	4189393.95	480.34	2.55
			701751.01	4189742.26	486.85	2.55
			702385.70	4189803.57	519.96	2.55
			702946.97	4189571.93	483.46	2.55
			703036.07	4189465.02	486.10	2.55
			701726.21	4187633.82	424.15	2.55

Source Pathway - Source Inputs

Area Sources Generated from Line Sources

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000053	632720.59	4193321.82	2.55	652.68	3.24	92.69	2.37
	A0000054	633370.07	4193285.36	2.55	307.33	19.07	85.89	2.37
	A0000055	633660.29	4193185.02	2.55	408.34	20.84	89.73	2.37
	A0000056	634041.73	4193039.85	2.55	412.53	22.32	84.97	2.37
	A0000057	634423.14	4192883.31	2.55	372.56	24.08	92.86	2.37
	A0000058	634762.48	4192731.71	2.55	482.18	30.49	99.10	2.37
	A0000059	635178.38	4192486.88	2.55	460.11	27.31	91.85	2.37
	A0000060	635588.80	4192275.14	2.55	104.04	14.93	93.02	2.37
	A0000061	635689.56	4192248.28	2.55	307.44	13.28	95.33	2.37
	A0000062	635989.42	4192177.52	2.55	178.75	8.57	96.25	2.37
	A0000063	636167.69	4192150.81	2.55	239.91	357.69	96.00	2.37
	A0000064	636407.90	4192160.53	2.55	331.04	354.12	96.96	2.37
	A0000065	636738.72	4192194.74	2.55	281.09	342.97	99.00	2.37
	A0000066	637008.85	4192277.62	2.55	486.28	332.41	101.13	2.37
	A0000067	637440.99	4192503.53	2.55	671.32	322.73	110.48	2.37
	A0000068	637974.34	4192909.48	2.55	675.44	330.29	135.21	2.37
	A0000069	638559.43	4193243.51	2.55	773.12	342.61	136.74	2.37
	A0000070	639297.62	4193474.76	2.55	607.56	339.44	159.14	2.37
	A0000071	639867.87	4193688.76	2.55	782.06	328.48	149.98	2.37
	A0000072	640536.08	4194098.88	2.55	905.17	314.20	125.94	2.37
	A0000073	641165.33	4194746.34	2.55	549.09	330.95	113.35	2.37
	A0000074	641642.30	4195012.05	2.55	491.78	353.77	120.27	2.37
	A0000075	642129.42	4195065.38	2.55	796.08	6.41	154.40	2.37
	A0000076	642921.22	4194976.45	2.55	844.43	1.33	154.12	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000077	643768.23	4194957.33	2.55	863.26	340.91	207.11	2.37
	A0000078	644586.72	4195241.30	2.55	785.16	318.24	151.31	2.37
	A0000079	645173.50	4195765.44	2.55	702.83	306.53	146.57	2.37
	A0000080	645591.53	4196329.80	2.55	686.00	310.19	138.91	2.37
	A0000081	646033.36	4196853.04	2.55	858.37	318.58	149.17	2.37
	A0000082	646678.12	4197421.99	2.55	883.98	307.62	156.07	2.37
	A0000083	647217.85	4198122.36	2.55	1539.96	305.93	149.36	2.37
	A0000084	648120.74	4199368.27	2.55	1565.66	315.23	126.44	2.37
	A0000085	649230.55	4200469.61	2.55	1560.70	330.66	125.47	2.37
	A0000086	650590.12	4201233.89	2.55	738.11	338.07	126.08	2.37
	A0000087	651272.81	4201509.03	2.55	735.59	352.96	142.07	2.37
	A0000088	652000.66	4201599.25	2.55	695.99	8.75	129.62	2.37
	A0000089	652687.66	4201493.61	2.55	843.92	15.33	133.33	2.37
	A0000090	653498.57	4201272.04	2.55	1257.28	39.55	129.27	2.37
	A0000091	654468.57	4200471.16	2.55	213.04	35.12	177.73	2.37
	A0000092	654643.29	4200348.28	2.55	179.89	31.06	189.76	2.37
	A0000093	654796.72	4200255.92	2.55	1353.69	36.85	178.37	2.37
	A0000094	655880.40	4199443.76	2.55	1101.83	32.90	163.53	2.37
	A0000095	656806.71	4198844.59	2.55	509.80	23.01	201.70	2.37
	A0000096	657276.72	4198645.04	2.55	786.86	17.10	192.32	2.37
	A0000097	658030.46	4198413.31	2.55	896.80	4.93	185.49	2.37
	A0000098	658924.06	4198336.17	2.55	721.76	4.09	241.97	2.37
	A0000099	659642.64	4198284.96	2.55	1276.56	13.83	183.03	2.37
	A0000100	660880.96	4197980.19	2.55	520.23	23.13	158.26	2.37
	A0000101	661359.98	4197775.59	2.55	675.65	18.43	176.18	2.37

Source Pathway - Source Inputs

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000102	662002.32	4197561.61	2.55	1112.89	8.38	168.75	2.37
	A0000103	663104.49	4197399.33	2.55	923.80	0.00	170.41	2.37
	A0000104	664026.66	4197399.50	2.55	905.89	11.77	188.70	2.37
	A0000105	664911.16	4197215.63	2.55	1064.86	29.83	171.94	2.37
	A0000106	665834.85	4196686.04	2.55	773.15	30.65	188.67	2.37
	A0000107	666501.62	4196291.16	2.55	763.47	17.85	197.96	2.37
	A0000108	667229.50	4196056.85	2.55	611.54	9.27	208.58	2.37
	A0000109	667834.58	4195958.21	2.55	801.00	358.24	198.00	2.37
	A0000110	668635.54	4195982.86	2.55	797.07	355.82	198.19	2.37
	A0000111	669428.99	4196041.04	2.55	851.18	6.60	225.89	2.37
	A0000112	670273.77	4195943.26	2.55	727.92	12.00	208.89	2.37
	A0000113	670984.40	4195792.39	2.55	722.30	22.46	215.43	2.37
	A0000114	671650.93	4195516.98	2.55	526.62	30.47	223.40	2.37
	A0000115	672104.44	4195250.22	2.55	881.63	33.90	217.40	2.37
	A0000116	672836.23	4194758.53	2.55	881.63	33.90	271.26	2.37
	A0000117	673569.14	4194266.20	2.55	1003.31	24.68	282.35	2.37
	A0000118	674481.52	4193847.04	2.55	1083.18	19.26	227.83	2.37
	A0000119	675502.41	4193490.57	2.55	891.99	32.59	226.25	2.37
	A0000120	676253.56	4193010.34	2.55	816.41	35.88	223.68	2.37
	A0000121	676917.80	4192530.64	2.55	973.78	14.29	234.26	2.37
	A0000122	677863.94	4192290.04	2.55	561.98	356.37	239.61	2.37
	A0000123	678426.62	4192325.99	2.55	1247.51	342.99	233.93	2.37
	A0000124	679620.22	4192691.23	2.55	1481.25	337.75	271.85	2.37
	A0000125	680992.35	4193252.67	2.55	461.15	328.42	307.98	2.37
	A0000126	681382.76	4193493.20	2.55	549.18	347.35	302.24	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000127	681917.52	4193613.32	2.55	592.57	355.24	283.63	2.37
	A0000128	682506.42	4193662.57	2.55	545.28	6.91	248.85	2.37
	A0000129	683046.43	4193597.22	2.55	404.84	16.48	239.24	2.37
	A0000130	683434.57	4193482.42	2.55	486.02	17.01	221.32	2.37
	A0000131	683898.62	4193340.51	2.55	1360.69	22.45	208.56	2.37
	A0000132	685156.21	4192820.93	2.55	1360.69	22.45	188.12	2.37
	A0000133	686414.99	4192300.95	2.55	1469.97	13.39	190.63	2.37
	A0000134	687844.99	4191960.48	2.55	1469.97	13.39	201.86	2.37
	A0000135	689275.56	4191619.89	2.55	1050.60	9.18	211.04	2.37
	A0000136	690310.06	4191453.19	2.55	877.12	29.32	225.10	2.37
	A0000137	691074.62	4191023.78	2.55	1527.15	30.96	236.00	2.37
	A0000138	692386.04	4190237.25	2.55	795.77	16.05	268.82	2.37
	A0000139	693149.46	4190017.77	2.55	945.17	26.37	279.43	2.37
	A0000140	693996.29	4189597.97	2.55	945.17	26.37	273.87	2.37
	A0000141	694842.86	4189178.32	2.55	593.12	28.51	289.44	2.37
	A0000142	695364.59	4188894.93	2.55	550.10	24.17	307.77	2.37
	A0000143	695868.35	4188669.15	2.55	495.93	10.10	325.43	2.37
	A0000144	696359.26	4188582.17	2.55	1394.84	351.03	332.56	2.37
	A0000145	697737.32	4188799.76	2.55	901.63	348.87	369.93	2.37
	A0000146	698618.91	4188973.80	2.55	1200.21	11.15	411.93	2.37
	A0000147	699799.78	4188741.69	2.55	682.98	347.12	424.53	2.37
	A0000148	700468.76	4188895.51	2.55	792.30	321.60	451.15	2.37
	A0000149	701088.39	4189386.86	2.55	751.87	332.40	479.54	2.37
	A0000150	701751.78	4189734.30	2.55	637.65	354.48	477.49	2.37
	A0000151	702382.65	4189796.17	2.55	607.19	22.43	519.12	2.37

Source Pathway - Source Inputs

AERMOD

Line Source ID	Area Source ID	X Coordinate [m]	Y Coordinate [m]	Release Height [m]	Length of Side [m]	Angle [deg]	Base Elevation [m]	Initial Sigma Z [m]
ARLN21	A0000152	702940.83	4189566.81	2.55	139.16	50.19	482.53	2.37
	A0000153	703029.56	4189469.68	2.55	1125.72	125.58	485.59	2.37
	A0000154	702374.63	4188554.07	2.55	1125.72	125.58	450.11	2.37