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FETHİYE ADVANCED BIOLOGICAL WASTE WATER TREATMENT  
PLANT 2<sup>ND</sup> STAGE UNITS APPLICATION PROJECT  
FINAL ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT  
REPORT

Prepared within the Scope of World Bank's Environmental Assessment  
Operating Policy (OP 4.01)



FETHİYE ADVANCED BIOLOGICAL WASTE WATER  
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REPORT



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Bağlıca Mah. Çambayırı Cad. Çınar Plaza No:66/5 06790 Etimesgut/ ANKARA

Tel: 0 312 472 38 39 Fax: 0 312 472 39 33

Web: [cinarmuhendislik.com](http://cinarmuhendislik.com)

E-mail: [cinar@cinarmuhendislik.com](mailto:cinar@cinarmuhendislik.com)

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Project Owner's Name	TC Muğla Metropolitan Municipality General Directorate of Water and Sewerage Administration
Address	Menteşe/MUĞLA
Phone Numbers	Phone: 0 (252) 441 4848
Name of the Project	Fethiye Advanced Biological Waste Water Treatment Plant 2nd Stage Units Application Project Environmental and Social Impact Assessment (ESIA) Report
Project Location	Muğla Province, Central District
Name of the Organization Preparing the Report	Çınar Mühendislik Müşavirlik A.Ş.
Address	Bağlıca Mah. Çambayırı Cad. Çınar Plaza No:66/5 06790 Etimesgut/ ANKARA 06460 Çankaya / ANKARA
Phone and Fax Numbers	Phone: 0 (312) 472 38 39 Fax: 0 (312) 472 39 33
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### ABBREVIATIONS & DEFINITIONS

WTP	Wastewater Treatment Plant
EU	European Union
EIA	Environmental Impact Assessment
Çınar	Çınar Mühendislik Müşavirlik A.Ş.
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
MUSKİ	Muğla Water and Sewerage Administration
OP	Operational Policy
O.G.	Official Gazette
TURKSTAT	Turkey Statistical Institute
UV	Ultraviolet

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## EXECUTIVE SUMMARY

Muğla has obtained the status of 'Metropolitan Municipality' with the “Law on Establishment of Metropolitan Municipalities and Twenty Seven Districts in Fourteen Cities and the Law on Amendment of with Decrees” numbered 6360. Within the scope of this law, the villages and towns within the provincial borders have been separated from each other; the villages have joined the district municipality as neighborhoods, and the towns as only neighborhoods of the districts to which they belong. As result of this change, Muğla Directorate General of Water and Sewerage Administration (MUSKI), a public legal entity affiliated to Muğla Metropolitan Municipality, has been established in order to carry out water and sewerage operations throughout the province.



The main target and principles of MUSKI are to provide clean, high quality and healthy drinking water to the inhabitants of Muğla, to use and protect water resources in the most efficient way, to ensure proper treatment of wastewater and to provide high quality service with modern management approaches in line with the corporate development.

The General Directorate of Muğla Metropolitan Municipality Water and Sewerage Administration (MUSKI) is planning the 2nd Stage Capacity Increase Project for Fethiye District Wastewater Treatment Plant located within the borders of Fethiye province.

In the existing treatment plant, daily average is 13.649 m<sup>3</sup>/day in the winter season and 22.394 m<sup>3</sup>/day in the summer season. Taking into account the return water from the filtration, the capacity was sized as 14.331 m<sup>3</sup>/day of wastewater flow in the winter season and 23.514 m<sup>3</sup>/day in the summer season. Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units Application Project was designed according to 33.850 m<sup>3</sup>/day in winter (Off Season) and 50.531 m<sup>3</sup>/day in summer. Within the project, existing discharge structure will be used and a new discharge line will not be built.

In addition, the capacity of the treatment plant is further planned for the period after the project life of 2028, and the treatment can be done with at least 2.5 times more additional capacity. The facilities within the scope of the project are as follows;

- TM4 Pump Station
- Pre-Treatment
- Primary Settling
- Selector Tank
- Anaerobic (Biop) Ponds
- Distribution Structure and Aeration Ponds
- Blower Building
- Final Sedimentation Tanks Flow Distribution Structure
- Foam Chamber

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- Final Sedimentation Tanks
- Sludge Feeding Tank
- Sludge Dewatering Building
- Reverse Cycle and Excess Sludge Pump Building
- Filtrate Water Pump Station
- Disc-Type Filtration
- UV Disinfection System
- Hydrophore Building

It is planned to employ 80 workers in the peak of the construction phase of the Project and 25 workers in the operational phase together with the existing operating personnel. In recruitment phase, priority will be given to the local people. It is planned that the project will be completed in 24 months and in a single phase. Construction works will take approximately 18 months and then, testing and acceptance works will be carried out.

Within the scope of ESIA studies, the impacts on the socioeconomic environment have been evaluated under three titles as tourism, transportation network and local supply. The key mitigation measure for the impacts on tourism will be to carry out the construction activities outside the tourism season (15 May-15 October) as much as possible, so that tourism will not adversely be impacted in the region. The other impacts on socio-economy are generally expected to be positive.

Apart from the local recruitment, the impact of the project on work and working conditions is generally considered to be negative but of low importance. These impacts are expected to be observed on issues such as working conditions, employer-worker relations, occupational health and safety, workers of third parties and the supply chain. The limited personnel requirement of the project facilitates management of the impacts on these issues. MUSKI aims to minimize the adverse impacts on workforce by following the provisions of IFC PS2, OP 4.01 as well as the relevant Turkish national laws and regulations.

In ESIA studies, project alternatives were examined and the most appropriate environmentally friendly alternative was selected. Although the alternatives for the project area and discharge are limited, there are technical alternatives for the treatment process. As a result of the assessments performed, the classical activated sludge system was chosen as the treatment technology of the plant. The option for the sludge disposal is the dewatering and transfer to the landfill sites.

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Within the scope of ESIA studies, baseline status of the project area and the discharge locations were examined via conducting laboratory analyses. Results of these analyses have shown that, no significant contamination/pollution were observed in the area, however, noise levels have been observed to be higher than the IFC requirements. This fact is considered to be occurred, since the project area located near the main road, nonetheless, special mitigation measures for the construction and operation phase to avoid creating an additional impact on noise level.

Main environmental concerns of the project are odor, sludge and discharge quality. Odor can be managed successfully and its formation can be prevented during the conceptual design phase. Nevertheless, additional measures will be taken as a result of unwanted odors.

The most important waste that will be generated as a result of the activities of the wastewater treatment plant is screening wastes and sludge. Daily sludge flow to be sent to dewatering is 1561 m<sup>3</sup>/day, and the daily dewatered sludge flow is 113.82 m<sup>3</sup>/day. The sludge to be formed is expected to have a density of approximately 6%. Treatment sludge will be sent to the stabilization unit first and then dewatering and then the solid content will be increased by thermal drying method.

As for the discharge quality, it was observed that current status of the wastewater treatment plant discharge is complying with the national and international standards for the moment and the design of the WWTP shows that, discharge water quality can reach significantly low values so it can have better efficiency and treated wastewater quality will be assured to comply the national/international/WBG standards for the future.



The Environmental and Social Management Plan (ESMP), which is one of the results of ESIA works, is based on performance improvement and mitigation measures and actions that address identified environmental and social issues, impacts and opportunities. The main objective of ESMP is to document significant environmental and social issues, steps to be taken to address them adequately, as well as identification of the person/unit and program responsible for implementation and monitoring and the associated costs.

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MUSKI will establish and manage an information system in compliance with the World Bank policies and will also request this from its possible contractors. In addition, MUSKI and the contractor company will gather public views through an effective and active grievance mechanism and stakeholder engagement.

Sub-management plans covering the risks and mitigation measures determined in this ESIA will be prepared by MUSKI and contractor. ese sub-management plans are;

- Pollution Prevention Plan
- Grievance Mechanism
- Emergency Preparedness and Response Plan
- Community Health and Safety Plan
- Dust Management Plan;
- Traffic Safety Management Plan;
- Noise and Vibration Management Plan;
- Soil and Groundwater Management Plan;
- Waste Management Plan (Hazardous and non-Hazardous Waste);
- Oil and Chemical Spill Contingency Management Plan;
- Emergency Preparedness and Response Plan (including Community Emergency Response Plan);
- Occupational Health and Safety Management Plan;
- Security Plan;
- Environmental monitoring plan and
- Contractor Management Plan
- Sludge Management Plan

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## I. INTRODUCTION

### I.1. Project Description

General Directorate of Muğla Water and Sewerage Administration (MUSKI) is a Public Legal Entity, affiliated to Muğla Metropolitan Municipality, established by the Decree numbered 2014/6072 published in the Official Gazette dated 31.03.2014 and numbered 28958 pursuant to the Law No. 2560.

Muğla has obtained the status of 'Metropolitan Municipality' with the "Law on Establishment of Metropolitan Municipalities and Twenty Seven Districts in Fourteen Cities and the Law on Amendment of with Decrees" numbered 6360. Within the scope of this law, the villages and towns within the provincial borders have been separated from each other; the villages have joined the district municipality as neighborhoods, and the towns as only neighborhoods of the districts to which they belong. As result of this change, Muğla Directorate General of Water and Sewerage Administration of (MUSKİ) has been established in order to carry out water and sewerage operations throughout the province.

The main goal and principle of MUSKI is to provide clean, high quality and healthy drinking water to the people of Muğla, to ensure treatment of wastewater and to provide high quality service with modern management approaches in line with the corporate development.

MUSKİ is planning to realize Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units Project in order to carry out waste water treatment processes in the region in line with these goals and principles. Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units Application Project was designed according to a flowrate of 33,850 m<sup>3</sup>/day in winter (Off Season) and 50,531 m<sup>3</sup>/day in summer.

The current plant has not received any administrative penalties to date and is regularly monitored by the Turkish Ministry of Environment and Urbanization.

In addition, further treatment is planned for the period after the project life of 2028, and wastewater treatment can be done with at least 2.5 times more additional capacity.



**Figure I-1: Satellite Image Showing the Project Area and the Discharge Area**

The project is planned to take place in the area of the wastewater treatment plant in Fethiye Neighborhood, Günlükbaşı Neighborhood's Square No. 2907, Parcel No. 1 in Fethiye district of Muğla. It is planned to discharge the treated wastewater into Aegean Sea via Mut Creek through the existing channel from the discharge point.

The workflow chart of the project is given below.

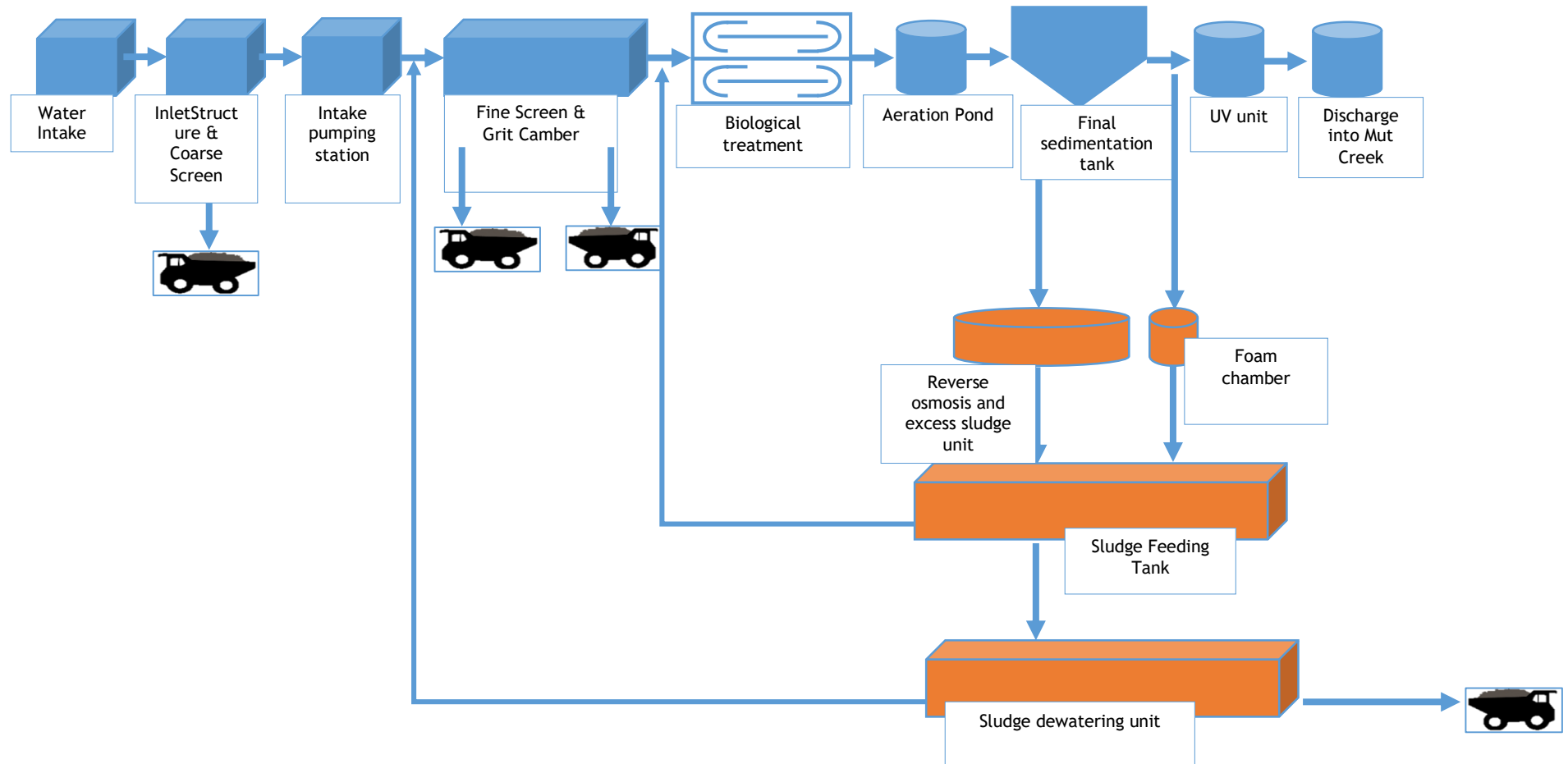




Figure I-2: Project Workflow Chart



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The existing Fethiye Wastewater Treatment Plant was designed for the year 2013, however, the year 2028 was also considered for future expansions. This project covers the second stage of the plant. The units to be renewed and built within the scope of the 2nd Stage Units Application Project are given below.

**Table I-1. Comparison Plant List for Existing and New Units in Fethiye Waste Water Treatment Plant**

Current Plant	To be renewed	To be built
TM4 Pump Station	All pumps will be renewed and be operated as 4 + 1.	-
Pre-Treatment	Coarse and Fine Screens will be replaced. Sand pumps will be renewed. Sand trap blowers will be added.	Screens and sand traps will be covered. In addition, 1 Screen channel will be built. 1 coarse grill, 2 + 1 fine grill, 2 + 1 tank reserve sand pump, 1 sand trap blower will be built.
Primary Sedimentation	-	-
Selector Tank	-	1 more tank will be built and a submersible mixer will be placed inside it. The existing and new selector tanks will be covered.
Anaerobic (Biop) Ponds	-	1 Biop Tank will be built. 2 submersible mixers will be placed. The existing and new Biop tanks will be covered.
Distribution Structure and Aeration Ponds	FeCl3 pumps will be replaced.	The distribution structure will be covered. 4 + 1 FeCl3 pumps will be placed.
Blower Building	Blowers will be replaced.	4 + 1 ventilation blowers will be placed.
Final Sedimentation Tanks Flow Distribution Structure	2 covers will be placed on the line going to the new pools.	-
Foam Chamber	1 + 1 foam pump will be placed in the existing foam chamber.	A new foam chamber will be constructed for the final sedimentation pools. 1 + 1 foam pump will be placed inside.
Final Sedimentation Tank	-	2 Final Sedimentation Tanks will be built.
Sludge Feeding Tank	The current situation will be preserved.	The foam collected in the new Foam Chamber will be pressed here with the pump.

Current Plant	To be renewed	To be built
Sludge Dewatering Building	Decanters will be put instead of belt presses. Decanter Feeding Pumps and Polyelectrolyte Unit-Dosing Pumps will be replaced.	Decanter Feeding Pumps will be changed to 2 + 2 and Polyelectrolyte Unit-Dosing Pumps to 2 + 2.
Reverse Cycle and Excess Sludge Pump Building	The Reverse Cycle Pumps will be provided to operate as 4 + 1. Excess Mud Pumps will be replaced.	2 pumps will be taken to the Reverse Cycle Pumps. Excess Mud Pumps 2 + 1 will be installed.
Filtrate Water Pump Station	Filtrate Water Pumps will be replaced.	Filtrate Water pumps will be placed as 2 + 1.
Disc-Type Filtration	More efficient operation will be provided by putting a filter system in front of the new UV system.	
UV Disinfection System	It will be demolished.	The new UV system will be rebuilt due to the replacement of filter system in front of it.
Hydrophore Building	Hydrophore Unit will be replaced as a package.	-

Views from the project area are given below.



Figure I-3: Inlet Structure & Screen



Figure I-4: Grit Chamber



Figure I-5: Anaerobic & Anoxic Aeration Tank Line and Selector Tank



Figure I-6: Aeration Tank



Figure I-7: Sludge Transfer Tank



Figure I-8: Final Sedimentation Tank



Figure I-9: Chlorination Unit



Figure I-10: Instant Measurement Unit



Figure I-11: Discharge Point



Figure I-12: Sludge Drying Unit



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Figure I-13: Waste Storage Area



## I.2. Scope of the Environmental and Social Impact Assessment Work

The impact assessment works were carried out using relevant impact assessment methodologies including mathematical calculations, geographic information systems and expert opinions after collecting the related data.

While preparing the Environmental and Social Impact Assessment report, various documents such as legal reports, legislation and regulations, technical and economic reports, publications related to field use, natural resources, geology, socio-economic area/region data, maps, parameters showing water quality, hydrology and climatology obtained from different authorities within the scope of the project are used. The impacts were determined and assessed based on all data.

As a result, this report, which includes the baseline physical, biological and socio-economic conditions, the possible impacts of the Project on the determined baseline conditions, mitigation measures and the environmental and social management plan (ESMP) that covers construction and operational phases, was prepared by Çınar Mühendislik Müşavirlik A.Ş. (Çınar). It should be noted that, this ESIA study also helped selecting the WWTP technology.



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### **I.3. Environmental and Social Impact Assessment Report Structure**

The World Bank Group's environmental policies form the basis of the development of the environmental and social impact assessment policies of international financial institutions. General format of the ESIA report was determined according to the requirements of the Environmental Assessment Operational Policy (OP 4.01) for the projects of category A of the World Bank. It consists of the following main titles;

- Executive Summary
- Introduction
- Project Description
- Policy, Legal and Administrative Framework
- Baseline Data
- Environmental and Social Impacts and Mitigation Measures
- Project Alternatives
- Environmental and Social Management Plan
- Public Participation
- Appendices



Fethiye Advanced Biological Wastewater Treatment Plant Project was structured under the main titles mentioned above. The information presented in the report were detailed under the related titles. The sections in the ESIA report can be briefly described as follows.

- Section I. Introduction includes an introduction to the project and the ESIA report, details of the project and environmental and social impact studies.
- Section II: Project Description includes information such as the location of the project, its components, specifications, relevant construction and operational activities, and its schedule.
- Section III: Policy, Legal and Administrative Framework includes National and International legal obligations and environmental agreements related to the project. However, the Environmental Impact Assessment procedure implemented in Turkey is described in details.
- Section IV: Environmental and Social Baseline Conditions describes the current situation including physical, biological and socio-economic conditions in and around the proposed project area.
- Section V: Environmental and Social Impact Assessment and Mitigation Measures determines the positive and negative impacts of the project with the mitigation measures.
- Section VI: Project Alternatives includes the analysis of alternatives suitable for the proposed project area, technology, design and activity.
- Section VII: Environmental and Social Management Plan explains the responsibilities for implementing the necessary management strategies, monitoring activities and mitigation measures.

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- Section VIII: Public Participation gives detailed information about the public participation meeting and summarizes the public's comments about the project and the survey results.

In accordance with the contents of the sections listed above, additional information such as list of preparers and contributors, legal documents, bibliography, related reports are given in the appendices of the ESIA report that is in line with the World Bank OP 4.01.

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## II. PROJECT DESCRIPTION

### II.1. Project Location

Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units Application Project is located within the boundaries of Fethiye District of Muğla Province and it is planned on an area of 32,657 m<sup>2</sup> located on the square No. 2907 parcel no 1 in Günlükbaşı neighborhood. The aforementioned project area is located within the borders of existing Wastewater Treatment Plant area owned by MUSKI. Site Location Map and Satellite Image of the Area are as follows.

Table II-1. Project Area Coordinates

	Coor. Order: Right, Up Datum: ED-50 Type: UTM D.O.M.: 27 Zone: 35 Slice Deg.: 6 degrees		Coor. Order: Latitude, Longitude Datum: WGS-84 Type: Geographic D.O.M.: - Zone: - Slice Deg.:	
Waste Water Treatment Plant	690849.669	4060295.372	36.6674926	29.1350708
	690773.774	4060227.217	36.6668938	29.1342051
	690721.667	4060180.292	36.6664816	29.1336108
	690667.701	4060171.375	36.6664120	29.1330051
	690665.513	4060174.138	36.6664374	29.1329813
	690664.864	4060200.350	36.6666736	29.1329806
	690650.242	4060222.583	36.6668769	29.1328226
	690611.209	4060248.005	36.6671137	29.1323924
	690610.631	4060252.098	36.6671507	29.1323870
	690668.722	4060312.422	36.6676825	29.1330516
	690830.116	4060477.795	36.6691399	29.1348976
	690852.300	4060505.501	36.6693850	29.1351525
	690856.037	4060505.968	36.6693885	29.1351944
	690874.400	4060487.284	36.6692165	29.1353951
	690874.543	4060484.307	36.6691897	29.1353960
	690788.569	4060379.230	36.6682603	29.1344084
	690788.340	4060371.169	36.6681877	29.1344038
	690849.760	4060299.486	36.6675297	29.1350728
	690851.712	4060297.206	36.6675087	29.1350941
	690849.669	4060295.372	36.6674926	29.1350708



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	Coor. Order: Right, Up Datum: ED-50 Type: UTM D.O.M.: 27 Zone: 35 Slice Deg.: 6 degrees		Coor. Order: Latitude, Longitude Datum: WGS-84 Type: Geographic D.O.M.: - Zone: - Slice Deg.:	
Exisitng Discharge Channel	690667.489	4060171.826	36.6664161	29.1330028
	690611.107	4060116.933	36.6659329	29.1323587
	690561.872	4060112.617	36.6659039	29.1318071
	690289.692	4060088.675	36.6657427	29.1287575
	690084.427	4060129.145	36.6661483	29.1264722
	689889.388	4060177.302	36.6666211	29.1243031
	689808.368	4060178.622	36.6666491	29.1233974
	689561.321	4060065.617	36.6656803	29.1206068
	689294.703	4059924.204	36.6644595	29.1175905
	689231.339	4059895.852	36.6642166	29.1168749
	688778.203	4059788.140	36.6633363	29.1117813
	688689.715	4059763.681	36.6631335	29.1107858
	688639.176	4059734.204	36.6628780	29.1102135
	688626.827	4059706.157	36.6626277	29.1100685
	688597.063	4059646.687	36.6620979	29.1097210
	688633.314	4059495.615	36.6607297	29.1100892
	688984.120	4058630.820	36.6528694	29.1137987



Figure II-1: Project Area Location Map and Satellite Image

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## II.2. Population Projections

Based on the design of the project, current population figures were taken from existing sources and compared with previous population figures to determine the population figures that would form the basis of population growth estimates.



According to the results of Address Based Population Census in 2008, the population in the center of Fethiye, is 77,237. According to the data of TURKSTAT, it is calculated that it will be 224,798 in 2028.

Table II-2. Population Data of Muğla Province

District	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bodrum	105,474	114,498	118,237	124,820	130,990	136,317	140,716	152,440	155,815	160,002	164,158	171,850
Dalaman	31,318	32,367	33,451	33,980	34,815	34,839	35,362	35,958	37,406	37,364	39,089	41,351
Datça	14,836	16,008	15,901	16,475	17,004	17,357	17,983	20,156	20,029	20,513	20,799	22,261
<b>Fethiye</b>	<b>173,426</b>	<b>181,415</b>	<b>183,184</b>	<b>188,259</b>	<b>192,886</b>	<b>195,419</b>	<b>140,509</b>	<b>145,643</b>	<b>147,703</b>	<b>151,474</b>	<b>153,963</b>	<b>157,745</b>
Kavaklıdere	11,153	11,169	11,140	11,132	10,994	11,008	10,878	10,814	10,759	10,780	10,780	10,898
Köyceğiz	32,395	32,347	32,753	32,817	33,331	33,570	33,777	34,027	34,363	34,942	35,325	36,389
Marmaris	73,461	76,820	75,350	77,390	81,910	83,081	85,801	88,621	89,630	90,187	91,871	94,247
Menteşe							99,911	102,414	105,860	108,068	109,979	112,447
Merkez (Center)	94,207	92,328	96,820	94,960	97,207	99,158						
Milas	120,508	123,501	123,984	125,727	127,094	128,006	129,128	132,445	132,437	134,774	136,162	139,446
Ortaca	39,648	40,649	41,704	42,364	42,920	43,633	44,227	44,827	45,875	46,982	47,697	48,373
Seydikemer							59,660	58,771	61,019	60,306	59,994	62,246
Ula	23,455	24,219	23,969	23,749	23,438	23,410	23,418	23,610	23,618	23,877	24,419	25,294
Yatağan	46,275	46,103	45,888	45,830	45,735	45,347	45,295	44,783	44,363	44,504	44,515	44,940
<b>Total</b>	<b>766,156</b>	<b>791,424</b>	<b>802,381</b>	<b>817,503</b>	<b>838,324</b>	<b>851,145</b>	<b>866,665</b>	<b>894,509</b>	<b>908,877</b>	<b>923,773</b>	<b>938,751</b>	<b>967,487</b>

The project with its capacity increase, is capable of meeting the population projection of the year 2028 and has a flow capacity of 33,850 m<sup>3</sup>/day in winter (Out of Season) and 50,531 m<sup>3</sup>/day in summer (Season).

Fethiye WWTP was designed in 1999 and its project was carried out accordingly. It was completed in 2003 and put into operation. Land acquisition is also planned to allow the construction of the 2nd level, and as it can be understood from the title deed registration example presented in the annex, the project area is under the ownership of MUSKİ. The 2nd stage project population projection is foreseen as 2028 for this reason. In the report as follows - In addition, further treatment is planned for the period after the project life of 2028, in this way, wastewater treatment can be done with at least 2.5 times more additional capacity and advanced technologies such as Membrane-Reverse Osmosis can be used. .

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## II.3. Wastewater Projections for the Project

### II.3.1. Waste Water Flow Rate Projections

In the existing treatment plant, daily average flow rate is 13,649 m<sup>3</sup>/day in the winter season and 22,394 m<sup>3</sup>/day in the summer season. In consideration of the return water originating from the filtrated waters in the treatment plant, the treatment have been sized according to 14,331 m<sup>3</sup>/day of wastewater flow rate in the winter season and 23,514 m<sup>3</sup>/day in the summer season. Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units Application Project was designed according to a flow rate of 33,850 m<sup>3</sup>/day in winter (Off Season) and 50,531 m<sup>3</sup>/day in summer.

Table II-3. Waste Water Flow Rate Design Values including the Returns in the Waste Water Treatment Plant

Parameter	Unit	First Stage (Extended Aeration)		Second Stage (Active Sludge)	
		2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Daily Flow Rate (5%)	m <sup>3</sup> /day	14,331	23,514	33,850	50,531
Maximum Dry Weather Flow Rate (7%)	m <sup>3</sup> /h	827	1518	1945	3108
Maximum WetWeather Flow Rate (5%)	m <sup>3</sup> /h	1218	2235	2863	4575

### II.3.2. Wastewater Characterization

During the Wastewater Characterization process, the wastewater pollution concentration and loads were determined by taking into account the existing wastewater analysis results and the per capita pollution loads given in the literature.

There are different per capita pollutant load values given in the literature and the legislation in the determination of the characterization of domestic wastewater. Per capita pollutant loads from different sources were used for the calculations in the determination of wastewater characterization for the project but the final wastewater characterization was determined based on the per capita pollution loads given in ATV-DVWK standards. In case that the pollutant loads are performed over the population affiliated to the plant, it is also suggested to make the calculations according to Table 1 in ATV-A 198E standard in the Wastewater Treatment Plants Design Guide.

Table II-4. Fethiye Wastewater Treatment Plant Inlet Waste Water Characterization\*

Parameter	Unit	First Stage (Extended Aeration)		Second Stage (Active Sludge)	
		2013 - Out of Season	2013 - Season	2028 - Out of Season	2028 - Season
BOD5 - Load (5%)	kg/day	4,362	6,608	10,116	14,162
BOD5 - Concentration	mg/l	304	281	299	280
SS - Load (5 %)	kg/day	5076	7689	11,801	16,523
SS - Concentration	mg/l	354	327	349	327
N - Load	kg/day	800	1,212	1,943	2,720
N - Concentration	mg/l	56	52	57	54
P - Load	kg/day	139	212	304	425
P - Concentration	mg/l	10	9	9	8

\* Discharge limits of advanced treatment are taken from urban wastewater treatment plants.



### II.3.3. Outlet Water Characterization

The Urban Wastewater Treatment Regulation (TR Ministry of Environment and Forestry, 2006), which was published in order to harmonize the Water Pollution Control Regulation (SKKY, 2008) and the EU Environmental Legislation with the National Legislation, was taken as base for the discharge standards of Fethiye Waste Water Treatment Plant. The discharge standards required by the legislation are given below. In addition, the discharge standards recommended for the treatment plant (SKKY, irrigation water criteria, Urban Wastewater Treatment Regulation, WBG EHS Criteria) are given comparatively. Within the scope of the project, the lowest limit value will be taken as the discharge standards as given in Table II-5.

Table II-5. Discharge Standards

Parameter	WB EHS	Urban Wastewater Treatment Regulation (for sensitive areas)	Irrigation Water Criteria (Table E7.1-Class A)	Water Pollution Control Regulation (Table 21.4) (24 h composite sample)	Project Standards (Discharge Standards to be complied with)
BOD5 (mg/l)	30	25	20	35	20
COD (mg/l)	125	125	-	90	90
Total Suspended Solids (mg/l)	50	35	-	25	25
Total Nitrogen (mg/l)	10	10	-	-	10
Total Phosphorus (mg/l)	2	1	-	-	1

**Table II-6. Fethiye Waste Water Treatment Plant Outlet Waste Water Characterization**

Parameter	Unit	First Stage (Extended Aeration)		Second Stage (Active Sludge)	
		2013 - Out of Season	2013 - Season	2028 - Out of Season	2028 - Season
BOD5 - Output Value	mg/l	15	15	15	15
BOD5 - Estimated Efficiency	%	95	95	95	95
Required BOD5 - Decrease	mg/l	289	266	284	265
SS - Output Value	mg/l	30	30	30	30
SS - Removal	%	92	91	91	91
Required SS - Decrease	mg/l	324	297	319	297
N - Output required	mg/l	5	5	5	5
N - Efficiency	%	73	71	73	71
Required N - Decrease	mg/l	41	37	42	39
P - Output required	mg/l	1	1	1	1
P - Efficiency	%	80	78	78	78
Required P - Decrease	mg/l	8	7	7	6

**Source:** Project Feasibility Study, 2013

It is aimed to reuse the treated wastewater. Therefore, the discharge criteria of the Urban Wastewater Treatment Regulation (TR Ministry of Environment and Forestry, 2006) and the irrigation water criteria of Waste Water Treatment Plants Technical Procedures Communiqué (AAT Technical Procedures Communiqué, 2010) were taken as basis in determining the discharge standards of the plant.

## II.4. Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units Application Project Components

### II.4.1. Pump Station

Wastewater collected from Fethiye Municipality are transferred to TM4 Pump Station. Wastewater transferred to TM4 Pump Station with DN 1000 GRP pipes is collected with intermediate supply stations until this point. Currently, the system operating with 2 + 1 pumps will be operated with 4 + 1 pumps (all pumps will be renewed).

Table II-7. Existing Inlet Pump Station, TM4 Features

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Maximum Dry Weather Flow Rate, $Q_h$	m <sup>3</sup> /h	858	858	1,678	1,678
Maximum Wet Weather Flow Rate, $Q_{max}$	m <sup>3</sup> /h	1,358	1,358	3,724	3,724
Pumps					
Pump type: Submersible					
Number of Pumps Selected (original)		2	2	4	4
Number of Spare Pumps		1	1	1	1
Pump Capacity Required (beaker)	m <sup>3</sup> /h	952	952	952	952

**Source:** Project Feasibility Study, 2013

### II.4.2. Screens

A new line will be installed on the inlet structure, a cover will be placed in the front, and a coarse grill will be placed on the inlet channel after this structure. 2 units of fine screens with a 6 mm of screen opening will be installed in the fine screen channel, each of which can be separated by covers at the end of the flow. In addition to the current project, this part will be covered with a roof. Screens will be changed to perforated screens. An additional screen channel considered as the second stage will be constructed and 1 unit of perforated screen will be located.

Table II-8. Existing Fine Screen Unit Features

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Maximum Wet Weather Flow Rate, $Q_{max}$ .	m <sup>3</sup> /h	1218	2235	2863	4575
Required in Front of the Screen	m/s	0.5	0.5	0.5	0.50



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Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Maximum speed required between screen bars	m/s	-	1.28	-	0.74
Calculated Screen Load	%	35	35	35	35
Load loss on the screen (max)	m.	-	0,066	-	0,020
<b>Selected Sizes:</b>					
Number of units		2	2	3	3
Selected opening (distance between bars)	mm	6	6	6	6
Channel width	m	1.10	1.10	1.10	1.10
Effective screen width	m	1.10	1.10	1.10	1.10
Channel depth	m	2.50	2.50	2.50	2.50
Water Depth	m	-	0.33	-	0.76
Number of Screen Presses Selected		1	1	1	1
Capacity of Each Unit	m <sup>3</sup> /h	0.5	0.5	0.5	0.5

Source: Project Feasibility Study, 2013

### II.4.3. Aerated Grit Chamber

Aerated grit chamber in the existing waste water treatment plant is designed in parallel with the maximum waste water flow of both stages (2013 and 2028), parallel double-eyed and rectangular section. Double eyed unit consists of two grit chambers and two parallel oil separator ponds. The inorganic solid removal efficiency of the grit chamber is 95% for solids greater than 0.16 mm. In addition to the current project, this section is covered with a roof. 1 unit of grit chamber blower will be added (2 + 1 blowers in total). Existing grit pumps will be replaced.

Table II-9. Oil Chamber Volume



Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Maximum Dry Weather Flow, $Q_H$	m <sup>3</sup> /h	827	1518	1945	3108
Maximum Wet Weather Flow, $Q_{MAX}$	m <sup>3</sup> /h	1218	2235	2863	4575
0.16-0.20 mm. (min) separation efficiency for particles	%	95	95	95	95
Base slope according to Oil Chamber	degree	40	40	40	40
Retention time according to WetWeather Flow	min	9	9	9	9
Required Volume, total	m <sup>3</sup>	183	335	429	686
Max. Horizontal speed	m/s	0.10	0.10	0.10	0.10
Length: width	-	11:1-15:1	11:1-15:1	11:1 -15:1	11:1- 15:1
Depth: width	-	1.3:1	1.3:1	1.3:1	1.3:1

**Source:** Project Feasibility Study, 2013

Sand accumulated in the collection pit located in the inlet direction of the grit chamber is transmitted to the grit separator by sand pumps.

**Table II-10.Grit Chamber Blowers Capacity and Sand Pumps Capacity**

Parameter	Unit	2013	2013	2028	2028
		Out of Season	of Season	Out of Season	Season
<b>Selected Sizes</b>					
Number of units	-	2 (1+1)	2 (1+1)	2	2
Length selected for each unit	m	32	32	32	32
Selected width	m	3.2	3.2	3.2	3.2
Selected section area	m <sup>2</sup>	10	10	10	10
Required volume, unit	m <sup>3</sup>	320	320	320	320
Effective retention time, (Q <sub>h</sub> )	min	25	14	21	13
Effective retention time, (Q <sub>max</sub> )	min	17	9	14	9
Horizontal Speed Q <sub>max</sub> )	m/s	0.03	0.06	0.04	0.06
Specific Air Requirement	m <sup>3</sup> /m <sup>3</sup> /dk	0.18-0.46	0.18-0.46	0.18-0.46	0.18-0.46
Selected Blower Capacity	m <sup>3</sup> /h	350	350	350	350
Number of Blowers selected (main)	-	1	1	2	2
Number of Blowers selected (spare)	-	1	1	0	0
Sand Production Amount	m <sup>3</sup> /1000 m <sup>3</sup>	0.14	0.14	0.14	0.14
Amount of Sand Formed (avg)	m <sup>3</sup> /g	2	3	5	7
The amount of sand/sludge in the Grit Chamber	%	3	3	3	3
The amount of sand sludge	m <sup>3</sup> /g	66	100	166	233
<b>Grease trap</b>					
Required loading, Q <sub>h(max)</sub>	m/h	25	25	25	25
Selected width	m	1.9	1.9	1.9	1.9
Selected length	m	31	31	31	31
Loading in selected dimensions, Q <sub>h</sub>	m/h	14.04	25.77	16.5	26.4
<b>Sand Discharge Pumps</b>					
Number of Pumps Selected (original)		1+1	1+1	2	2
Number of Spare Pumps Selected		0	0	0	0
Selected Pump Capacity, unit	m <sup>3</sup> /h	15	15	15	15
<b>Grit Separator</b>					
Number of Units Selected		1	1	1	1
Capacity selected, unit	m <sup>3</sup> /h	15	15	15	15

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Parameter	Unit	2013	2013	2028	2028
		Out of Season	of Season	Out of Season	Season
Grit Separator working time	h	4.4	6.7	11	16

#### II.4.4. Primary Sedimentation Tank

As part of the planned project, the primary sedimentation tank will be taken into operation.

Table II-11. Primary Sedimentation Tank

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Maximum Dry Weather Flow, $Q_h$	m <sup>3</sup> /h	-	-	1,945	3,108
Maximum Wet Weather Flow, $Q_{max}$	m <sup>3</sup> /h	-	-	2,863	4,575
Required Retention Time, $Q_h$	h	-	-	0.5-1.0	0.5-1.0
Selected Sizes:					
Number of units	-			2	2
Total Volume Selected	m <sup>3</sup>			1792	1792
Length	m			34	34
Width	m			9.5	9.5
Surface Area, unit	m <sup>2</sup>			323	323
Depth, avg.	m			2.8	2.8
Unit Volume	m <sup>3</sup>			904	904
Surface load - $Q_h$	m <sup>3</sup> /(m <sup>2</sup> xh)			3.01	4.81
Surface load - $Q_{max}$	m <sup>3</sup> /(m <sup>2</sup> xh)			4.4	7.08
Retention time - $Q_h$	h			0.93	0.58
Surface load $Q_h$	m/h			3.01	4.81
Weir length	m			44	44
Weir load $Q_h$	m/h			44.2	70.6
BOD <sub>5</sub> - Inlet load	kg/day			10,116	14,162

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
BOD5 - Decrease	kg/day			25	25
BOD5 - Efficiency	%			2,529	3,514
BOD5 - Output Load	kg/day			7,587	10,622
SS - Inlet Load	kg/day			11,801	16,523
SS - Efficiency	%			50	50
SS - Decrease	kg/day			5,900	8,261
SS-Output Load	kg/day			5,900	8,261
N-Inlet Load	kg/day			1,943	2,720
N - Efficiency	%			9.1	9.1
N - Decrease	kg/day			177	248
N - Output Load	kg/day			1,766	2,473
P - Input Load	kg/day			304	425
P - Efficiency	%			11	11
P-Decrease	kg/day			34	47
P - Output Load	kg/day			270	378

**Source:** Project Feasibility Study, 2013

#### II.4.5. Selector Tank

It is designed to mix wastewater and return sludge (coming from the return cycle pump station) before the aeration pond. A submersible mixer is used in the pond to prevent sludge settling. Since the primary sedimentation tanks will not be built in this project, the wastewater comes here after the venturi channel. The second tank, which is considered as the second stage, will be built and a submersible mixer will be used in the newly built tank (Totally 1 piece of submersible mixer).





**Table II-12.Existing Selector Tank's Sizes and Mixer Features**

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Maximum Dry Weather Flow, Q <sub>h</sub>	m <sup>3</sup> /h	827	1,518	1,945	3,108
Maximum Wet Weaheer Flow, Q <sub>max</sub>	m <sup>3</sup> /h	1,218	2,235	2,863	4,575
Retention time (Q <sub>h</sub> + Q <sub>RS</sub> )	min	10	10	10	10
F/M Ratio	kgBODs/ kgDS.d	7.0	7.0	7.0	7.0
<b>Selected Sizes</b>					
Number of units		1	1	2	2
Length	m	4	4	4	4
Width	m	11	11	11	11
Depth	m	5.3	5.3	5.3	5.3
Total Volume Selected	m <sup>3</sup>	233	233	466	466
F/M ratio in the selected volume	kgBODs/ kgDS.d	4.56	6.16	4.07	6.33
Retention time in the selected volume	min	9.6	4.8	7.8	5.8
Number of Submersible Mixers Selected	-	1	1	2	2
Mixer power selected, each	kW	1.5	1.5	1.5	1.5
Mixing efficiency	W/m <sup>3</sup>	6.44	6.44	6.44	6.44

**Source:** Project Feasibility Study, 2013

#### **II.4.6. Biological Phosphorus Removal Tank**

The existng anaerobic pond (1 unit) has been designed in the existing volume compared to 2013 in order to remove phosphorus by biological process. In addition to the current project, a second tank of the same volume, designed as the second stage, was designed. Two submersible mixers are used in each pond to prevent sludge settling.

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The amount of phosphorus that cannot be removed biologically will be removed by dosing FeCl<sub>3</sub> into the aeration pond.

**Table II-13. Anaerobic Pond Dimensions and Iron Chloride Unit Properties**

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Maximum Dry Weather Flow	mf/h	827	1,518	1,945	3,108
Maximum Wet Weather Flow	m <sup>3</sup> /h	1,218	2,235	2,863	4,575
Retention time (Q <sub>n</sub> + Q <sub>rs</sub> )	h	0.70	0.70	0.70	0.70
Required Anaerobic Tank volume (min)	m <sup>3</sup>	816	1,913	2,301	3,285
Selected Sizes Anaerobic Tank					
Number of units	-	1	1	2	2
Length	m	34.50	34.50	34.50	34.50
Width	m	11.0	11.0	11.0	11.0
Depth	m	5.3	5.3	5.3	5.3
Selected Volume, Total	m <sup>3</sup>	2000	2000	4000	4000
Effective Retention Time (Q <sub>n</sub> +Q <sub>rs</sub> )	h	1.37	0.69	1.11	0.83
Number of Submersible Mixers Selected	-	2	2	4	4
Mixer power selected, each	kW	5.0	5.0	5.0	5.0
Mixing efficiency	W/m <sup>3</sup>	5.0	5.0	5.0	5.0
<b>Chemical Phosphorus Removal</b>					
Inlet P load	Kg P/day	139	212	270	378
Biologically removed P	kg P/day	65	94	150	159

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
The amount of P to be chemically removed	kg P/day	46	71	52	117
FeCl <sub>3</sub> - dry matter need	kgDS/day	358	557	409	920
FeCl <sub>3</sub> - commercial solution amount (40%)	kg/day	895	1394	1023	2300
FeCl <sub>3</sub> amount (d = 1.41)	lt/h	635	988	726	1631
Required pump capacity	lt/h	26.5	41.2	30.2	68.0
Increased* pump capacity	lt/h	63.9	95.5	117.2	160.2
Number of pumps selected (original)	-	2	2	4	4
Number of pumps selected (spare)	-	1	1	1	1
Selected pump capacity (If biological phosphorus removal cannot be performed, the pump capacity to be used has been chosen to be bigger for safety purposes and the next stage reserve will also be in the first stage)	lt/h	50-(100)	50-(100)	50-(100)	50-(100)

**Source:** Project Feasibility Study, 2013

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#### II.4.7. Distribution Structure of Aeration Ponds

A two-eyed distribution structure was designed to distribute the wastewater evenly to both existing aeration ponds. Water inlet and outlet are controlled by gates.

#### II.4.8. Aeration Ponds

Biological treatment stages are designed to remove carbon and nitrogen by simultaneous denitrification process. In the first stage (2013), the aeration ponds will operate in accordance with the extended aeration process, and in the second stage (2028), the tanks will be operated according to the active sludge principle without adding volume to the ponds.

The aeration ponds are equipped with an aeration system consisting of fine bubble diffusers, air distribution system and blowers to meet the required oxygen demand. The current blowers will be replaced (4 + 1 blowers in total).

Table II-14. Aeration Ponds Volume and Nitrification Sludge Quantities

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
BODs - Load	kg/day	4,362	6,608	7,587	10,622
SS Load	kg/g	5,076	7,689	5,900	8,261
Temperature	°C	10	17	10	17
Mud age, $t_{rs}$	day	20	15	>10	>8
Loading Speed	kgBOD <sub>5</sub> / kg DS.d	0.05	0,075	< 0.15	<0.15
Amount of solid matter selected	kg/m <sup>3</sup>	4.10	4.5	4.35	3.4
Selected Sizes					
Oxidation Pond					
Number of units	-		2	2	2
Length	m	64.60	64.60	64.60	64.60
Width	m	28.60	28.60	28.60	28.60
Depth	m	7.0	7.0	7.0	7.0
<b>Total Volume, selected</b>	<b>m</b>	<b>23,786</b>	<b>23,786</b>	<b>23,786</b>	<b>23,786</b>

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Effective Volumetric Loading	kg/m <sup>3</sup> , day	0.19	0.28	0.32	0.45
Effective Biological Loading	kgBOD5/kgDS	0,045	0,062	0,074	0,133
Number of submersible mixers selected for each pool	-	4	4	4	4
Diver Mixer diameter	m	2.5	2.5	2.5	2.5
Mixer power, each	kW	4.0	4.0	4.0	4.0
Mixing efficiency	W/m <sup>3</sup>	1.35	1.35	1.35	1.35
Fluid velocity at the base	m/s	0.3	0.3	0.3	0.3
<b>Nitrogen Balance:</b>					
Total N Load	kg/day	800	1,212	1,766	2,473
TKN passing to the sludge	kg/day	175	264	379	531
TKN average output	kg/day	43	71	102	152
N to Nitrification	kg/day	583	877	1285	1790
NO <sub>3</sub> - N output (12 mg/l)	kg/day	8.0	23.1	327	485
NO <sub>3</sub> - N <sub>D</sub>	kg/day	576	896	958	1305
N03 - ND/BOD5		0,132	0,136	0.1007	0,123
V <sub>D</sub> /V <sub>to</sub> ,		0.43	0.41	0.43	0.43
Parameter	Unit	2013	2013	2028	2028
Design Temperature	°C	10	17	10	17
Nitrification-sludge age	day	11.41	8.55	8.84	4.66
Total sludge age	day	20.16	15.09	15.63	8.26
C Specific sludge reproduction caused by elimination	kgDS/ kdBODj	1,025	1.0	0.83	0.85
Daily Sludge Reproduction Amount	kgDS/d	4778	7,094	6,620	9796

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Total Sludge Amount	kgDS	95,608	106,410	102,676	80,131
Total volume selected	m <sup>3</sup>	23,786	23,786	23,786	23,786
Solid concentration	kg/m <sup>3</sup>	4.01	4.47	4.32	2.93
Selected solids concentration	kg/m <sup>3</sup>	4.1	4.5	4.35	3.4
Effective sludge age	day	20.41	15.09	15.63	8.26
Water height in aeration pond	m	6.0	6.0	6.0	6.0

**Table II-15.Oxygen Demand Calculation**

<i>Oxygen Calculation</i>					
Sludge age for oxygen calculation		20.41	15.09	15.63	8.26
OV <sub>c</sub> - at design temperature	kgO <sub>2</sub> /day	5,167	8,054	8,616	11,734
OV <sub>c</sub> - at 25 °C	kgO <sub>2</sub> /day		8,582		12,863
OV <sub>N</sub>	kgO <sub>2</sub> /day	2505	3851	5528	7697
OV <sub>D</sub>	kgO <sub>2</sub> /day	1666	2597	2778	3784
F <sub>c</sub>	-	1.13	1.15	1.15	1.20
F <sub>n</sub>	-	1.5	1.5	1.5	2.0
O <sub>2</sub> cons. in the aeration pond	mgO <sub>2</sub> /l	1.0	1.0	1.0	1.0
<b>Aeration with Blower</b>					
Average oxygen demand	kgO <sub>2</sub> /day	6,589	10,430	12,471	17,456
Peak oxygen demand	kgO <sub>2</sub> /sa	332	522	646	1,085
Alpha coefficient	-	0.55	0.55	0.55	0.55
Average oxygen requirement in standard conditions	kgO <sub>2</sub> /day	10,982	17,383	20,784	29,093

Peak oxygen requirement in standard conditions	kgO <sub>2</sub> /h	553	870	1,077	1,809
Diffuser oxygen transfer efficiency	g/m <sup>3</sup> /m	17	17	17	17
Ventilation Depth	m	5.75	5.75	5.75	5.75
Daily need for oxygen	m <sup>3</sup> /day	112,351	177,835	212,627	297,623
Total oxygen demand	m <sup>3</sup> /h	5,658	8,904	11,014	18,501
<b>Selected Blower Capacity</b>					
Number of Blowers selected (main)	-	2	2	4	4
Reserve unit	-	1	1	1	1
Required Unit Blower capacity		2,829	4,452	2,753	4,625
Selected Unit's Blower capacity		4,650	4,650	4,650	4,650
Adjustment rate for each blower	%	30-100	30-100	30-100	30-100
Selected working pressure	mbar	700	700	700	700

**Source:** Project Feasibility Study, 2013

#### II.4.9. FeCl<sub>3</sub> Dosing Station

The amount of phosphorus that cannot be removed biologically will be removed by dosing FeCl<sub>3</sub> into the Aeration Pond with the biological sludge collected in the Final Sedimentation Tank. In the first stage, 2 original + 1 spare will be used and, in the second stage, 2 more pumps will be added to the system. If necessary, FeCl<sub>3</sub> dosing will be made at the entrance of the Selector Tank, where the return sludge is poured with spare pumps.

#### II.4.10. Distribution Structure of the Final Sedimentation Tanks

A two-eyed distribution structure has been designed to distribute wastewater evenly to each available final sedimentation tanks. Water inlet and outlet are controlled by gates. In addition to the existing Plant, two gates were made for 2 tanks.

#### II.4.11. Final Sedimentation Tanks

The final sedimentation tank diameter was calculated to be  $\leq 1.3$  m/h in the first stage (2 tanks) and in the second stage (+2 tanks) peak wet weather flows. Wastewater is taken from the Aeration Ponds by gravity. In addition to the current project, 2 tanks of the same capacity will be built.

The tanks are circular and the sludge collected in the sludge cones with the scraper on the bottom flows towards the Sludge Reverse Pump Station with hydraulic pressure. The foam that may occur on the surface is taken into the Foam Chamber with foam scrapers. +1 foam chamber will be constructed for the new tanks that will be designed as the second stage. 1 + 1 pump will be installed in the existing foam chamber and the foam in this chamber will be pressed into the newly constructed foam chamber; then the foam collected here will be sent to the Sludge Feeding Tank with a 1 + 1 foam pump placed in the new reservoir.

**Table II-16. Dimensions and Load of the Final Sedimentation Tanks**

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Max. Wet Weather Flow	m <sup>3</sup> /h	1,218	2,235	2,863	4,575
Sludge Volume Index, SVI	ml/g	100	100	100	100
Sludge Volumetric Loading, q-SV	l/m <sup>2</sup> /h	460	460	460	460
Solid Matter in the Aeration Pond	kg/m <sup>3</sup>	4.10	4.5	4.35	3.4
Surface loading (q-A = q-SV / DS x SVI)	m/h	1.12	1.02	1.06	1.35
<b>Selected dimensions and surface load:</b>					
Number of units		2	2	3	4
Diameter	m	38	38	38	38
Unit surface area	m <sup>2</sup>	1,133	1,133	1,133	1,133
Total surface area	m <sup>2</sup>	2,266	2,266	3,400	4,532
Fresh water zone	m	0.5	0.5	0.5	0.5
Separation zone	m	1.67	1.77	1.73	1.60
Accumulation zone	m	0.73	0.79	0.76	0.64
Condensation zone	m	1.49	1.61	1.56	1.32
Depth (at 2/3)	m	4.39	4.66	4.55	4.06
Selected depth (at 2/3)	m	4.60	4.60	4.60	4.60



Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Side wall water height	m	4.18	4.18	4.18	4.18
Surface load for qh, q-A	m/h	0.36	0.67	0.57	0.69
Surface load for Qmax, q-A	m/h	0.54	0.99	0.84	1.01
Return cycle rate RV	%	76	90	85	57
Maximum weir load, single weir	m/h	5	9	8	10

#### II.4.12. Venturi Channel

Flow rate, temperature, oxygen, pH, conductivity are measured here.

#### II.4.13. Ultraviolet Disinfection Unit



A channel type ultraviolet system has been designed for disinfection of purified water at the outlet of the treatment plant. Instead of the existing UV system, a new UV system with a filter will be designed.

#### II.4.14. Reverse Cycle Sludge Pump Station

The active sludge flowing from the Final Sedimentation Tanks to the Reverse Cycle Pump Station is pumped directly to the selector tank in front of the Biop (Anaerobic) Pond and the excess sludge into the Sludge Feeding Tank. Reversing and excess sludge pumps will all be replaced. The number of pumps which is 2 + 1 in Reverse Cycle will be 3 + 2. Excess sludge pumps will operate as 2 + 1 pumps.

Table II-17. Reverse Cycle Sludge Pump Capacities

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
<b>Return Cycle Sludge:</b>					
QRS	m <sup>3</sup> /h	926	2012	2433	2607
Number of pumps selected (original)	-	2	2	4	4
Number of Spare Pumps		1	1	1	1
Selected Pump Capacity, unit	m <sup>3</sup> /h	1.150	1.150	1.150	1.150
Total capacity	m <sup>3</sup> /h	2.300	2.300	4.600	4.600

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Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
<b>Excess Sludge:</b>					
Total excess sludge	kg/day	4,778	7,094	6,620	9,796
Specific load	gDS/PE. d	65	63	41	44
Solid concentration	%	0.8	0.8	0.8	0.8
The amount of sludge	m <sup>3</sup> /day	597	887	828	1225
Operation time	h/day	12	16	12	12
The amount of sludge	m <sup>3</sup> /h	50	55	69	102
Number of pumps selected		1	1	2	2
Number of Spare Pumps		1	1	1	1
Pump capacity required, unit	m <sup>3</sup> /h	55	55	35	51
Selected Pump Capacity, unit	m <sup>3</sup> /h	55	55	55	55

**Source:** Project Feasibility Study, 2013

#### II.4.15. Mechanical Sludge Concentrator (Biological Sludge)

It is aimed to concentrate the biological excess sludge so that the amount of solid matter will be 4%. Mechanical concentrator feed pumps absorb from the sludge tank and feed them.

As a sludge conditioner, an in-pipe static mixer was used by dosing the polyelectrolyte solution with help of a poly dosing pump. As a second stage project, mechanical condensers will be removed and only decanters intended for dewatering will be placed.

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**Table II-18. Mechanical Concentrator Feeding Pumps and Mechanical Concentrator Properties**

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Inlet solids ratio	%	0.8	0.8	0.8	0.8
Outlet solids ratio	%	4.0	4.0	4.0	4.0
Amount of solid material entering	kg/day	4,778	7,094	6,620	9,796
Inlet solid flow	m <sup>3</sup> /day	597	887	828	1225
Outlet solids flow rate	m <sup>3</sup> /day	119	177	166	245
Operation time	d/ha	6	6	6	6
	h/d	8	8	8	8
<i>Mechanical Concentrator Unit:</i>					
Required dewatering unit capacity	kg/h	697	1035	965	1429
Required capacity, total	m <sup>3</sup> /h	87	129	121	179
Belt Concentrator Selected	-	2	2	3 (2+1)	3
Required capacity, unit unit	m <sup>3</sup> /h	44	65	40	60
Capacity selected, unit	m <sup>3</sup> /h	65	65	65	65
Number of feed pumps selected, main	-	2	2	3	3
Number of Spare Pumps Selected	-	1	1	1	1
Pump capacity selected	m <sup>3</sup> /h	65	65	65	65
<i>Dense Sludge Feeding Pump (P-127/ABC Advanced Stage)</i>					
Number of pumps	-	-	-	3	3
Number of spares	-	-	-	0	0
Required Capacity	m <sup>3</sup> /h			8	12
Selected Capacity	m <sup>3</sup> /h			15	15
Required capacity, unit	kg/h	348	518	322	476



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Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Capacity selected, unit	kg/h	518	518	518	518
Required working time	h/d	4.6	6.8	4.2	6.30
<i>Polyelectrolyte Preparation and Dosing</i>					
Spec. Polymer addition	kg/t DS	4	4	4	4
Total Polyelectrolyte Consumption	kg/day	19.11	28.4	26.5	39.2
Number of Units Selected	-	2	2	3 (2+1)	3

**Table II-19. Polyelectrolyte Dosing unit**

Operation time	g/ha	6	6	6	5
Operation time	h/d	8	8	8	8
Required capacity (Dry matter), total	kg/h	2.8	4.15	3.87	5.72
Required capacity (Dry matter) unit	kg/h	2.8	4.15	3.87	5.72
Concentration at the end of preparation	%	0.5	0.5	0.5	0.5
Solution percentage (0.5%), Total	m3/h	0.56	0.83	0.77	1.15
Required Dosing Pump Capacity	m3/h	0.28	0.42	0.26	0.38
Required Dosing Pump Capacity	m3/h	0.45	0.45	0.45	0.45
Number of Required Dosing Pumps	-	2	2	3	3
Number of Spare Pumps Selected	-	1	1	1	1
Required Dosing Unit capacity, unit	m3/h	0.56	0.83	0.77	1.15
Selected Pump Capacity, unit	m3/h	1.70	1.70	1.70	1.70
Final Dilution Unit Inlet poly concentration	%	0.5	0.5	0.5	0.5
Final Dilution Unit Output poly concentration	%	0.1	0.1	0.1	0.1

**Source: Project Feasibility Study, 2013**

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#### II.4.16. Filtrate Water Reservoir

In order to pump the tank filtrate waters (from sludge storage area and dewatering system, building drainage systems) to the entrance of the plant, 1 main + 1 spare and 1 pump in the second stage will be added and 2 + 1 operation will be provided.



#### II.4.17. Sludge Dewatering

Beltpres is used to dewater the dense sludge after Mechanical Sludge Concentrator. In addition to the current project, Beltpres dewaterers were replaced with decanters.

As a sludge conditioner, an in-pipe static mixer was used by dosing the polyelectrolyte solution with help of a poly dosing pump. After the Poly, the biological excess sludge was dehydrated to have a solids concentration of 22-27%. Decanter feeding pumps will be replaced (3 + 1) and 2 main + 1 spare decanters will be installed. Polyelectrolyte tank and polymer dosing pumps (3 + 1) will be renewed.

Table II-20. Beltpres Features and Pumps Capacity

Parameter	Unit	2013	2013	2028	2028
Outlet solids ratio	%	22	22	27	27
Solid content (Excess sludge)	kg/g	4,778	7,094	8,138	11,737
Incoming sludge flow	m <sup>3</sup> /g	119	177	271	391
Outgoing sludge flow	m <sup>3</sup> /g	21.7	32.2	30.1	43.5
Operation time	g/ha	6	6	6	6
	h/d	8	8	8	8
Required dewatering unit capacity, total	kg/h	697	1035	1187	1712
Beltpres number selected	-	2	2	3	3
Required capacity, total	m <sup>3</sup> /h	17.4	25.8	39.5	57
Required capacity, unit	m <sup>3</sup> /h	8.7	12.9	19.8	19
Capacity selected, unit	m <sup>3</sup> /h	20	20	20	20
Beltpres width		2.5	2.5	2.5	2.5
Required capacity, unit	kg/h	139.4	207	158	228
Capacity selected, unit	kg/h	207	207	207	207
Required working time	h/d	4.62	6.85	5.24	7.56

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Parameter	Unit	2013	2013	2028	2028
<i>Beltpres Feeding Pump</i>					
Type: Monopump					
Number of pumps selected (original)	-	-	-	3	3
Number of Spare Pumps	-	-	-	1	1
Capacity selected, unit	m <sup>3</sup> /h	-	-	20	20
<i>Polyelectrolyte Preparation and Dosing</i>					
Spec. Polymer Addition	kg/t DS	-	-	4	4
Total Polyelectrolyte Consumption	kg/g	-	-	32.5	47.0
Number of Units Selected	-	-	-	1	1
Operation time	g/ha	-	-	6	6
Operation time	h/d	-	-	8	8
Required capacity (Dry matter)	kg/h	-	-	6.2	6.2
Selected capacity (Dry matter)	kg/h	-	-	6.2	6.2
Concentration at the end of preparation	%	-	-	0.5	0.5
Solution percentage (0.5%), Total	m <sup>3</sup> /h	-	-	1.24	1.24
Number of Required Dosing Pumps	-	-	-	3	3
Number of Spare Pumps Selected	-	-	-	1	1
Required Pump Capacity, unit	m <sup>3</sup> /h	-	-	0.41	0.41

#### **II.4.18. Biological Sludge Dewatering (Decanter)**



Biological sludge dewatering centrifuges will be capable of increasing the sludge concentration to 25%. Centrifuges will work 16 hours a day, 6 days a week.

Operating time daily = 16 hours/day

Operating time weekly: 6 days/week

Percentage of Solids after Dewatering (% DS) = 25%

Daily biological sludge flow, to dewatering (QWAS)

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$$Q_{WAS} = \frac{SP_{WAS}}{SS_{RS}} = \frac{15730}{10,80} = 1561 \text{ m}^3 / \text{gün}$$



**Table II-21.Excess Sludge Pumps and Centrifuges**

Parameter	Year 2028	Unit
Flow	1561.00	m3/day
Operating Time	16	hours/day
Operating Time	6	day/week
Flow	113.82	m3/hour
Number of Main Pumps	3	pcs
Number of Spare Pumps	1	pcs
Pump Capacity	37.94	m3/hour
Selected Pump	40	m3/hour
Main Centrifuge Number	2	pcs
Number of Spare Centrifuges	1	pcs
Centrifuge Capacity	65	m3/hour

Daily dehydrated sludge flow (QWAS, thick)

$$Q_{WAS,thick} = \frac{SP_{WAS}}{1000} \times \frac{100}{(\%D_s)} = \frac{1561}{1000} \times \frac{100}{25} = 113,82 \text{ m}^3 / \text{gün}$$



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#### II.4.19. Sludge Feeding Tank

It is designed as 1 original + 1 spare blower that will provide only internal breathing in order to distribute excess sludge evenly to the Mechanical Concentrators before sending it to the Condensing units and to prevent the release of phosphorus for pre-storage. In addition, the foam collected from the Final Sedimentation Tanks will be pressed here with the pump from the foam reservoir.

Table II-22. Sludge Feeding Tank Features and Blower Calculation



Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Solid content	m <sup>3</sup> /d	597	887	828	1225
Retention Time	d	1	1	1	1
Tank volume	m <sup>3</sup>	597	887	828	1225
Selected Tank Volume	m	900	900	900	900
Effective retention time	g	1.5	1.02	1.08	0.73
Number of blowers selected		1	1	1	1
Number of spare blowers		1	1	1	1
Blower Capacity	m <sup>3</sup> /h	900	900	900	900

Source: Project Feasibility Study, 2013

#### II.4.20. Decayed Sludge Concentrator and Storage Pond (Advanced Level)

Table II-23. Decayed Sludge Concentrator and Storage Pool Features

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Incoming decayed sludge flow	m <sup>3</sup> /g	-	-	264	383
Amount of incoming decayed sludge	kgDS/g	-	-	8,138	11,737
Extracted solids ratio	%	-	-	3.0	3.0
	m <sup>3</sup> /g	-	-	271	391
Number of units	-	-	-	1	1

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Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Selected diameter	m	-	-	18	18
Total Volume Selected	m <sup>3</sup>	-	-	1.272	1.272
Holding period	g	-	-	4.52	3.16

Source: Project Feasibility Study, 2013



#### II.4.21. Sludge Storage

The sludge storage unit is used for 30-day intermediate storage of dehydrated sludge.

Table II-24. Sludge Storage Unit's Features

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
The amount of sludge cake	m <sup>3</sup> /g	21.7	32.2	30.1	43.5
	m <sup>3</sup> /m	651	966	903	1305
Storage time	month	1	1	1	1
Required storage volume	m <sup>3</sup>	651	966	903	1305
Selected Sizes					
Storage height	m	2.2	2.2	2.2	2.2
Required Area	m <sup>2</sup>	296	439	410	593
Number of Units Selected	-	1	2	2	3
Unit length	m	30	30	30	30
Unit width	m	8	8	8	8
Selected area	m <sup>2</sup>	240	480	480	720
Layer height	m	0.25	0.25	0.25	0.25

Source: Project Feasibility Study, 2013

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#### II.4.22. Sludge Conditioning Lime Addition

The dehydrated sludge can be removed with containers or can be conditioned with quicklime before removal. The current situation will be preserved.

Table II-25.Lime Addition Account

Parameter	Unit	2013	2013	2028	2028
		Out of Season	Season	Out of Season	Season
Amount of solid material entering	kg/d	4,778	7,094	8,138	11,737
Amount of sludge entering	m <sup>3</sup> /d	21.7	32.2	30.1	43.5
Solid concentration	%	35	35	35	35
Specific Lime Addition	kg CaO/m <sup>3</sup>	140.4	140	86	86
Daily lime supplement	kg CaO/d	3,036	4,507	2,593	3,739
Formed Ca(OH) <sub>2</sub>	t CaOH/d	3.8	5.8	3.3	4.8
Total sludge and Ca (OH) <sub>2</sub> qty.	t/d	24.8	36.8	32.7	47.2
Specific density	t/m <sup>3</sup>	1,105	1,105	1,068	1,068
Sludge volume to be stored	m <sup>3</sup> /d	22.4	33.3	30.6	44.2

#### II.4.23. Energy Efficiency

During the construction phase, aggregate amaterial, energy and water consumptipn will be in question. However, as the contruction will be a temporary phase, and construction will not be complex, construction material needs will be insignificant.



Besides the investment costs of treatment plants, operating costs are more important. Especially business-related problems and design problems make the treatment plants inefficient after a certain period of time and cause high energy usage.

Approximately 80% of the costs in a treatment plant operation is energy expenses. For this reason, energy optimization and efficient operation of the facilities provide significant gains.

Detailed Efficiency Determination of the Treatment Plant will be done before the operation phase. In addition,

- With Improved Physical, Chemical and Biological Treatment Methods,
- 10-40% decrease in General Operation Costs
- Up to 40% decrease in the Amount of Chemical Used
- 10-20% decrease in the Aeration Amount

will be provided.

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## II.5. Personnel Requirements

Within the scope of this project, it is planned to employ 80 workers in total during the peak period of the construction phase and 25 workers in total, together with the existing workers, during the operation period. Local recruitment will be given priority in recruitment.



Workers to be employed at different stages of the project will reside in settlement areas close to the project. In this context, there will be no accommodation facilities in the project area. The areas required for catering and other needs of the workers in the construction site will be located in the administrative building.

## II.6. Project Cost

The planned cost of the project is 4.500.000 Euro in total.

## II.7. Project Schedule

The project is planned to be completed in 24 months and at one stage. The tender process for the construction of the project will start following the ESIA processes. Construction will begin immediately after completion of the tender process.

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### III. LEGAL FRAMEWORK



#### III.1. National Legislation

Environmental Law No. 2872 constitutes the basic legal framework for environmental legislation in Turkey. This law is supported by many regulations. Article 10 of the Environmental Law constitutes the main framework of the Environmental Impact Assessment Regulation (EIA Regulation), which was published in the Official Gazette dated 25.11.2014 and numbered 29186. Environmental Impact Assessment (EIA) practices will be carried out in determining the positive and negative impacts of the projects planned to be carried out, in order to prevent negative impacts or to minimize them so as not to harm the environment, to determine and evaluate the alternatives and technology alternatives, and to monitor and control the implementation of the projects. The EIA process defines the process that covers the application, pre-construction, construction, operation and post-operation works for the environmental impact assessment of the planned project. EIA is the process that starts with the presentation of the reports in which all the aspects of the projects are explained and ends with the decision of the Ministry.



For the projects that are subject to the Environmental Impact Assessment Regulation published in the Official Gazette dated 25.11.2014 and numbered 29186, no incentives, approvals, permits, building and usage licenses can be issued for the projects that do not have "Environmental Impact Assessment Positive" decision or "No Environmental Impact Assessment Required" decision and investments for these project cannot be started and tendered. In this context, for the evaluation of the project within the scope of the EIA Regulation, the Opinion of the Provincial Environment Directorate of Muğla Governorship was asked and it was specified to be outside the scope of the EIA Regulation by the letter of Provincial Directorate of Environment dated 19/04/2018 and numbered 4675.

As part of the European Union membership process, Turkey was carried out by a variety of institutional and legislative reforms. Thanks to these reforms, environmental legislation and environmental protection instruments have been harmonized with international standards. Activities and obligations to be carried out within the scope of the project should be made in accordance with the provisions of the relevant Turkish legislation. The regulations concerning the project are given below.

- Waste Management Regulation (02.04.2015-23.03.2017)
- Regulation on Wastewater Collection and Disposal Systems (06.01.2017)
- Environmental Impact Assessment Regulation (25.11.2014-09.02.2016-26.05.2017- 14.06.2018)
- Regulation on Assessment and Management of Environmental Noise (04.06.2010-27.04.2011-08.11.2015)

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- Regulation on the Detection and Penalty of Violation and Collection of Administrative Fines in accordance with Environmental Laws (03.04.2007)
- Regulation on Exhaust Gas Emission Control (11.03.2017)
- Regulation on Control of Excavation Soil, Construction and Debris Wastes (18.03.2004)
- Regulation on Air Quality Assessment and Management (06.06.2008-05.05.2009)
- Regulation on Inventory and Control of Chemicals (26.12.2008-10.11.2009-23.05.2010)
- Regulation on Control of Odor-Emitting Emissions (19.07.2013)
- Regulation on Control of End of Life Tires (25.11.2006-30.03.2013-10.11.2013-11.03.2015)
- Industrial Air Pollution Control Regulation (03.07.2009 - 30.03.2010 - 10.10.2011 - 13.04.2012-16.06.2012-10.11.2012-20.12.2014)
- Regulation on Tracking of Greenhouse Gas Emissions (17.05.2014-29.06.2016-31.05.2017)
- Strategic Environmental Assessment Regulation (08.04.2017)
- Water Pollution Control Regulation (31.12.2004-13.02.2008-30.03.2010-24.04.2011-25.03.2012-30.11.2012-10.01.2016)
- Medical Waste Control Regulation (25.01.2017)
- Regulation on Soil Pollution Control and Point-Sourced Contaminated Sites (08.06.2010-14.06.2012-11.07.2013)
- Soil Conservation and Land Use Law (19.07.2005)
- Soil Conservation and Land Use Law Implementation Regulation (15.12.2005)
- Law No. 167 on Groundwater, (23.12.1960)
- Regulation on Protection of Groundwater Against Pollution and Deterioration (07.04.2012-22.05.2015)
- Environmental Law No. 2872 (11.08.1983)
- Labor Law No. 8423 (22.5.2003)
- Occupational Health and Safety Law (30.06.2012)
- Occupational Health and Safety Regulation (09.12.2003)

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### III.2. International Legislation

#### EU National Program (2008)

"Decision on Implementation, coordination and monitoring of the Turkish National Program on Adoption of the European Union Acquis" numbered 2008/14481 was published in the Official Gazette dated December 31, 2008 and numbered 27097 (5th duplicate) (EU National Program, 2008).



In the National Program published in 2003, the title of Improving Water Quality was defined as the first priority and treatment of urban wastewater is also included under this heading. The National Report published in 2008 lists the sub-expansions required for these priorities.

#### Wastewater Treatment Action Plan

The Wastewater Treatment Action Plan has been prepared by making use of the outputs obtained from the "National Environmental Strategy and Action Plan", the "Integrated Harmonization Strategy Project" carried out with EU resources, and the "High Cost Environmental Investments Planning Project".

The Wastewater Treatment Action Plan has been prepared in line with the strategies and objectives of the Environmental Law. It also contains detailed information on what will be the wastewater infrastructure improvements and regulations that will be made to fulfill the obligations imposed by the Environmental Law and to comply with the EU environmental acquis (MoEF, 2008).

In the plan, targets and strategies have been determined in order to monitor the pollution of underground, surface and coastal waters, to minimize and prevent pollution, to establish sewerage systems and treatment facilities in accordance with the Urban Wastewater Treatment Regulation, and to strengthen the technical and economic infrastructures of municipalities. Wastewater treatment action plans were prepared according to the basins and provinces.

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### III.3. Water Resources

Within the scope of the control and management of water resources, Regulation on Control of Water Pollution (Official Gazette dated 31.12.2004 and numbered 25687) and Surface Water Quality Regulation (Official Gazette dated 30.11.2012 and numbered 28483) apply.



The purpose of the Water Pollution Control Regulation is to determine the legal and technical principles necessary to achieve the prevention of water pollution in line with sustainable development objectives, in order to maintain the potential of the country's underground and surface water resources and to ensure its best use. This Regulation covers the quality classifications and uses of water environments, planning principles and prohibitions regarding the protection of water quality, the principles of wastewater discharge and permits of discharge, the principles regarding wastewater infrastructure facilities and the monitoring and inspection procedures and principles to be carried out to prevent water pollution.

The purpose of the Surface Water Quality Regulation is to determine the biological, chemical, physico-chemical and hydromorphological qualities of surface waters and coastal and transitional waters, to monitor water quality and quantity, and to balance the use of these waters in accordance with sustainable development goals and to determine the procedures and principles for the measures to be taken in order to put forward, protect and reach the good water condition. This Regulation covers all surface waters, coastal and transitional waters, excluding open sea. Project standards and applicable national and international limits are given below:

Table III-1. Fethiye WWTP Project Standards and Applicable Legislation

Parameter	Unit	WPCR Limit Value	WBG EHS	Project standards
BOD	mg/L	50	30	20
COD	mg/L	180	125	90
SS	mg/L	70	50	25
pH	-	6-9	6-9	6-9
Total Nitrogen	mg/L		10	10
Total Phosphorus	mg/L		2	1



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### **III.4. Waste Management**

Within the scope of waste management, the provisions of Waste Management Regulation (02.04.2015-23.03.2017), Excavation Soil, Construction and Debris Waste Control Regulation (18.03.2004), Medical Waste Control Regulation (25.01.2017) are implemented.

The purpose of the Waste Management Regulation is to ensure management without harming the environment and human health from the formation of waste to the disposal, to reduce waste generation, to reuse waste, to recycle, to reduce the use of natural resources and to provide waste management and to determine the general procedures and principles having certain criteria in terms of environment and human health regarding the production of the products covered by this Regulation and the market surveillance and control with basic conditions and features.



The purpose of the Regulation on Excavation Soil, Construction and Debris Waste Control is to regulate the technical and administrative issues related to the reduction, collection, temporary accumulation, transportation, recovery, evaluation and disposal of excavation soil and construction and wreckage wastes in a manner that will not harm the environment.

The purpose of the Regulation on the Control of Medical Wastes is to prevent direct or indirect delivery to the receiving environment in a way that harms the environment and human health, to be collected separately at its source without harming the environment and human health, to be transported within the health institution, to its temporary storage, to its medical waste processing facility and its disposal, to regulate the principles, policies and programs as well as the procedures and principles regarding the determination and implementation of legal, administrative and technical principles.

### **III.5. Air quality**

Within the scope of air quality, the provisions of the Regulation on Control of Industrial Air Pollution, Regulation on Air Quality Assessment and Management, Exhaust Gas Emission Control Regulation and Regulation on Greenhouse Gas Emissions are applied.



The purpose of the Regulation on Control of Industrial Air Pollution is to control the emissions in the form of smoke, dust, gas, steam and aerosol emitted into the atmosphere as a result of the activity of the industrial and energy production facilities; to protect people and their surroundings from the dangers arising from contamination in the air-taking environment; to determine the procedures and principles for eliminating the negative effects and preventing the emergence of these effects, which cause significant damage to the public and neighborhood relations arising in the environment due to air pollution.

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The purpose of Air Quality Assessment and Management Regulation is to define and establish air quality targets to prevent or reduce the harmful effects of air pollution on the environment and human health, to evaluate the air quality based on defined methods and criteria, to maintain the current situation where air quality is good and to improve it in other situations, to gather sufficient information about air quality and to inform the public through warning thresholds.

The purpose of the Exhaust Gas Emission Control Regulation is to protect the living and the environment from the effects of air pollution caused by the motor vehicles driving in traffic, to reduce the exhaust gas pollutants, to make measurements, to control and to determine the procedures and principles regarding the application.

The purpose of the Regulation on the Monitoring of Greenhouse Gas Emissions is to regulate the procedures and principles regarding the monitoring, reporting and verification of the greenhouse gas emissions arising from the activities listed in Annex-1 of this regulation.

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### III.6. Ambient Noise and Vibration

Within the scope of Ambient Noise and Vibration, the provisions of Environmental Noise Assessment and Management Regulation are applied.

The purpose of this Regulation is to determine the noise maps to be prepared, acoustic report and environmental noise level assessment report, to inform the public about environmental noise and its effects, noise maps, acoustic report and environmental noise level assessment report; to determine the procedures and principles regarding the preparation and implementation of noise prevention and mitigation plans, especially where the levels of environmental noise exposure can have harmful effects on human health and it is necessary to maintain environmental noise quality based on the results of the environmental noise exposure levels by using assessment methods in order to ensure that the necessary measures are taken to prevent the peace and tranquility of people, physical and mental health as a result of exposure to environmental noise and to be put into practice gradually.

### III.7. Occupational Health and Safety

The purpose of the Labor Law is to regulate the rights and responsibilities of the employees who are employed on the basis of an employment contract with employers regarding the working conditions and working environment.

Within the scope of Occupational Health and Safety, the provisions of the Occupational Health and Safety Law and the Occupational Health and Safety Regulation are applied.



The purpose of the Occupational Health and Safety Law is to regulate the duties, authorities, responsibilities, rights and obligations of employers and personnel in order to ensure occupational health and safety at workplaces and to improve existing health and safety conditions.

The Occupational Health and Safety Regulation determines the measures to be taken to improve the health and safety conditions in the workplaces.

### III.8. Land Acquisition

Within the scope of Land Acquisition, the provisions of the Expropriation Law No. 6203 are applied.

The purpose of the Expropriation Law is to regulate the conditions on the transactions to be made in the expropriation of real property owned by real and private legal entities, where the public interest requires, the calculation of the expropriation value, the registration of the immovable property and the right of easement, the transfer of the immovable property, the transfer of immovable properties and transactions, mutual rights and obligations, and resolution methods and disputes based on them.

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### III.9. Biodiversity

Relevant national and international laws, regulations, contracts, standards and principles are given below.

Table III-2. Related laws, regulations, contracts, standards and principles

Laws, Regulations, Contracts, Standards and Principles	U / UA	Purpose and / or Scope	Acceptance Dates and Official Newspaper Numbers and Dates
<b>Convention on Biological Diversity (Rio Conference, 1994)</b>	UA	Countries that are party to this agreement including Turkey aim the following within their boundaries: <ul style="list-style-type: none"> <li>· Complete protection of the diversity of plants, animals and microbiological life</li> <li>· Sustainable use of biodiversity</li> <li>· They have committed to sharing the benefits from biodiversity equally.</li> </ul>	Turkey has been a party in 1992.
<b>Convention on the Protection of Europe's Wildlife and Habitats (Bern Convention)</b>	UA	This contract, prepared by EU member states, aims to protect natural plant and animal species and their habitats.  The Bern Convention consists of 3 annexes.	It was published in the Official Gazette No. 18318 dated February 20, 1984 and entered into force on September 1, 1984.
<b>Convention on Wetlands of International Importance as Waterfowl Habitat (RAMSAR Convention)</b>	UA	The purpose of this Regulation is to protect and develop all wetlands, whether or not of international significance, for the implementation of the Convention on Wetlands of International Importance as a Waterfowl Habitat (RAMSAR Convention) and to determine the principles of cooperation and coordination among institutions and organizations in charge of this matter.	It was published in the Official Gazette No. 21937 on May 17, 1994.
<b>Habitat and Bird Directives</b>	UA	The European Union (EU) envisaged the establishment of a European Protected Areas Network, named Natura 2000, with the Directive 92/43/EEC of 1992. The basic idea of establishing this protection network is that nature does not act according to administrative boundaries and a holistic protection approach that covers the whole of Europe, outside the administrative boundaries, should be observed to protect the biological diversity of Europe. EU countries have determined Natura 2000 areas in line with Habitat and Bird Directives  220 habitats and about 1000 species were aimed to be protected in the annexes of the Habitat Directive. These are; <ul style="list-style-type: none"> <li>· Annex I covers living spaces,</li> <li>· Species in Annex II Special Protected Areas and requiring protection,</li> <li>· Annex IV species needing strict protection and</li> </ul>	Turkey has been a party in 1992.

Laws, Regulations, Contracts, Standards and Principles	U / UA	Purpose and / or Scope	Acceptance Dates and Official Newspaper Numbers and Dates
		Annex V species from nature may be restricted by European law.	
<b>Convention on the International Trade of Endangered Wild Animals and Plants Species (CITES, 1975)</b>	UA	<p>CITES is an international regulation that is based on permits and documents and provides for the granting of these permits and documents only if certain conditions regarding import, export, re-export and entry from the sea of the wild animals and plant species, their easily recognizable parts and derivatives among the contracting countries are met.</p> <p>Annex I is about 1200 species that may be threatened with extinction and/or commercially affected. Commercially caught specimens of these species are commercially prohibited.</p> <p>21.000 species in Annex II are species that are not necessarily threatened with extinction, but species that are subject to strict regulation to trade the wild species of the species in order to avoid practices incompatible with life. In addition, the species in Annex II may be the same as the species listed in other annexes.</p> <p>170 species in Annex III are listed after a request from other CITES Parties for assistance in trade control for one species of a member country. These species are not threatened with absolute global extinction.</p>	It was published in the Official Gazette dated 20 June 1996 and numbered 22672. It came into force on 22 December 1996.
<b>Convention on the Protection of Migratory Species of Wild Animals (Bonn Convention, 1983)</b>	UA	The purpose of the contract is to consider the conservation of wild flora and fauna in the Council of Europe member states and other states signing this convention with the national objectives and programs of governments, and in particular international cooperation in the protection of migratory species.	Turkey has been a party to the agreement on February 20, 1984.
<b>NATURA 2000</b>	UA	In May 1992, the European Union member governments introduced legislation to protect species that are significantly threatened across Europe. This legislation, which became the Habitat Directive, complemented the Bird Directive adopted in 1979. These directives define the needs and requirements for the formation and management of the protected areas network called NATURA 2000. The Bird Directive requires establishment of Important Protected Areas (SPA) for birds. Similarly, the Habitat Directive has been established to protect other species and habitats with their Important Protected Areas (SAC). SPA and SACs together form the Natura 2000 network.	Turkey have become a party in 1992.



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Laws, Regulations, Contracts, Standards and Principles	U / UA	Purpose and / or Scope	Acceptance Dates and Official Newspaper Numbers and Dates
World Nature Conservation Association (IUCN)	UA	The World Nature Conservation Association or the International Union for Conservation of Nature and Natural Resources (IUCN) is an international organization established to protect natural resources. Classes:	Turkey is one of the member states.
		NE: Not evaluated	
		DD: Data Deficient	
		EX: Extinct	
		EW: Extinct in nature	
		CR: Critically Endangered	
		EN: Endangered	
		VU: Vulnerable	
		NT: Near Threatened	
LC: Least Concern			
IFC Standards	UA	The Sustainability Framework, which is an integral part of IFC's risk management approach, sets out IFC's strategic commitment to sustainable development. Performance Standard 1,	
		· To make a comprehensive assessment to identify the environmental and social impacts, risks and opportunities of the projects,	
		· Effective participation by disclosing project-related information to the public and consulting them on issues directly affecting local communities,	
		· Reveals the importance of managing the environmental and social performance of the customer during the project.	
		Performance Standards 2-8 includes targets and conditions to prevent, minimize and remove the risks and impacts for employees, affected communities and the environment, and where there are residual impacts. While it is necessary to consider all environmental and social risk and potential impacts under the assessment, Performance Standards 2-8 define potential environmental and social risks and impacts that require particular attention.	
United Nations Convention on Biological Diversity (UNCBD)	UA	The three main objectives of UNCBD are fair and equitable sharing of benefits arising from the conservation of biological diversity, sustainable use of biological resources and the use of genetic resources.	Turkey signed the Convention in 1992, approved on December 26, 1996, and entered into force on May 14, 1997 contract year.

Laws, Regulations, Contracts, Standards and Principles	U / UA	Purpose and / or Scope	Acceptance Dates and Official Newspaper Numbers and Dates
<b>Land Hunting Law (4915-01.07.2003)</b>	U	The purpose of this Law is regulate hunting and use of hunting resources to be beneficial for the national economy and to cooperate with relevant public and private legal entities, and to protect the hunting animals in their natural habitats for sustainable hunting and wildlife management.	It was published in the Official Gazette No. 27437 dated December 19, 2009.
		<b>ADDITIONAL LIST-1;</b> Wild Animals Protected by the Ministry of Forestry and Water Affairs,	
		<b>ADDITIONAL LIST-2;</b> Hunting animals taken under protection by the Central Hunting Commission,	
<b>Regulation on the Protection of Pests and Wild Animals and Habitats, Procedures and Principles on Combating Pests</b>	U	The purpose of this Regulation is to regulate the procedures and principles regarding the protection of hunting and wild animals and their habitats, the displacement of species, their placement, protection measures, their collection and capture from nature, the management of predatory species, and their fight against pests, diseases and pests.	Published in the Official Gazette No. 25976 dated October 24, 2005.
<b>Regulation on the Implementation of the Convention on the International Trade of Endangered Wild Animal and Plant Species</b>	U	The purpose of this Regulation is to regulate the procedures and principles for controlling international trade by ensuring coordination with relevant institutions and organizations in order to ensure the sustainable use of animal and plant species within the scope of the Convention on International Trade in Endangered Species (CITES).	It was published in the Official Gazette No. 24623 dated December 27, 2001.
<b>Animal Protection Law (5199-24.06.2004)</b>	U	The purpose of this law is to ensure that animals live comfortably and are treated well and appropriately, to ensure that animals are best protected against suffering, suffering and suffering, and that all their grievances are prevented.	It was adopted by the Law No. 5199 of June 24, 2004.
<b>Regulation on the Protection of Animal Genetic Resources</b>	U	The purpose of this Regulation is to determine the genotypic and phenotypic characterization of animal genetic resources turkey, to cultivate with the purpose of protection, to regulate the procedures and principles regarding these characterizations.	It was published in the Official Gazette dated June 21, 2003 and numbered 25145.
<b>Animal Breeding Law (4631-28.02.2001)</b>	U	The purpose of this Law is to provide all kinds of animal production and the activities that make this production effective and the breeding activities to increase the productivity of animals raised for racing competition, to protect the genetic resources of pets and wild animals, to make the animal production economic and to increase competitiveness, to ensure breeding of animal breeds, to breed in healthy and hygienic conditions and to ensure delivery to the producers free from the diseases.	Published in the Official Gazette No 24338 dated March 10, 2001.

Laws, Regulations, Contracts, Standards and Principles	U / UA	Purpose and / or Scope	Acceptance Dates and Official Newspaper Numbers and Dates
<b>Law and regulation on Protection of Breeder's Rights on New Plant Varieties (5042-08.01.2004)</b>	U	To encourage development of plant varieties, to protect new varieties and breeder rights. This Law covers all plant species.	Published in the Official Gazette No. 25551 dated August 12, 2004.
<b>Seed Law (5553-31.10.2006)</b>	U	The purpose of this Law is to increase the yield and quality in crop production, to provide quality assurance to the seeds, to make arrangements for seed production and trade and to make the necessary arrangements for restructuring and development of the seed sector.	Published in the Official Gazette No. 26340 dated November 8, 2006.
<b>Pasture Law (4342-25.02.1998) and regulation</b>	U	The purpose of this Regulation is to regulate the procedures and principles of implementation of the Law on Pasture dated 25/02/1998 and numbered 4342 and the Amendment of Some Articles of Pasture Law No. 4368 dated 11/06/1998.	It was published in the Official Gazette No. 23272 dated February 28, 1998.
<b>Regulation on Dismantling, Production and Export of Natural Flower Onions</b>	U	The purpose of this Regulation is to regulate the principles and methods on collection, production, harvesting, storage and export of seeds, onions or other parts from nature in order to protect the bulbous plant species in nature.  This regulation covers bulbous, tuberous, clawed and rhizome plant species that are defined as natural flower bulbs although they are not found in nature.	Published in the Official Gazette No. 28358 dated July 19, 2012.
<b>Seed Law (5553-31.10.2006)</b>	U	The purpose of this Law is to increase the yield and quality in crop production, to provide quality assurance to the seeds, to make arrangements for seed production and trade and to make the necessary arrangements for restructuring and development of the seed sector.  This Law includes the regulations on production, certification, trade, market control and institutional structures of the seeds, field crops, vine-garden plants, forest plant species and other plant species and the registration of the varieties and genetic resources of the propagation materials.	Published in the Official Gazette No. 26340 dated November 8, 2006.
<b>Pasture Law (4342-25.02.1998) and regulation</b>	U	The purpose of this Regulation is to regulate the procedures and principles of implementation of the Law on Pasture dated 25/02/1998 and numbered 4342 and the Amendment of Some Articles of Pasture Law No. 4368 dated 11/06/1998.  This Regulation covers pasture, highland and wintering areas and public meadow and grassland areas.	It was published in the Official Gazette No. 23272 dated February 28, 1998.



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Laws, Regulations, Contracts, Standards and Principles	U / UA	Purpose and / or Scope	Acceptance Dates and Official Newspaper Numbers and Dates
Plant Protection and Agricultural Quarantine Law (6968-15.05.1957)	U	It covers the procedures and principles regarding import, export and transportation of all plants within the country, protection from diseases and pests, and import, export, production, export, sale and use of pesticides and drugs.	It came into force on December 22, 2000.

The above mentioned national and international laws, regulations, contracts, standards and principles are evaluated within the scope of the project and are given in the relevant section below.



### III.10. International Conventions and Agreements

International conventions and agreements on International Environmental Conventions, to which Turkey is a party, are given below.

- The International Convention on the Protection of Birds, Paris, 1959 (Turkey OG 17.12.1966, No. 12480)
- Agreement on Establishment of European and Mediterranean Plant Protection Organization (Amended), Paris 1951 (Turkey 08/10/1965)
- 12.19.1954 European Cultural Agreement (Turkey OG 17.6.1957, number 9635)
- Convention for the Protection of the World Cultural and Natural Heritage, Paris 1972 (Turkey OG 14.2.1983, number 17959)
- European Wildlife and Natural Life Convention for the Protection of the Environment, Bern 1979 (Turkey OG 20.2.1984, number 18318)
- Convention on the Protection of the Mediterranean Sea Against Pollution, Barcelona 1976 (Turkey OG 12.6.1981, number 17368)
- Protocol for the Protection of the Mediterranean Sea against Pollution from Land-based Sources, Athens 1980 (Turkey OG 18.3.1987, number 19404)
- Protocol for Specially Protected Areas in the Mediterranean, Geneva 1982, (signature 6.11.1986) (RG 23.10.1988, number 19968)
- Long Range Transboundary Air Pollution Convention, Geneva, 1979 (Turkey OG 23.3.1983, number 17 996)
- Additional Protocol to 1979 Long-Range Cross-Border Air Pollution Convention on Long-Term Financing of the Cooperation Program (EMEP) for Monitoring and Evaluation of Long-Range Transfers of Air Pollutants in Europe, Geneva 1984 (RG 23.7.1985, number 18820)

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- Vienna Convention on Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer, (RG 8-9.9.1990, number 20629)
- Convention on Biological Diversity, Rio de Janeiro, 5.6.1992 (Official Gazette No. 22860, December 27, 1996)
- Convention on Wetlands of International Importance, Especially as Waterfowl Habitats (RAMSAR), (RG 17.5.1994, number 21937)
- Convention on the International Trade of CITES Endangered Animal and Plant Species (Official Gazette of 20 June 1996)

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### III.11. World Bank Protection Policies

The objectives of the Protection Policies are:

- Protecting people and environment from negative effects
- Increasing environmental sustainability and social equality
- Integrating environmental and social issues into decisions on project selection, design and implementation
- Building environmental and social management capacity for the investors
- Providing a mechanism for disclosure of information, stakeholder information and participation, accountability
- Responding to the needs of local and cultural stakeholders



The Environment, Health and Safety (EHS) Guidelines of the World Bank Group are technical reference sources containing general and industry-specific examples of international good industry practices. It contains information on applicable environmental, health and safety issues for all industry sectors. The World Bank uses the EHS Guidelines as a source of technical information during the project evaluation phase. The EHS Guidelines include the performance levels and measurements that the World Bank deems appropriate and can be achieved at newly established facilities using reasonable technologies at reasonable costs. Along with these guidelines, the relevant industry-specific guidelines (EHS Guidelines for Water and Sanitation) are applicable. The General Environment, Health and Safety Guidelines contain the following main topics;

#### 1. Environment

- Air emissions and ambient air quality
- Energy conservation
- Wastewater and ambient water quality
- Water conservation
- Hazardous materials management
- Waste management
- Noise
- Contaminated land

#### 2. Occupational Health and Safety

- General facility design and operation
- Communication and training
- Physical hazards
- Chemical hazards
- Biological hazards
- Radiological hazards
- Personal protective equipment
- Special hazard environments
- Monitoring

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### 3. Community Health and Safety

- Water quality and availability
- Structural safety of project infrastructure
- Life and fire safety
- Traffic Safety
- Transport of hazardous materials
- Disease prevention
- Emergency preparedness and response

### 4. Construction and Decommissioning

- Environment
- Occupational Health and Safety
- Community Health and Safety



Within the scope of the World Bank's operational policy on Environmental Assessment (OP4.01), projects are classified under categories A, B, C according to the degree of possible environmental impacts. The classification in question is based on the type of project, its sensitivity, scale, and the nature and dimensions of its potential impacts.

The World Bank requires implementation of the Protection Policies in managing the environmental risks and impacts of the customers in order to create more development opportunities in direct investments. While the World Bank directs its business activities in order to reach its general development goals, it applies the Sustainability Framework along with other strategies, policies and initiatives.

The following 10 Protection Policies are mandatory during the World Bank's investment.

#### Environmental Policies:

***Environmental Assessment (OP/BP 4.01):*** Activities carried out within the scope of simple construction works, by their nature, create environmental and social impacts that are not very critical within the current project boundaries. Although the impact is not critical, the World Bank's Environmental Assessment Policy needs to be implemented. With the introduction of OP 4.01, environmental and social management tools should be prepared. Since the project in question is a wastewater treatment plant, and the potential impacts are temporary and reversible and limited to the construction site, and considering that it is also exempt from the EIA Regulation according to the Turkish Environmental legislation, the project is considered as **Category B**.

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**Natural Habitats (OP/BP 4.04):** The project area is located in Fethiye Göcek Special Environmental Protection Area according to Turkish legislation.

**Hazardous Substance Management (OP 4.09):** No activities that would require pest management will be carried out under the project.

**Physical Cultural Resources (OP/BP 4.11):** Laws and practices in Turkey meets the requirements of the World Bank. Since national legislation on the protection of cultural assets is strictly enforced, no additional conditions are expected outside the World Bank's protection policies. However, in case that an element involving the management of cultural artifacts discovered by chance is found, a random finding procedure will be applied, which will alert the audit consultants and the contractors about the steps to be followed. In addition, all official correspondences to be made before or during construction works will be recorded and added to periodic monitoring reports.

**Forests (OP/BP 4.36):** The project is not expected to have an impact on forest areas.

**Dam Safety (OP/BP 4.37):** There is no affected dam project within the scope of the project.

#### **Social Policies:**

**Involuntary Resettlement (OP/BP 4.12):** Within the scope of the project, there is an existing wastewater treatment plant on the site which the subject area belongs to MUSKI, and thus the issue of private property that may be subject to expropriation is eliminated. The project in question is not expected to result in physical resettlement.



The entire project area belongs to MUSKI and there is no need for additional land. No land purchase / lease will be made for the storage of materials and equipment during the construction phase.

**Indigenous People (OP/BP 4.10):** This policy is not considered in the projects in Turkey.

#### **Legal Policies**

**Projects in Controversial Areas (OP/BP 7.60):** The location of the project is not in controversial areas.

**Projects on International Waterways (OP/BP 7.50):** There is no international waterway within the scope of the project.

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#### IV. BASELINE CONDITIONS

##### IV.1. Physical Environment

###### IV.1.1. General Geology

Beydağları autochthon and Lycian nappes and Yeşilbarak nappe, which provide continuity in the lateral directions, outcrop in the region located in the northwest of Teke peninsula in the Western Taurus Mountains. Beydağları autochthon, which outcrops in the region in shape of tectonic windows, covers the Upper Cretaceous aged Beydağları formation, the Upper Paleocene - Middle Eocene aged Dişitaştepe formation and the Lower Miocene Sinekçi formation. Yeşilbarak nappe, which is located on Beydağları autochthon as a tectonic cover, consists of two different structural units, namely Gömbe and Yavuz units. Gömbe unit, which is the sub-structural unit of Yeşilbarak nappe, is represented by Gebeler formation consisting of Upper Cretaceous aged limestones and Elmalı formation consisting of Upper Lutetian - Burdigalian aged sandstone and shales. Yavuz unit, which is the upper structural unit, is represented by Yavuz formation consisting of Upper Lutetian - Priabonian aged limestone intermediate level sandstone, claystone and siltstones (Şenel M., 1997).

Lycian nappes consisting of structural units developed in different environments covers Tavas nappe represented by Upper Devonian - Middle Eocene aged rock units, Günbahar nappe represented by Liassic - Middle Eocene aged rock units, Marmaris ophiolite nappe and Domuzdağ nappe represented by Middle Triassic - Lower Jurassic aged rock units (Şenel M., 1997).

###### IV.1.2. Project Area Geology

The project area is located on Quaternary aged alluviums, which consist entirely of sand, gravel and deposits.

Beach sediments outcrop in the coastal areas to the west of the project area, while crops belonging to the Cretaceous Marmaris Peridotite (harzburgite, dunite, serpentinite, serpentinitized harzburgite, dunite etc.) are observed at the elevations to the north and east of the area.

Generalized stratigraphic column section of the project area and surroundings is given in Figure IV-1 and the geological map is given in Figure IV-2.

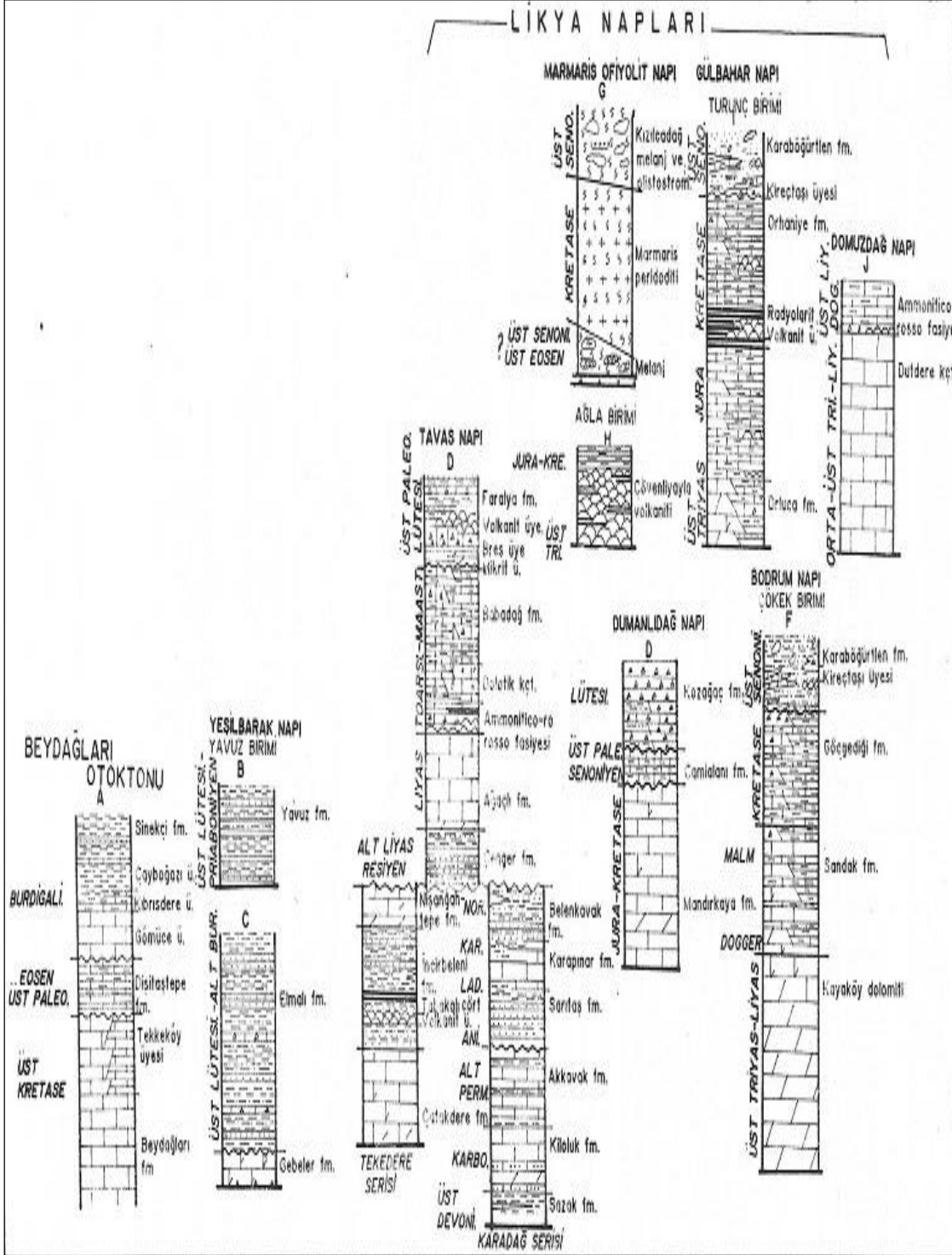




Figure IV-1: Generalized Stratigraphic Column Section of the Project Area and Surroundings

Source: Şenel M., 1997

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## Stratigraphy

### Cretaceous

#### Marmaris Peridotite (Kmo)

Marmaris peridotite is composed of serpentinized ultramafic rocks. The abrasion surfaces of the harzburgites, which are more common than other rock types, is red, reddish brown, greenish gray, and their crushing surfaces are blackish green, greenish gray, dark gray and dark green. Glassy and green-colored olivine crystals in medium-coarse rocks and silvery pyroxene crystals are noticeable. Olivines, which lost their brightness as result of serpentinization partially, have become dull and gained mesh texture. Since they are more resistant to abrasion, pyroxenes that form protrusions on the rock surface are lizarditized partially (*Şenel M., 1997*).

The rupture surfaces of dunites in light greenish gray, light green and brownish colors are olive green. They are widely serpentinized. They contain abundant amount of olivine and rarely pyroxene crystals. Serpantines are evident in tectonic lines and they are wide spread. In the unit there are rock types such as gabbro, diabase, etc. which are partially sheared. There are many chrome deposits in Marmaris peridotite (*Şenel M., 1997*).

### Quaternary

#### Beach Sediments (Qp)

They are sand and pebbles developed along the Mediterranean coast (*Şenel M., 1997*).

#### Alluvium (Qal)

They are in shape of gravel, sand and deposits in river beds, depression areas, plains (*Şenel M., 1997*).



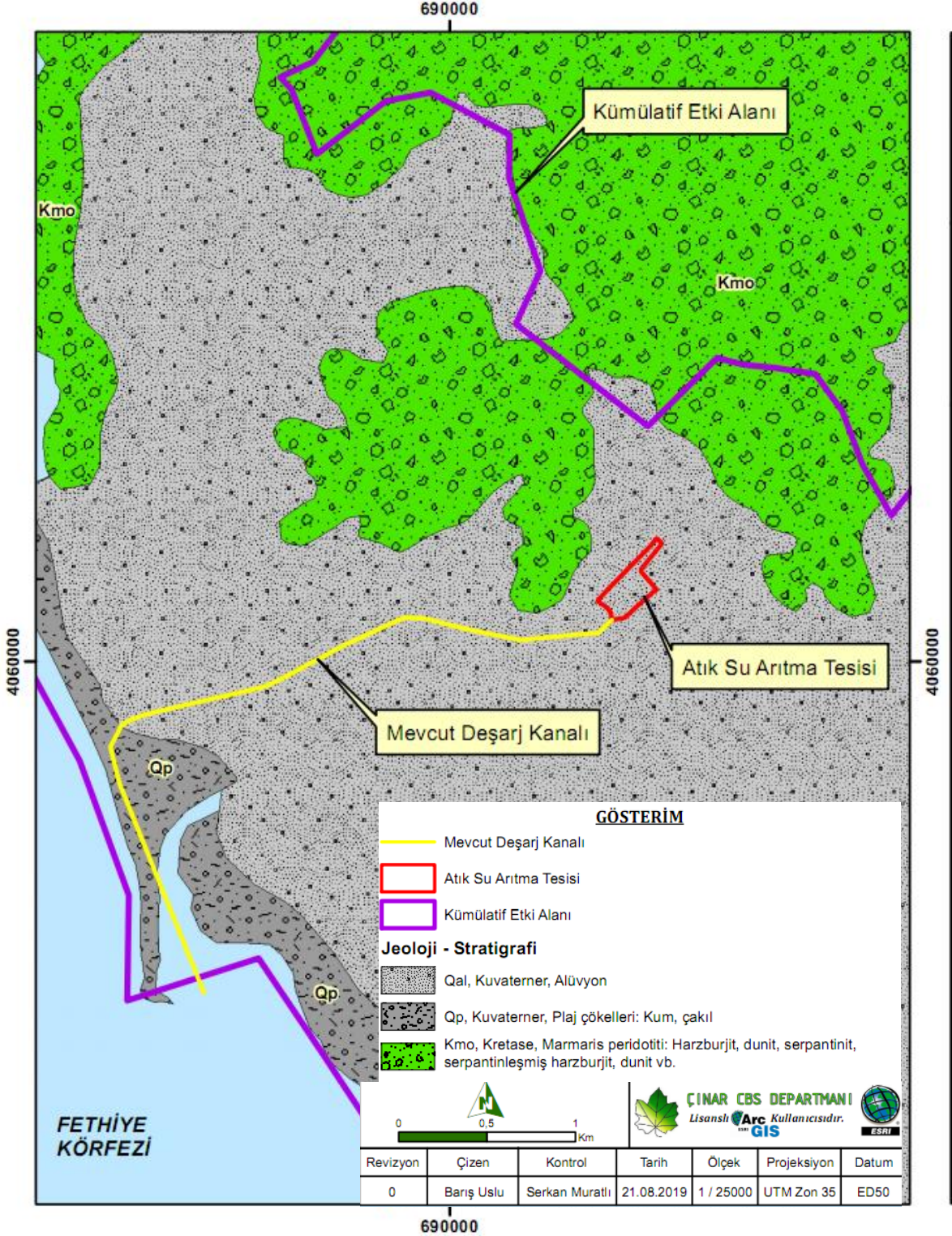




Figure IV-2: Project Area Geology Map

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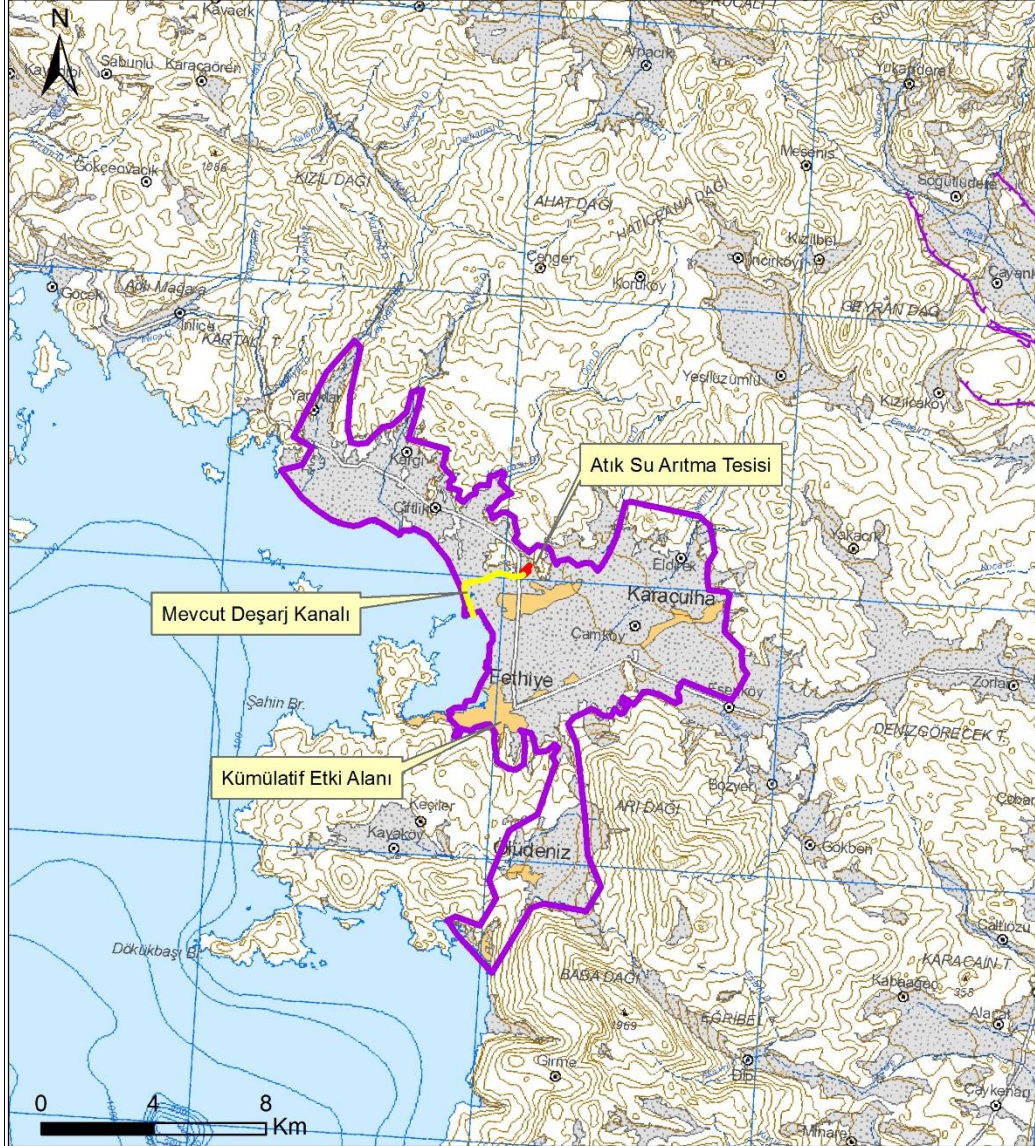
#### IV.1.3. Tectonic

There are structural units bearing different traces of deformation in the area where the rock units with autochthon position and allochthon position are exposed.

Gülbahar nappe, Domuzdağ nappe and Marmaris ophiolite nappe came together as result of the possible N-S directional compression regime developed in Upper Senonian and these units settled on Bodrum nappe due to this compression regime that continued in late Senonian. these nappes were dragged on Tavas nappe with Bodrum nappe underneath them due to the possible N-S directional compression regime at the end of the Eocene (*Şenel M., 1997*).

In the Lower Miocene, a similar N-S directional compression regime has developed again, and the Lycian nappes, which had previously settled in the south of Menderes Massif, overlapped on Beydağları autochthon from the north to the south by taking Yeşilbarak nappe which originated from between Menderes Massif and Beydağları autochthon in the Lower Langhian. At the end of Pliocene and afterwards, normal faults have developed on a large scale (*Şenel M., 1997*).

No active faults were observed in the immediate vicinity of the project area. Active fault map of the project area and its surroundings are shown in Figure IV-3



**FAY SINIFLAMASI / FAULT CLASSIFICATION**

- **Deprem Yüzey Kırığı:** 1900-Günümüz arasında yüzey faylanması oluşturan diri fay  
*Earthquake Surface Rupture:* Fault ruptured since 1900
- **Holosen Fayı:** Holosen'de (11.000 yıl) yüzey faylanması oluşturan fay  
*Holocene Fault:* Fault produced surface rupture in Holocene (11,000 years)
- **Kuvaterner Fayı:** Pleyistosen'de (1.600.000 yıl) yüzey faylanması oluşturan, Holosen etkinliği kuşkulu fay  
*Quaternary Fault:* Fault produced surface rupture in Pleistocene (1,600,000 years), no clear evidence for Holocene activity
- **Olası Kuvaterner Fayı veya Çizgisellik:** Kuvaterner veya öncesi dönemde oluşmuş, Kuvaterner etkinliği kuşkulu fay veya güncel morfolojide belirgin çizgisellik  
*Probable-Quaternary Fault or Lineament:* or distinctive morphological lineament

**İŞARETLER / SYMBOLS**

- ⇨ Doğruyu atımlı fay; oklar doğruyu boyunca hareketin yönünü gösterir  
*Strike slip fault; arrows indicate sense of lateral motion*
- |||| Normal fay; dişler tavan blok yönündedir  
*Normal fault; ticks indicate downthrown side*
- ⇨ Ters fay veya bindirme; dişler tavan blok yönündedir  
*Reverse fault or thrust; barbs on upper plate*
- Niteliği belirlenmemiş fay  
*Unspecified fault*
- - - - - Olasılı fay  
*Inferred fault*
- Deprem yüzey kırığı başlangıç-bitiş sınırı  
*Termination points of earthquake surface rupture*
- 17.08.1999 6.2-7.2  
Yüzey faylanması gelişen depremin tarihi ve büyüklüğü  
*Date and magnitude of the earthquake that formed surface rupture*



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Figure IV-3: Active fault map of the project area and its surroundings: Fethiye (NJ 35-16) Section, MTA, 2011

#### **IV.1.4. Hydrological and Hydrogeological Properties**

The project area is within the borders of western Mediterranean basin which is among the water basins divided in general of Turkey. There is 1 drying channel at a distance of approximately 50 m to the project area and 1 irrigation channel at a distance of about 205 m. While there are no lakes, ponds or dams in the immediate vicinity of the project area, Fethiye Bay is located approximately 2.2 km from the project area.

The sandy-pebbly alluvial deposits, which are widely dispersed in and around the project area, are generally permeable due to their porous structure and can contain groundwater. Cretaceous aged Marmaris Pedidodite which outcrop on the elevations around the project area is generally composed of soft rocks in terms of groundwater ( *Turkey 1/500000 scale hydrogeological maps, DSI, 1970* ).

#### **IV.1.5. Natural Disasters and Seismicity**

The renovated "Turkey Earthquake Hazard Map" published in the Official Gazette dated 18.03.2018 and numbered 30364 (duplicate) and entered into force on 01.01.2019 is given below in Figure IV-4. The approximate midpoint of the project area was examined on the interactive earthquake hazard map published by AFAD, and the greatest ground acceleration and ground velocity (PGA 475) for 475 Year Repetition Period were found to be 0.445 g and (PGV 475) 23.279 cm/s.

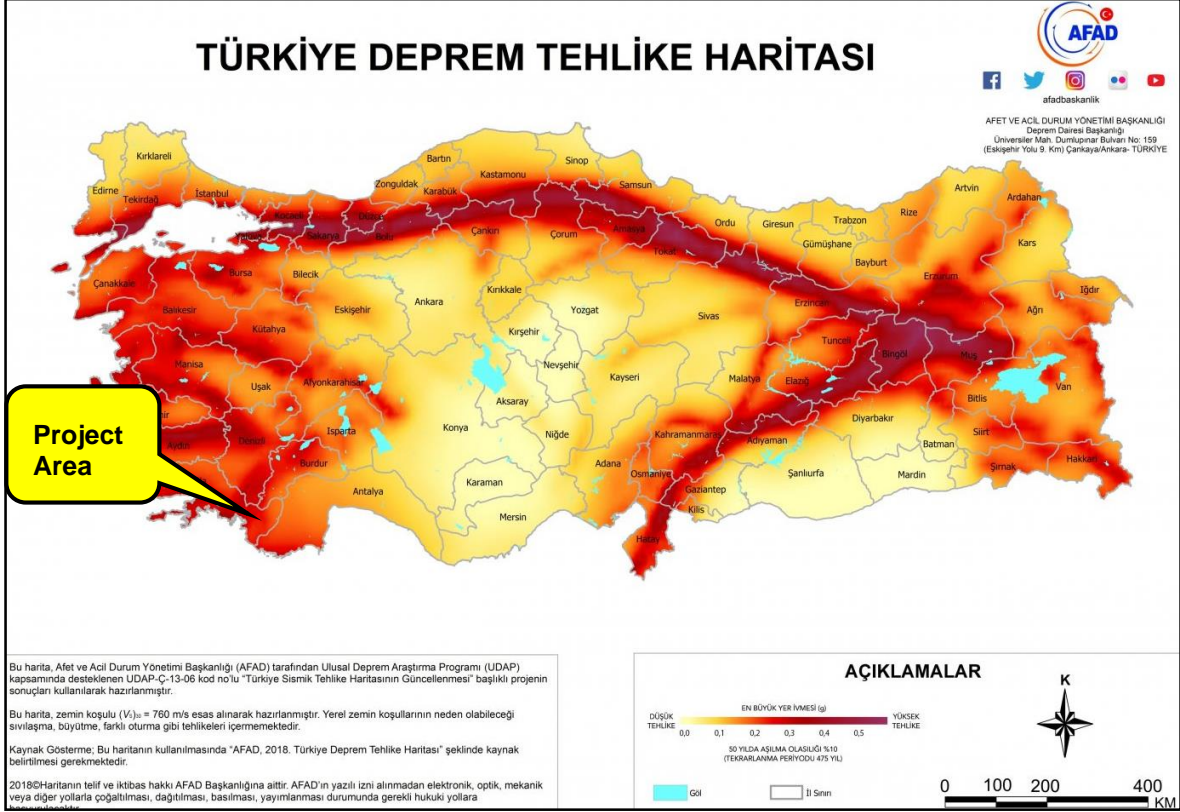


Figure IV-4: Turkey Earthquake Hazard Map

Source: AFAD, 2018, Earthquake Hazard Map of Turkey

In order to reveal the earthquake activity in the instrumental period of the project area and its surroundings, the earthquakes whose depth range that occurred between 01.01.1900 - 27.08.2019 in the 100 km radius area covering the project area ranges between 0-300 m, and the magnitude range between 4 - 10 are shown in Figure IV-5 and Table IV-1.

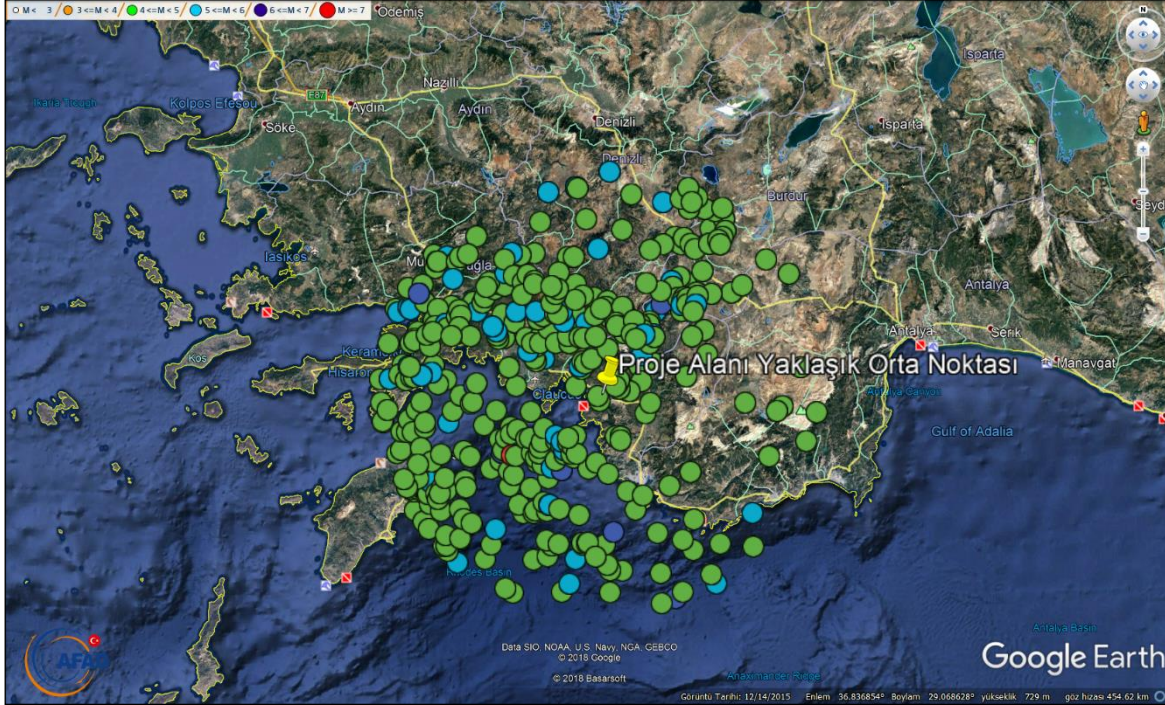


Figure IV-5: Map Showing the Instrument Period Earthquake Activity

Source: <https://deprem.afad.gov.tr/depremkatalogu#>

Table IV-1. Instrumental Period Earthquakes in the Project Area and Surroundings ( $4 \leq M \leq 10$ )

Time (UTC)	Latitude	Longitude	Depth	Size
12.09.2018 18:13	36.4171	28.6991	14.86	4.1
05.01.2018 04:33	37.1116	28.6075	13.31	4.2
24.11.2017 21:49	37.1146	28.6045	24.46	5.1
22.11.2017 20:22	37.1206	28.5921	24.75	5.0
07.11.2017 02:40	36.3163	28.4438	41.89	4.4
04.11.2017 21:54	36.7326	28.1870	66.78	4.2
13.04.2017 16:22	37.1533	28.6470	11.33	5.0
27.01.2017 20:51	35.8621	28.6880	25.44	4.6
04.01.2017 00:08	36.2751	29.2586	42.29	4.1
15.12.2016 16:43	37.1040	28.6418	18.11	4.2
06.09.2016 05:27	36.2865	28.1553	49.58	4.2
24.03.2016 01:22	35.9365	29.6781	17.93	4.2
05.02.2016 13:25	36.9488	29.3670	8.03	4.0
06.10.2015 21:27	36.1846	29.8853	34.23	5.2
28.09.2015 03:34	36.0775	29.5355	5.99	4.0
13.09.2015 02:57	37.1010	28.8780	21.36	4.4



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Time (UTC)	Latitude	Longitude	Depth	Size
25.07.2015 18:35	37.1431	28.6885	15.05	4.2
28.04.2015 07:59	37.0570	28.5396	16.92	4.0
10.02.2015 08:56	37.1475	30.0690	11.86	4.5
04.12.2014 05:35	35.9763	29.1588	37.67	4.0
15.11.2014 20:23	36.4280	28.8160	6.02	4.2
10.11.2014 09:20	37.1473	28.7580	10.34	4.3
10.11.2014 06:16	37.1163	28.7345	14.46	4.8
01.10.2014 07:16	36.9611	29.3695	25.37	4.2
20.07.2014 02:46	36.7425	28.1100	37.97	4.0
20.06.2014 13:59	36.3646	28.5753	49.42	4.3
03.05.2014 04:46	36.3276	28.8631	32.25	4.1
19.04.2014 23:39	37.0345	28.8783	14.17	4.0
29.01.2014 10:02	36.0668	29.0620	40.70	4.1
16.05.2013 21:26	37.0218	28.3715	16.61	4.2
16.05.2013 21:21	37.0053	28.4100	20.87	4.4
16.05.2013 03:02	36.9827	28.4208	25.43	4.6
21.04.2013 01:45	36.1927	28.1948	50.96	4.4
27.12.2012 16:09	36.1948	28.8563	16.90	4.0
30.11.2012 02:32	37.2087	28.6405	20.27	4.2
13.11.2012 18:25	36.5287	28.2418	8.40	4.0
20.10.2012 01:09	36.5500	28.2425	2.90	4.1
18.07.2012 17:46	37.1728	28.2912	25.40	4.0
25.06.2012 13:05	36.4422	28.9422	27.00	5.0
14.06.2012 16:46	36.3662	29.0642	32.89	4.8
13.06.2012 08:59	36.4807	28.9013	27.33	4.5
12.06.2012 21:58	36.4578	28.9283	28.02	4.5
11.06.2012 19:51	36.4575	28.9837	27.87	4.3
11.06.2012 17:35	36.4112	28.9907	27.94	4.4
11.06.2012 14:00	36.4267	29.0053	28.69	4.0
11.06.2012 02:06	36.4258	28.9788	28.19	4.4
10.06.2012 22:31	36.4242	28.9442	28.32	4.0
10.06.2012 18:28	36.4737	28.9608	28.64	4.5
10.06.2012 13:01	36.4830	29.2245	7.34	4.0
10.06.2012 12:50	36.4912	28.9612	7.13	4.4
10.06.2012 12:49	36.4762	28.9295	26.85	5.0
10.06.2012 12:44	36.3600	28.9300	30.00	6.1
09.06.2012 14:33	37.0387	28.4823	20.92	4.2



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Time (UTC)	Latitude	Longitude	Depth	Size
04.06.2012 14:19	36.9163	28.2020	12.11	4.6
08.05.2012 07:31	37.0355	28.5287	23.36	4.3
10.04.2012 06:01	36.7742	28.1660	53.50	4.0
15.02.2012 02:34	36.2198	28.7157	63.60	4.5
23.01.2012 18:23	36.1432	28.4798	19.60	4.0
20.01.2012 01:36	36.1603	28.4400	8.10	4.1
06.01.2012 20:35	36.1787	29.0177	53.70	4.2
14.11.2011 09:46	36.0610	28.9153	40.51	4.4
24.10.2011 10:14	36.5233	28.7075	23.32	4.2
24.10.2011 10:06	36.5340	28.6738	25.83	4.0
05.09.2011 11:42	36.1967	28.7975	50.79	4.3
25.08.2011 12:19	35.8200	29.4300	10.00	4.2
15.06.2011 18:23	36.5967	28.7742	25.98	4.0
07.05.2011 18:00	37.0200	28.1700	5.00	4.0
27.04.2011 02:04	36.3400	28.6900	2.00	4.0
10.04.2011 11:11	36.4500	28.8200	6.00	4.0
03.04.2011 23:42	36.4900	28.7700	5.00	4.0
14.12.2010 23:01	36.5986	28.0533	66.50	4.1
14.10.2010 09:08	36.1602	29.5918	42.80	4.3
26.05.2010 14:22	36.6326	29.8462	14.50	4.5
31.01.2010 04:18	36.9247	29.3357	6.92	4.0
12.12.2009 15:23	36.4838	28.6180	56.30	4.4
04.12.2009 17:19	37.4107	29.5697	19.50	4.7
28.07.2009 17:38	36.0608	29.7236	25.40	4.5
09.06.2009 05:26	35.9826	29.1591	37.20	4.3
01.01.2009 19:01	37.0192	29.1508	22.52	4.1
24.11.2008 11:34	36.6326	28.2234	73.20	4.0
09.11.2008 13:20	36.8701	28.1658	63.60	4.0
06.10.2008 05:19	36.0815	28.4232	76.70	4.1
01.10.2008 03:53	36.9738	29.1743	5.40	4.1
25.08.2008 02:57	36.9757	29.2112	10.00	4.3
24.08.2008 22:52	36.9555	29.2010	10.00	4.0
11.07.2008 14:11	37.0425	29.1598	4.80	4.3
03.07.2008 17:37	37.0196	29.2339	13.20	4.5
30.05.2008 05:34	36.9428	29.2048	1.20	4.0
28.05.2008 22:35	36.9235	29.2671	9.20	4.0
17.01.2008 08:39	36.3909	29.1038	49.10	4.1





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Time (UTC)	Latitude	Longitude	Depth	Size
08.01.2008 15:57	36.9286	29.2359	10.00	4.3
28.12.2007 10:34	36.9135	29.2433	12.90	4.0
09.12.2007 20:29	36.9640	29.2920	20.00	4.3
02.12.2007 20:21	36.9490	29.3210	27.40	4.6
16.11.2007 09:08	36.9090	29.3830	20.00	5.1
15.11.2007 23:26	36.3577	29.5703	55.60	4.1
12.11.2007 15:02	36.9730	29.2670	10.00	4.5
31.10.2007 17:58	36.8980	29.3920	20.00	4.4
29.10.2007 19:41	36.8720	29.3680	20.00	4.5
29.10.2007 09:23	36.9080	29.3420	20.00	5.3
20.09.2007 16:56	35.8670	28.9320	50.00	4.1
02.04.2007 12:38	36.4863	28.7519	13.00	4.0
06.03.2007 03:34	37.0986	28.5497	4.70	4.4
07.02.2007 05:25	36.4170	29.9630	54.80	4.5
24.08.2006 04:30	36.3910	28.8059	10.00	4.2
18.04.2006 01:21	36.8804	28.1849	16.90	4.0
17.04.2006 20:18	36.9040	28.2500	5.60	4.2
17.04.2006 11:53	36.9158	28.2806	10.00	4.1
15.03.2006 03:17	36.3917	28.2775	74.60	4.0
20.01.2006 10:40	36.8580	28.2660	12.40	4.0
31.07.2005 15:54	36.0500	29.1200	38.00	4.0
11.07.2005 17:20	36.4240	28.1030	58.90	4.0
23.01.2005 22:36	35.8990	29.7030	45.10	5.8
14.01.2005 19:08	36.9332	28.3530	16.80	4.2
10.01.2005 01:12	35.9427	29.4251	33.00	4.0
28.12.2004 20:34	37.0100	28.3030	13.70	4.5
28.12.2004 15:37	37.0349	28.2373	19.40	4.2
21.12.2004 00:23	36.9642	28.2824	42.00	4.1
20.12.2004 23:02	36.9500	28.3450	28.30	5.3
06.07.2004 17:57	36.0642	29.0563	30.00	4.1
26.06.2004 18:24	37.2267	28.2830	10.00	4.1
20.05.2004 11:26	36.1187	28.2657	74.50	4.0
19.02.2004 04:09	36.9570	28.6900	9.80	4.1
08.01.2002 14:17	36.0480	29.8890	42.60	4.5
29.12.2001 23:12	36.5120	28.1240	100.30	4.0
08.10.2001 11:38	36.7330	28.1730	87.70	4.0
19.05.2001 06:11	35.8650	29.1720	33.00	4.2



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09.04.2001 20:05	36.5060	28.6740	63.30	4.0
30.10.2000 19:37	36.9360	28.4120	9.50	4.1
18.10.2000 22:55	36.1860	28.7380	25.30	4.4
26.12.1999 03:37	36.5480	28.0330	89.00	4.1
05.10.1999 01:04	36.7840	28.1270	6.30	4.2
05.10.1999 00:53	36.7390	28.2260	19.00	5.2
02.08.1999 16:58	36.4980	29.2250	47.10	4.3
29.03.1999 04:05	37.1220	28.7930	21.90	4.2
09.03.1998 11:21	35.9830	28.4100	60.30	5.1
24.02.1998 15:11	36.3300	28.2210	31.50	4.5
13.02.1998 07:18	36.2880	28.4510	72.60	4.8
12.01.1997 10:48	35.9970	28.7895	73.10	4.1
02.02.1996 23:30	36.4218	28.3242	33.10	4.0
30.10.1995 15:45	36.5106	28.1514	17.80	4.1
28.09.1995 01:16	36.6326	29.3750	22.30	4.4
04.07.1995 18:21	36.8679	28.0551	41.50	4.1
30.06.1995 05:34	36.3987	28.6229	56.20	4.1
27.06.1995 05:50	36.0356	29.5881	51.90	4.2
27.05.1995 21:35	35.9989	28.5478	77.40	4.2
19.04.1995 01:04	36.0511	28.3542	86.00	4.0
28.02.1995 12:56	36.3460	29.1630	48.50	4.2
27.02.1995 04:12	36.9026	28.9600	13.00	4.0
25.01.1995 12:16	36.2590	29.3370	43.30	4.4
23.01.1995 08:37	36.8737	28.9676	15.00	4.0
22.01.1995 19:46	36.8971	29.0191	16.20	4.3
13.11.1994 11:38	36.9525	28.9693	4.10	4.1
13.11.1994 08:15	36.9850	29.0950	41.40	4.8
13.11.1994 07:58	37.0020	29.0250	44.00	4.9
13.11.1994 07:13	36.8940	29.0410	48.00	4.5
13.11.1994 06:56	36.9550	29.0530	20.00	5.3
09.11.1994 05:09	37.0120	29.1270	30.00	4.3
04.11.1994 21:18	36.5989	30.0019	11.40	4.3
03.04.1994 06:56	37.2200	28.9600	5.00	4.1
13.02.1994 03:31	37.1056	28.2284	8.40	4.1
25.01.1994 06:47	36.0657	29.0326	47.00	4.0
05.10.1993 18:35	36.8278	29.6563	10.00	4.1
26.08.1993 10:03	36.7240	28.0620	37.00	5.2



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14.01.1993 15:24	37.1996	28.3031	21.90	4.6
30.12.1992 18:10	36.5934	30.1942	1.60	4.0
30.09.1992 00:01	37.2472	29.3735	10.10	4.1
05.08.1992 14:20	36.6288	28.0201	30.00	4.3
29.07.1992 22:50	37.1567	28.9145	10.00	4.0
29.07.1992 21:59	36.9690	28.8097	10.00	4.0
12.07.1992 14:49	36.4760	30.1504	64.70	4.0
29.06.1992 19:43	36.7049	28.3065	70.20	4.0
19.04.1992 22:12	36.2875	28.7748	117.70	4.0
05.04.1992 03:38	36.0576	29.0384	11.80	4.0
16.01.1992 12:32	35.9528	29.2339	14.40	4.0
18.11.1991 13:35	37.0524	29.5595	26.60	4.2
13.08.1991 10:10	36.5525	28.0287	91.10	4.1
30.07.1991 04:50	36.3232	28.2108	47.70	4.3
29.07.1991 17:01	36.9400	29.2300	10.00	4.0
27.07.1991 15:04	37.2851	29.7161	27.80	4.0
27.07.1991 14:43	37.2978	29.7378	1.10	4.2
27.07.1991 11:38	37.2680	29.7260	36.80	4.6
02.06.1991 03:11	36.4127	28.4706	14.30	4.2
25.01.1991 09:03	36.9821	28.8350	2.30	4.3
16.01.1991 17:08	37.0986	29.4867	14.00	4.0
15.01.1991 21:01	37.1211	29.4809	1.00	5.3
13.01.1991 05:11	37.1183	29.5519	6.50	4.9
10.01.1991 22:55	37.0546	29.5123	28.50	4.1
21.11.1990 14:02	37.0267	29.6006	19.00	5.0
19.11.1990 09:36	36.7923	29.0471	6.40	4.2
31.10.1990 04:15	36.2998	29.4678	71.30	4.0
28.10.1990 17:12	37.1030	29.8340	10.00	4.4
04.10.1990 16:00	37.0331	29.4679	40.20	4.0
29.09.1990 16:28	36.4464	28.2228	76.60	4.1
08.09.1990 21:01	37.1394	29.5223	10.00	4.7
03.09.1990 07:56	37.0753	29.6055	18.70	4.1
03.09.1990 00:04	37.0409	29.5337	19.70	4.2
02.09.1990 04:02	37.0812	29.4259	10.00	4.0
20.08.1990 22:55	36.9983	29.5861	35.60	4.4
17.08.1990 23:49	37.0621	29.6108	10.00	4.0
07.08.1990 13:09	37.0277	29.5580	13.20	4.0



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02.08.1990 19:12	37.0018	29.5295	13.30	4.0
01.08.1990 07:17	37.0778	29.4834	4.60	4.1
18.07.1990 14:56	37.0573	29.5439	19.70	4.2
18.07.1990 11:29	37.0260	29.5310	40.40	5.5
26.06.1990 04:48	37.3275	29.2329	19.10	4.2
25.05.1990 22:22	36.8942	28.6404	10.00	4.2
16.08.1989 11:22	36.0757	28.8541	57.80	4.2
25.07.1989 15:40	36.1056	29.4099	33.00	4.1
08.07.1989 05:45	36.7226	28.0128	65.70	4.1
28.04.1989 13:30	36.9950	28.1010	20.80	5.5
27.04.1989 23:06	37.0160	28.1530	18.70	5.5
19.02.1989 14:28	37.0070	28.1630	23.30	5.4
08.12.1988 13:33	36.6180	30.0287	76.90	4.9
23.10.1988 17:21	36.7231	28.3474	111.00	4.2
24.06.1988 15:06	37.2057	29.9549	1.30	4.0
06.05.1988 12:18	36.9246	29.6423	24.20	4.4
30.01.1988 19:10	36.2865	28.2238	1.00	4.5
12.12.1987 18:24	36.7820	28.2849	77.80	4.3
26.11.1987 00:28	36.0583	29.1466	13.60	4.5
27.10.1987 14:48	36.1922	28.3259	6.00	4.6
25.10.1987 16:19	36.3799	28.2089	18.20	4.5
25.10.1987 14:40	36.2800	28.1746	8.10	4.2
25.10.1987 13:02	36.3260	28.3440	34.90	4.6
12.10.1987 02:44	36.2631	28.3010	10.00	4.6
09.10.1987 12:09	36.2404	28.3097	8.00	4.6
09.10.1987 11:22	36.2751	28.3518	10.00	4.4
06.10.1987 21:25	36.2847	28.3288	14.00	4.7
06.10.1987 20:45	36.2779	28.2445	20.30	4.5
06.10.1987 12:07	36.2532	28.2559	36.00	4.5
06.10.1987 11:31	36.4375	28.1229	4.10	4.4
06.10.1987 11:28	36.2630	28.3200	32.80	4.6
05.10.1987 09:27	36.3090	28.2730	42.10	5.1
18.07.1987 14:30	36.1487	28.2385	51.20	4.2
19.06.1987 18:45	36.7770	28.1590	76.10	5.3
04.04.1987 15:59	36.9000	28.3740	18.50	4.6
06.12.1985 22:35	36.9930	28.8970	7.80	4.6
11.09.1985 11:08	36.3820	28.8340	56.50	4.6



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23.08.1985 20:38	37.2344	28.7916	11.00	4.5
20.05.1985 10:33	36.1870	28.7900	50.30	4.8
31.07.1984 12:44	36.4744	28.8295	5.00	4.1
07.06.1984 23:37	37.2261	28.7215	10.00	4.3
26.04.1984 00:28	37.2175	28.4178	8.60	4.3
29.02.1984 14:07	36.4409	28.6356	13.00	4.3
22.02.1984 07:52	36.0573	28.5792	10.00	4.1
11.02.1984 16:15	36.0939	28.3512	76.30	4.0
06.02.1984 04:03	37.0919	28.1544	25.70	4.9
05.02.1984 21:07	37.2276	28.4578	23.80	4.2
05.02.1984 00:20	37.2340	28.6780	32.50	5.0
18.11.1983 07:13	36.8738	28.8202	15.00	4.5
28.09.1983 07:17	37.0078	28.0892	5.00	4.1
14.06.1983 03:55	36.4354	28.4384	93.50	4.1
28.05.1983 15:27	37.1092	28.7909	10.00	4.1
24.05.1983 07:39	36.8885	28.1868	11.20	4.1
24.03.1983 10:55	37.1133	29.3538	10.00	4.6
22.03.1983 11:19	37.0135	29.2394	10.00	4.4
23.11.1982 11:49	37.4528	29.5292	17.10	4.5
11.05.1982 10:25	36.9323	28.8624	12.00	4.2
23.11.1981 10:56	37.0742	29.7798	20.70	4.6
09.09.1981 14:36	35.8660	29.5354	33.00	4.1
15.08.1981 05:46	37.2954	29.5443	10.00	4.2
08.06.1981 21:06	36.2195	28.8673	68.30	4.1
28.05.1981 21:04	37.4956	29.0083	10.00	4.2
11.05.1981 19:15	36.7200	28.1450	15.20	4.7
27.04.1981 16:23	36.0547	28.8817	36.50	4.6
03.01.1981 06:01	36.9034	28.6023	10.00	4.8
11.11.1980 01:45	36.8951	28.7497	1.20	4.1
11.11.1980 01:22	36.8981	28.8213	10.00	4.9
04.10.1980 15:12	37.0000	28.8000	26.00	5.1
29.04.1980 21:19	37.0671	28.7310	31.70	4.4
22.06.1979 10:34	36.8000	29.0339	10.50	4.1
22.12.1978 03:53	36.5975	28.3810	12.30	4.2
18.09.1978 17:34	36.9100	29.2800	29.00	4.0
03.04.1978 15:44	37.2200	28.9900	10.00	4.9
11.01.1978 03:57	37.4800	28.8600	5.00	5.0



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13.06.1977 08:59	36.9900	28.9100	10.00	4.0
08.06.1977 04:49	36.2300	28.8400	64.00	4.0
08.03.1977 03:01	36.5406	28.5393	64.80	4.1
15.02.1976 23:36	36.0109	28.8603	19.00	4.4
12.11.1975 09:03	36.3200	28.1390	61.70	4.8
31.05.1975 12:41	36.7392	28.2267	34.30	4.1
31.05.1975 05:36	36.2025	28.9186	42.00	4.0
09.07.1974 02:32	36.6340	28.4810	53.80	4.9
24.05.1974 21:27	36.7252	29.2174	36.90	4.4
24.03.1974 07:09	37.2712	29.5778	7.80	4.1
05.02.1974 18:23	37.3307	29.6766	4.90	4.5
26.01.1974 05:49	37.2500	29.6000	34.00	4.0
26.01.1974 05:19	37.4140	29.7376	21.30	4.4
08.12.1973 19:40	37.3215	29.7522	17.30	4.4
30.11.1973 06:47	36.2952	28.6686	25.00	4.5
30.10.1973 19:40	37.3710	29.0515	19.00	4.3
29.07.1973 15:01	37.1180	28.5622	18.00	4.0
09.06.1973 19:09	36.2000	28.4200	63.00	4.0
29.08.1972 02:48	37.0004	29.1438	10.00	4.4
30.07.1972 20:08	36.8737	28.7796	10.00	4.1
22.01.1972 17:17	37.4087	29.6466	9.70	4.4
26.11.1971 16:22	35.9544	29.1726	41.10	4.5
16.10.1971 09:45	36.6280	28.4720	59.30	4.8
03.10.1971 17:18	36.7736	30.1209	21.60	4.4
03.09.1971 13:17	36.8116	28.7915	10.00	4.6
30.07.1971 13:07	36.8741	28.8993	10.00	4.2
08.07.1971 06:35	36.7931	29.3920	40.40	4.0
19.06.1971 00:27	37.1618	29.6368	33.70	4.7
15.06.1971 22:55	37.0253	29.0420	2.70	4.7
16.05.1971 12:05	37.4366	29.5830	4.30	4.2
14.05.1971 22:51	37.4550	29.6100	16.40	4.6
12.05.1971 17:48	37.4958	29.5678	48.90	4.4
28.02.1971 23:11	37.3690	29.7451	26.00	4.2
25.02.1971 04:46	37.0563	29.0935	8.50	4.4
24.02.1971 02:14	37.0472	28.9970	12.20	4.5
03.01.1971 12:46	37.0776	28.9926	25.90	4.4
02.01.1971 03:25	37.0651	29.0359	6.60	4.4



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31.12.1970 10:29	37.1100	29.0000	38.00	4.4
30.12.1970 18:54	36.9600	28.9400	23.00	5.1
30.12.1970 11:32	36.0500	28.3400	36.00	4.2
28.12.1970 12:43	37.0900	28.9100	23.00	4.4
28.12.1970 03:42	37.0600	29.0200	7.00	4.4
21.11.1970 02:13	36.8800	28.9200	10.00	4.5
17.11.1970 00:24	36.7400	29.5500	44.00	4.5
24.10.1970 19:34	36.8600	28.8000	28.00	4.1
19.10.1970 01:32	37.0100	29.0100	11.00	4.6
28.09.1970 19:54	37.0900	28.5900	24.00	4.6
16.06.1970 09:46	36.2700	28.1900	33.00	4.0
24.04.1970 14:37	36.7750	28.6640	39.50	4.6
27.03.1970 23:47	36.0300	28.3600	10.00	4.5
02.03.1970 06:57	36.8000	28.8000	49.00	4.6
01.03.1970 12:54	36.9000	29.1000	10.00	4.5
26.01.1970 05:29	37.0000	28.5000	10.00	5.1
21.12.1969 22:01	36.6600	28.4200	69.00	4.6
15.11.1969 05:50	37.2700	29.4400	45.00	4.8
06.09.1969 20:30	36.7520	28.2740	68.30	5.0
03.08.1969 08:28	37.0000	29.0000	57.00	4.1
27.04.1969 10:58	36.5100	28.1810	35.30	4.7
26.04.1969 08:25	36.7100	28.5000	13.00	4.3
24.04.1969 14:45	36.3570	28.6650	54.80	4.7
21.04.1969 20:57	36.2200	28.2700	11.00	4.6
24.03.1969 12:44	36.6000	28.6000	10.00	4.6
26.01.1969 06:56	37.3000	29.5000	53.00	4.3
14.01.1969 23:12	36.1100	29.1900	22.00	6.2
16.11.1968 23:25	36.6900	29.2200	10.00	4.0
16.10.1968 14:47	36.6000	28.2000	41.00	4.0
10.10.1968 05:16	36.5000	29.2000	10.00	4.5
04.07.1968 02:27	36.7700	29.0300	94.00	4.4
13.03.1968 02:26	37.2700	29.6700	10.00	4.4
26.10.1967 04:55	37.2500	29.1120	49.30	5.0
05.09.1967 08:31	36.7200	29.3300	24.00	4.5
09.08.1967 00:33	36.9800	28.4000	64.00	4.8
18.06.1967 05:28	36.7800	29.3200	35.00	4.9
02.06.1967 00:50	36.8900	29.3000	10.00	4.3



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01.06.1967 10:39	36.8250	29.3310	39.90	5.0
22.05.1967 19:46	36.5900	29.3500	54.00	4.6
04.04.1967 04:39	36.6800	29.2700	24.00	4.9
21.11.1966 03:46	36.2000	29.3000	10.00	4.5
16.08.1966 21:01	37.4700	29.2800	79.00	4.4
08.12.1965 11:22	37.3000	28.5000	10.00	4.5
13.10.1964 10:30	36.9400	28.2900	76.00	4.5
28.09.1964 21:00	36.7000	29.2000	63.00	4.4
08.06.1964 16:49	36.2600	28.2600	62.00	4.6
13.05.1964 17:06	36.2800	28.2100	82.00	4.5
31.03.1964 09:33	36.4300	28.7800	57.00	4.8
30.01.1964 17:52	37.4000	29.7000	30.00	4.4
29.01.1964 22:28	36.4000	28.9000	70.00	4.7
22.11.1963 20:26	37.0700	29.6800	60.00	4.7
29.09.1963 13:35	36.5000	29.0000	60.00	4.5
26.07.1963 19:46	36.8400	28.7600	80.00	5.1
23.05.1963 10:14	36.0100	29.1000	80.00	4.2
23.05.1961 02:45	36.7000	28.4900	70.00	6.3
26.01.1960 13:13	36.8900	28.6100	30.00	4.6
26.01.1960 13:05	37.0000	28.9300	72.00	5.2
09.01.1960 03:58	37.0700	28.9000	49.00	4.9
08.12.1959 09:35	36.9100	29.0700	70.00	5.0
09.06.1959 11:21	36.8100	29.0800	20.00	4.7
25.04.1959 01:05	36.9200	28.6000	40.00	5.3
25.04.1959 00:26	36.9400	28.5800	30.00	5.9
26.01.1959 16:15	36.7000	29.0000	30.00	4.5
26.01.1959 11:38	36.7800	29.0200	47.00	5.0
20.01.1959 20:40	36.7000	28.7000	30.00	4.8
11.01.1959 04:27	36.6400	29.1200	50.00	4.7
07.01.1959 22:22	36.7100	29.2100	40.00	4.8
06.01.1959 14:28	36.6600	29.1100	30.00	4.8
06.01.1959 04:06	36.8500	29.1600	20.00	4.5
09.12.1958 08:54	36.5600	28.1600	50.00	4.5
26.04.1957 16:09	36.4100	28.8000	10.00	4.7
26.04.1957 06:33	36.2200	28.8700	50.00	5.9
25.04.1957 07:52	36.1200	28.6000	10.00	5.0
25.04.1957 02:25	36.4200	28.6800	80.00	7.1





FETHİYE ADVANCED BIOLOGICAL WASTE WATER  
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Time (UTC)	Latitude	Longitude	Depth	Size
24.04.1957 19:10	36.4300	28.6300	80.00	6.8
05.02.1957 17:20	36.3700	28.8800	60.00	5.2
05.05.1956 20:42	36.9900	28.6300	40.00	4.7
08.04.1954 04:18	37.2700	29.5300	10.00	4.8
23.09.1952 20:30	36.9000	29.5800	10.00	4.8
05.11.1951 13:43	36.0000	29.0000	10.00	5.2
04.06.1950 14:11	36.5300	28.8400	30.00	4.8
20.11.1943 10:01	36.5500	28.3600	35.00	5.5
15.11.1943 11:43	36.8100	28.8400	83.00	5.2
14.10.1941 00:00	37.2000	28.4000	15.00	4.6
23.05.1941 23:00	37.2200	28.3500	48.00	5.2
23.05.1941 22:34	37.1300	28.3800	40.00	5.3
23.05.1941 20:25	37.2000	28.4000	10.00	4.5
23.05.1941 19:51	37.0700	28.2100	40.00	6.0
24.07.1939 22:05	37.2000	28.3000	15.00	4.8
13.03.1939 03:36	36.0000	29.0000	15.00	5.0
12.08.1936 22:24	37.4400	29.4400	130.00	5.0
17.08.1933 06:24	37.3600	28.8200	10.00	4.5
14.05.1932 03:45	35.8800	28.6500	10.00	4.7
24.03.1926 07:04	35.9000	28.9700	90.00	5.5
18.03.1926 23:28	36.0000	29.0000	10.00	4.7
18.03.1926 14:06	35.8400	29.5000	10.00	6.8
03.03.1926 06:58	37.0000	29.4000	10.00	5.0
01.03.1926 20:02	37.0300	29.4300	50.00	6.1
01.09.1925 08:16	37.5600	29.1700	130.00	5.4
06.12.1922 14:01	37.5000	29.0000	15.00	5.2
20.11.1922 04:24	37.5000	29.0000	10.00	4.9
03.06.1922 04:14	36.4900	28.6500	10.00	4.9
22.05.1921 21:23	37.0000	28.7000	32.00	5.1
04.07.1920 20:45	37.5000	29.0000	15.00	5.2
04.07.1920 12:17	37.5000	29.0000	15.00	5.0
01.05.1920 06:34	37.0000	28.7000	30.00	5.0
25.11.1906 00:00	36.9000	28.4700	10.00	4.6
05.12.1905 17:13	36.5000	28.9000	10.00	5.2

Source: <https://deprem.afad.gov.tr/depremkatalogu#>

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Within the project, the provisions of the "Regulation on the Constructions to be built in the Disaster Regions" of former Ministry of Public Works published in the Official Gazette dated 14/07/2007 and numbered 26582 and the provisions of "Turkish Buildings Earthquake Regulations" of the Directorate of Disasters and Emergencies being effective as of 01.01.2019 by being published in the Official Gazette dated 18.03.2018 and numbered 30364.

The entire of Muğla Province including the district of Fethiye is within the Region defined as 1st Degree Earthquake Zone in the "Turkey Earthquake Zones Map" accepted with the Decree dated 18.04.1996 and numbered 96/8109. For this reason, the earthquake risk should be taken into consideration in the design of wastewater treatment plants.

In this context;



According to the "Building Inspection Procedures and Principles" regulation, the building inspection companies are responsible for inspection works starting from the project phase of the building to the completion phase. The inspection is done as follows:

→ They draw and approve the appropriate project according to the earthquake region where it is located. They submit the approved project to the relevant municipality. The municipality, which oversees all the layouts of the project, gives license approval. The audited projects are as follows; static, architecture, electricity and plumbing. Auditing is performed according to the following standards and regulations: TS 500, Disaster Regulation, TS 498

→ The building, whose license is obtained, is actually put into operation.

→ Inspection during excavation: They tell how they will apply the excavation security measures and make them done. According to the project, they have the excavation applied to the land. When the excavation excavation is finished, the project elevations are compared with the excavation elevations without leaving the excavation machine and its accuracy is ensured. The ground should be checked by placing Gross Concrete or gravel.

Checking During the Foundation: The project is properly placed in the area where the building was excavated (Application). The expert building inspector and assistant inspector inform the molder about the basic plan. Mold application is started, when the construction work is finished, the same people check the mold's suitability to the project. Iron flooring is started. → Iron control is performed before commencement of iron flooring. In the control, flow and tensile tests are carried out in the laboratory by taking two rods of iron types that are basically applied. Among the iron standards, iron floor approval is given. Otherwise, it should not be allowed to be used.

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After the wall construction, the necessary installations are installed and checked to the relevant people.

The building inspection company is responsible for the building for 15 years.

#### IV.1.6. Water Resources

Currently, there are no streams in the vicinity of the project area, and in this section, general information about the water resource in the province of Muğla is given.

##### Streams



The territory of Muğla Province is situated within Greater Menderes basin and Western Mediterranean basin. These two basins are the country's medium size basins.

##### Western Mediterranean Basin

The part of Muğla between Gökova Bay and Akdağlar lies in this basin. The basin, which has a catchment area of 21,000 km<sup>2</sup>, has a volume of averagely 7 billion m<sup>3</sup>/year. There are 322,000 hectares of plain in the basin. 211,500 hectares of this are irrigable. The waters of the Western Mediterranean Basin drain into the Mediterranean with Dalaman and Eşen Streamlets. These streamlets are also the two most important streamlets of the province.

##### *Dalaman Streamlet*

It originates from the northern slopes of Boncuk Mountains. It flows in the northeastern direction and reaches Burdur's Gölhisar pit. In this depression area, it is fed with a large number of small streams, arising from the extensions of Akdağlar pouring into Burdur province area. Dalaman Streamlet, which is born from these two mountains from the east and west and feeds on short but abundant watery streams, enters Muğla territory from the north of Oğlansini. It expands by taking Hüsniye and Gürlek Rivers from the east, Gök Streamlet, Ören Streamlet and Cehennem Creek from the west. Among these streams, which mix with Dalaman Streamlet, especially Hüsniye and Gürlek Streamlets are abundantly watery streamlets since they are born in the parts of Boncuk Mountains open to the moist winds of the Mediterranean. On the other hand, the waters of Gök Streamlet, Ören Streamlet and Cehennem Creek, which mix from the west, are very abundant in winter and very low in summer. In summer, their narrow and deep valleys are in shape of dry-grooves.

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### ***Eşen Streamlet***

It is the second largest stream of Muğla Province in the Western Mediterranean basin. Similar to Dalaman in terms of flow regime and basin characteristics, Eşen Streamlet is born from the northwest slopes of Akdağlar and flows in the southwest direction up to Seki Plateau. It merges with numerous small streams originating from Boncuk Mountains from the west and from Akdağlar from the east. Then it reaches Ören by drawing a wide arc from west to southwest. Eşen Stream, which begins to flow southward in a very wide valley after Ören, flows into the Mediterranean on Muğla-Antalya border in Eşen Plain.

Almost all of Eşen Streamlet remains within the province area. Its water is abundant in summer and winter, but it is a little less in summer than Dalaman Streamlet.

### ***Kargıcık Streamlet***

It is a small river flowing into Köyceğiz Lake in the part of Muğla Province that enters the Western Mediterranean basin. The stream rises from the northeast of Köyceğiz-Ağla Village and flows about 17-18 km in the southwest direction and pours into Köyceğiz Lake from Yüksekbuk region.

### ***Namnam Streamlet***



It is the second river that flows into Köyceğiz Lake, which can be considered important. It is born on 5-6 km east of Ula District. It firstly flows from northeast to southwest and then from southwest to southeast and pours into the lake in the region of Günlük-Düveç, on the northwest of Köyceğiz Lake.

### **Greater Menderes Basin**

This basin consists of Greater Menderes River in Southwestern Anatolia, some small streams that directly reach the sea and the basins of several lakes. Its catchment area is approximately 25,000 m<sup>2</sup>. The average annual water volume of the basin is around 4.5 billion m<sup>3</sup>. In Greater Menderes basin, there are 812,000 hectares of plain area. Approximately 590,000 hectares of it is irrigable.

### ***Dipsiz Streamlet***

It is the most important river in Greater Menderes basin of the province. It takes its resources from the southwest slopes of East Menteşe Mountains and the northeastern slopes of West Menteşe Mountains. These branches unite near Yatağan and form Dipsiz Streamlet. Dipsiz Streamlet flowing in the northwest direction and passing through the middle of Yatağan Plain, then turns north and enters Aydın territory and merges with Greater Menderes River. With help of the river, Yatağan Plain is irrigated.

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### **Sarıçay**

Sarıçay, which is a short river, is completely dry in the summer. In winter, it forms marshes and pours into Güllük Bay. In the 1970s, these marshes were transformed into agricultural areas by drying works.

### **Natural Lakes, Ponds and Reservoirs**

#### **Köyceğiz Lake**

This lake which is close to the shore is famous for its natural beauties. It covers an area of 65 km<sup>2</sup> in the south of Köyceğiz. Its depth varies between 1.5-5 m. It is connected to the Mediterranean with a narrow strait. When the sea waters swell, sea water comes to this lake. Excess water is poured into the sea through the canal. There are plenty of fish, especially mullet, in the lake.

#### **Bafa Lake**

28 km<sup>2</sup> of the surface area of Bafa Lake, which is located on the northwestern tip of Milas district, is within the borders of Muğla province and its surface area is 65 km<sup>2</sup>. It is a very rich lake in terms of fish.

#### **Denizcik Lake**

It is a crater lake located on Beçin Plateau in Milas District. Its area is 4 km<sup>2</sup> and its depth is 18-24 m.

#### **Hacat Lake**



It was formed by a streamlet closing the inlet of an old bay in the mouth of Sarıçay near Milas. It is connected to the sea with a narrow strait. The increasing water in the winter flows into the sea with the strait. It is a shallow lake with a maximum depth of 1.5 m. In the lake, which has plenty of fish, a fishpond was established in the strait opening to the sea. The discharge of the lake, which swells in the winter, can be easily observed.

#### **Sülündür Lake**

It is located 10 kilometers southwest of Ortaca District and the surface of the lake is 260 hectares.

#### **Koca Lake**

It is 10 kilometers from Dalaman District and the lake surface is 260 hectares.

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#### IV.1.7. Existing WWTP Effluent Quality

In order to examine the efficiency of the existing Fethiye Wastewater Treatment Plant, 76 analysis results covering the period between 01.03.2018 and 18.02.2019 taken from the plant's effluent within the scope of Fethiye WWTP internal audit were examined. When the results of the analysis are examined, it has been observed that the average effluent quality is well below both the Water Pollution Control Regulation discharge limit values and limit values given in International EHS Guidelines (Table IV-5).

Moreover, when each analysis result was examined one by one, it was observed that all parameters were generally below Project Standards (Figure IV-6 - Figure IV-11).

Table IV-2. Fethiye WWTP Average Effluent Quality Values

Parameter	Unit	Measuring dates	Fethiye WTP	WPCR Limit Value	Project standards
BOD	mg/L	01.03.2018 - 18.02.2019	20.74	50	20
COD	mg/L	01.03.2018 - 18.02.2019	37.42	180	90
SS	mg/L	01.03.2018 - 18.02.2019	12.44	70	25
pH	-	01.03.2018 - 01.11.2018	7.46	6-9	6-9
Total Nitrogen	mg/L	12.11.2018 - 18.02.2019	7.81		10
Total Phosphorus	mg/L	12.11.2018 - 18.02.2019	0.77		1

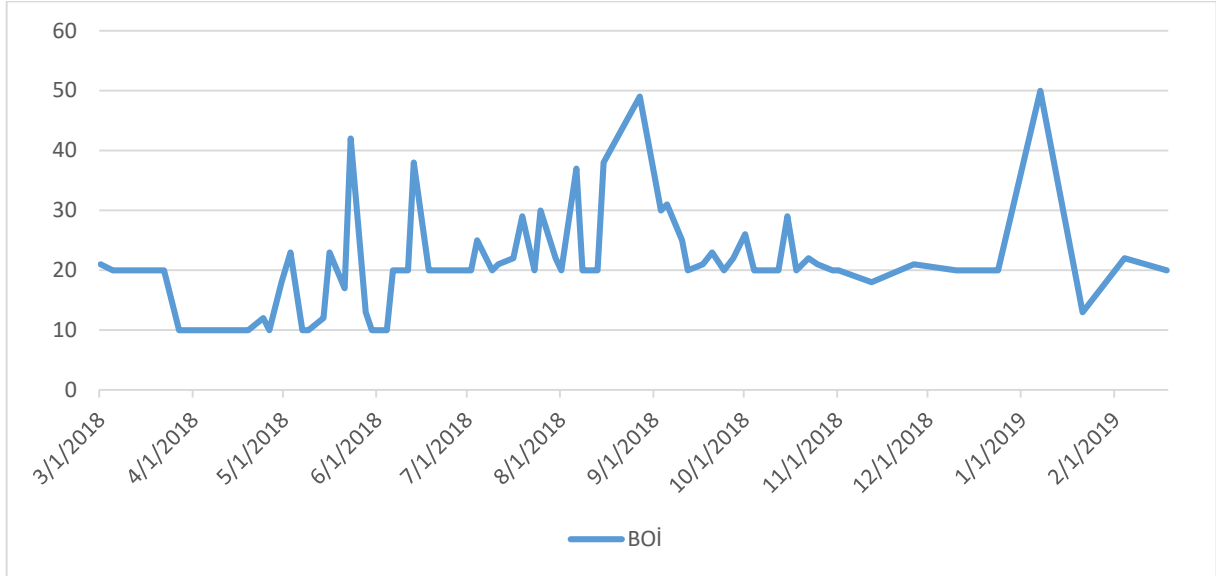


Figure IV-6: Effluent BOD values between 01.03.2018 - 18.02.2019

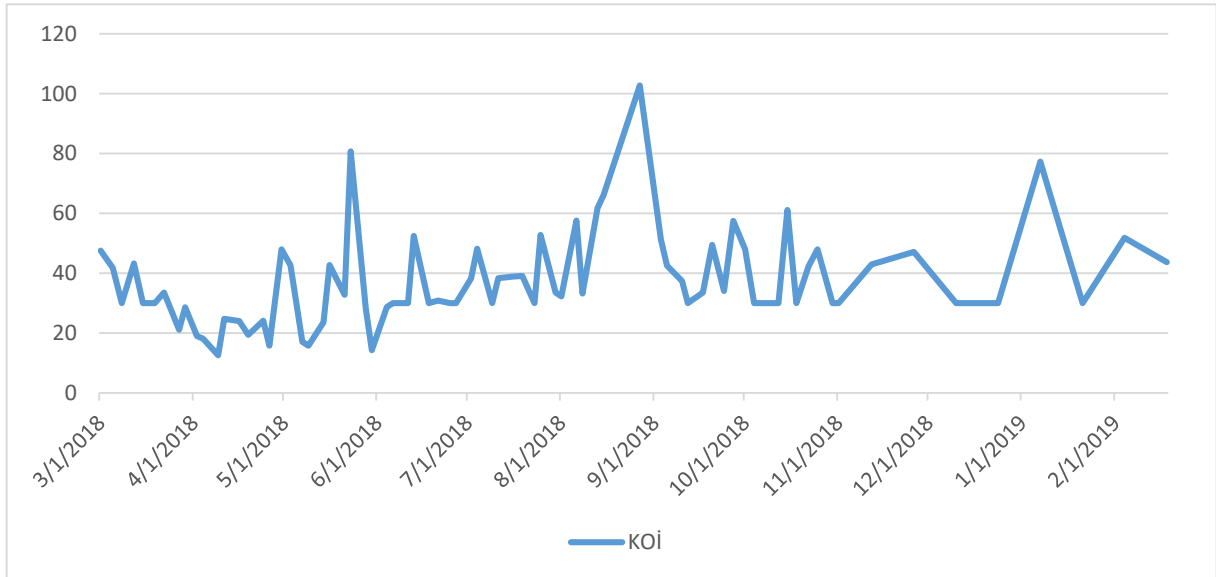


Figure IV-7: Effluent COD values between 01.03.2018 - 18.02.2019

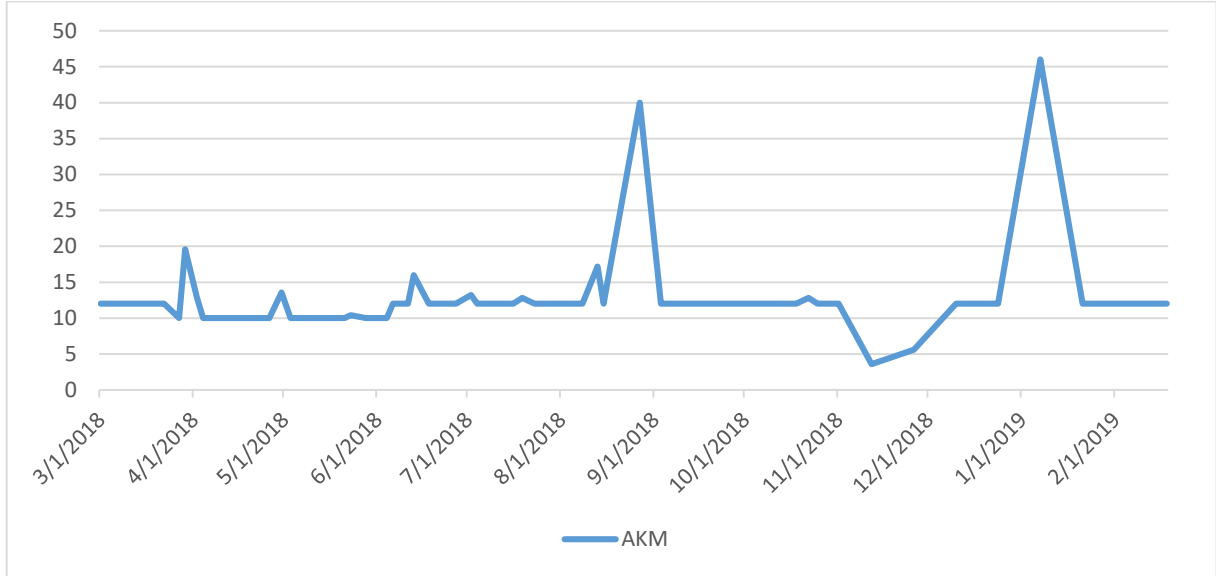


Figure IV-8: Effluent SS values between 01.03.2018 - 18.02.2019

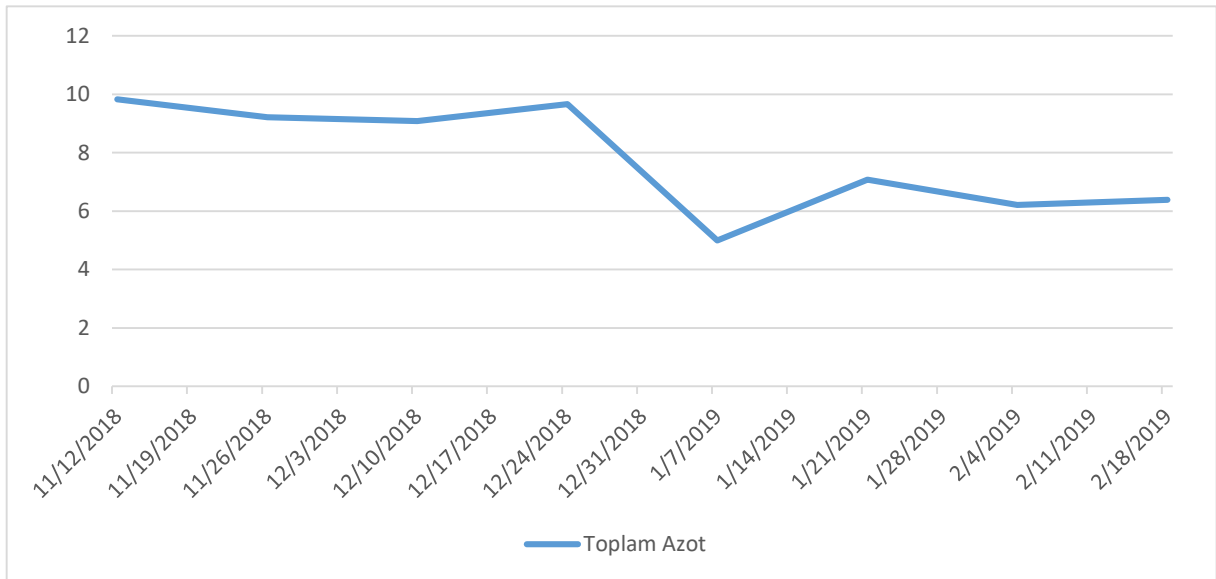


Figure IV-9: Effluent Total Nitrogen values between 12.11.2018 - 18.02.2019



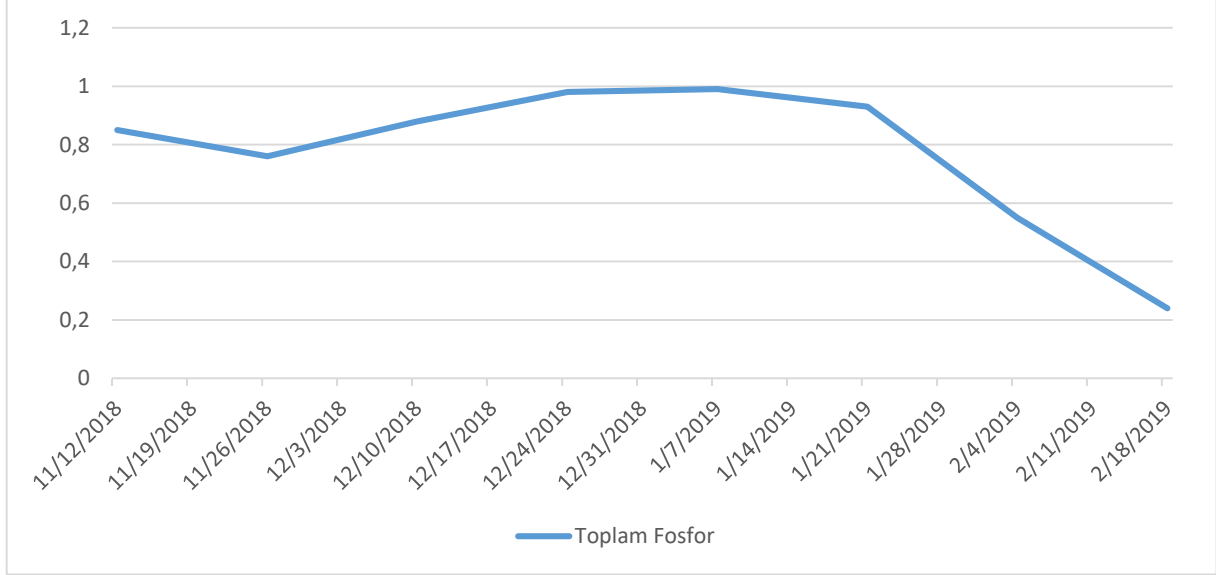


Figure IV-10: Effluent Total Phosphorus values between 12.11.2018 - 18.02.2019

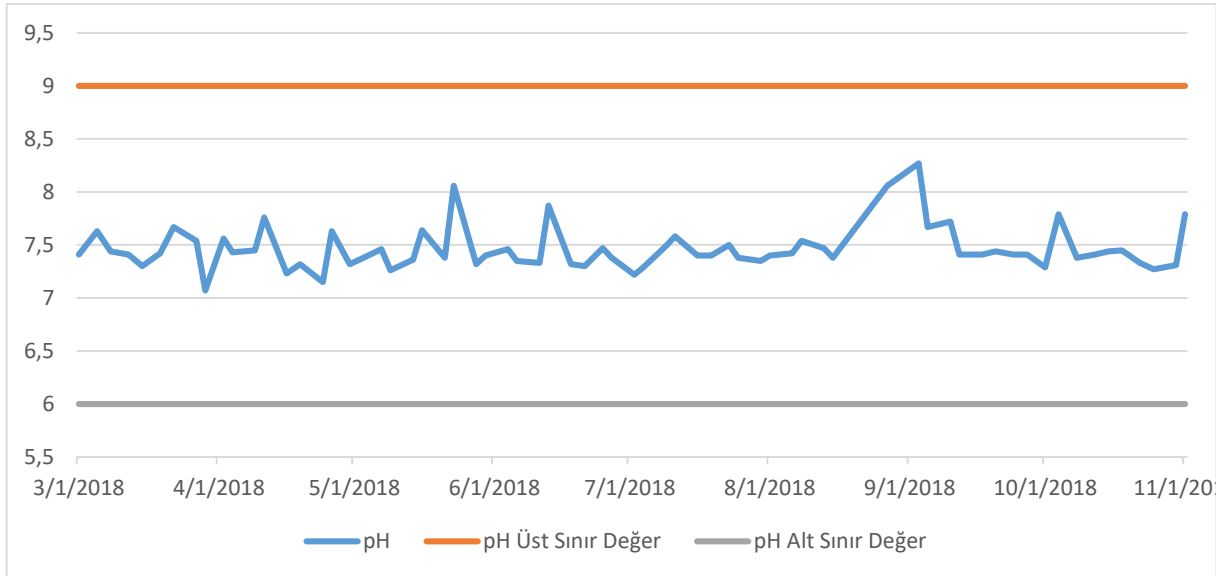


Figure IV-11: Effluent pH values between 01.03.2018 - 01.11.2018

As it can be seen from the above figures, even though the Fethiye WWTP is complying the national legislation, it can have efficiency decreases in January (i.e. 9/1/2018, 1/1/2019). It could possibly be due to the fact that this is the month with heavy rainfalls and snowfalls and possible diffused sources of water pollution like surface runoff have shown its impact. The capacity increase which is planned by the project is considered to eliminate possible unexpected daily load problem.

#### IV.1.8. Characteristics of Receiving Environment

The wastewater to be treated within the scope of the planned project will finally reach to the Aegean Sea via the existing discharge structure (existing channel).

In order to determine the characteristics of the receiving environment, 3 samples were taken from the discharge channel and Aegean Sea on 21.06.2019 by Çınar Çevre Labaratuvarı A.Ş. and water quality determination has been made within the scope of the Groundwater Quality Regulation. Sample points are shown in Figure IV-12.

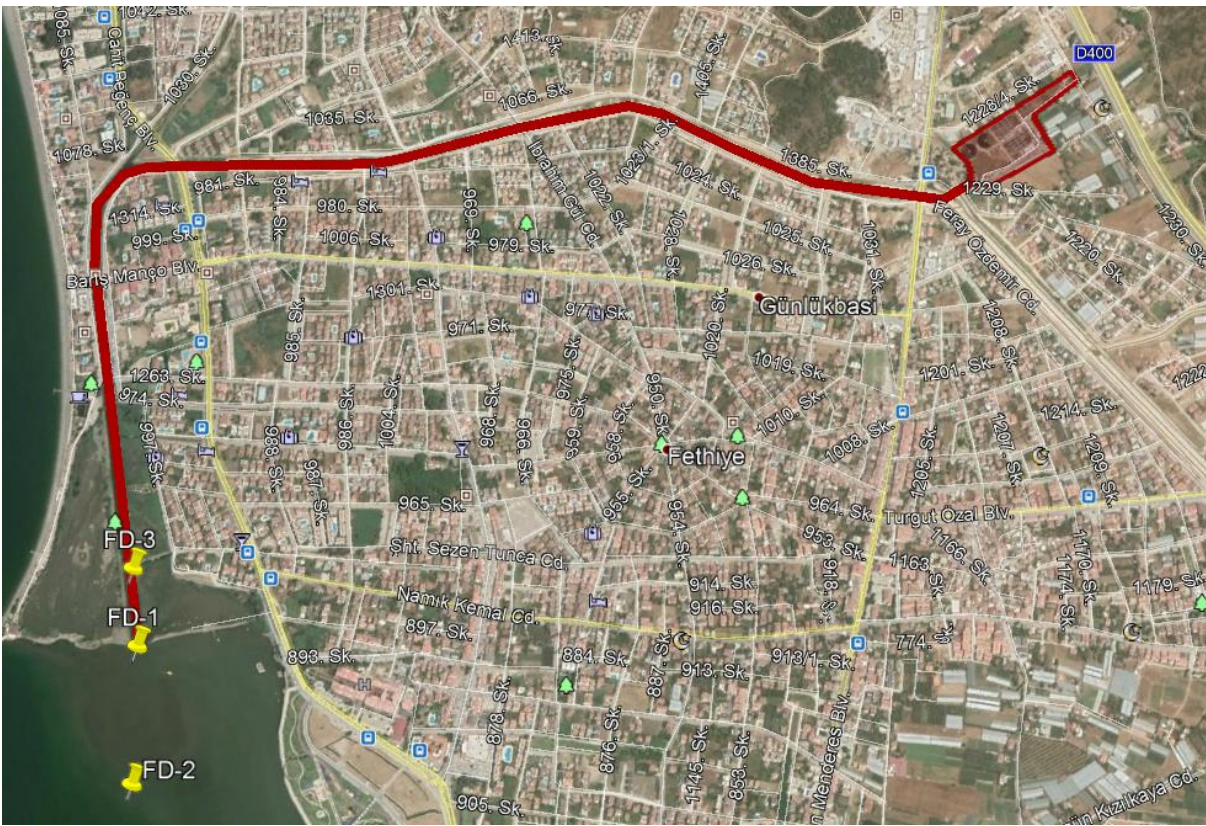


Figure IV-12: Receiving environment water sampling points

Samples taken from the points shown above were assessed within the scope of Groundwater Quality Regulation, Annex-5, Table 2: Quality Criteria of the Continental Surface Water Resources in Terms of General Chemical and Physicochemical Parameters and Table 3: Coastal Waters Receiving Environment Quality Criteria in terms of General Chemical and Physicochemical Parameters and the water quality class was determined (Table IV-3).

In this context, it can be said that except the “Conductivity” parameter, the existing water quality is I. and II. Class, that is, it can be evaluated as drinking and irrigation water standards. On the other hand, the reason for the measurement point being the area where the channel meets sea water may explain the high salinity level. Sea water will take suspended solids and nutrients from the soil, but also can reduce the conductivity of water by accumulating its salts on land.<sup>1</sup> However, it is thought that the effect of sea water has not yet been measured at the measurement points.

Table IV-3. Evaluation of the Receiving Environment under Groundwater Quality Regulation, Annex-5, Table 2

Parameter	Unit	FD-1	FD-2	FD-3
pH	-	8.18	8.32	8.06
Conductivity	µS/cm	49000	54300	19100
Dissolved Oxygen	mg/L	8.7	10.5	7.19
Chemical Oxygen Demand	mg/L	<10	<10	<10
Biological Oxygen Demand	mg/L	<3	<3	<3
Color	Pt -Co	<5	9.43	8.25
Ammonium Nitrogen	mg/L	0.041	<0,016	0.497
Total Kjeldahl Nitrogen	mg/L	0.553	0.601	1.34
Total Nitrogen	mg/L	0.553	0.601	2.46
Sulfur	mg/L	<0,1	<0,1	<0,1
Ortho-Phosphate Phosphorus	mg/L	<0,1	<0,1	<0,1
Nitrate Nitrogen	mg/L	<0,1	<0,1	1.12
Fluoride	mg/L	<0,1	<0,1	<0,1
Total Phosphorus	mg/L	<0,05	<0,05	<0,05
Manga	mg/L	<0,005	<0,005	<0,005
Selenium	mg/L	<0,005	<0,005	<0,005
Oil and Grease	mg/L	<10	<10	<10

I.	Class
II.	Class
III.	Class
IV.	Class

<sup>1</sup><https://www.fondriest.com/environmental-measurements/parameters/water-quality/conductivity-salinity-tds/>



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Table IV-4. Evaluation of the Receiving Environment under Groundwater Quality Regulation, Annex-5, Table 3 (According to Aegean-Mediterranean Sea)

Parameter	Unit	FD-1	FD-2	FD-3
Dissolved Oxygen	mg/L	8.7	10.5	7.19
Total Phosphorus	mg/L	<0,05	<0,05	<0,05
Nitrate Nitrogen	mg/L	<0,1	<0,1	1.12
Oil and Grease	mg/L	<10	<10	<10
Floating Substances	-	Not detected	Not detected	Not detected

I.	Class
II.	Class
III.	Class
IV.	Class



AB-0038-T

3675/19

17.07.2019

**Deney Raporu**  
*Test Report*

<b>Müşterinin Adı/ Adresi</b> <i>Customer Name / Address</i>	:ÇINAR MÜHENDİSLİK MÜŞAVİRLİK A.Ş./Bağlıca Mah. Çambayın Cad. Çınar Plaza No:88/5 Etimesgut/Ankara
<b>Numunenin Adı ve Örnekleme Tarihi</b> <i>Name And Sampling Date of the Sample</i>	:S26893 - Deniz Suyu - 20.06.2019
<b>Numunenin Alındığı Yer</b> <i>Sampling Location</i>	:FD-1 NOKTASI
<b>Numuneyi Alan Kuruluş</b> <i>Sampled by</i>	:Çınar Çevre Laboratuvarı A.Ş.(Mert Lapaloğlu-Yasin Mergen)
<b>Proje No</b> <i>Project Number</i>	:P 8310 - Fethiye Atık Su Arıtma Tesisi Projesi :21.06.2019
<b>Numunenin Kabul Tarihi</b> <i>Date of Sample Acceptance</i>	:21.06.2019
<b>Numunenin Teslim Koşulları</b> <i>Delivery Conditions of the Sample</i>	:Numune, TS EN 5667-3 – Su Kalitesi – Numune Alma – Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları standardında belirtilen sürede ve mühürlü (Mühür No: CNR 011515) olarak teslim edilmiştir.
<b>Numunenin Alınış Şekli ve Amacı</b> <i>Way and Aim the Sampling</i>	:ANLIK ve KONTROL AMAÇLI alınmıştır.
<b>Numune Alım Standardı</b> <i>Standard of Sampling</i>	:TS ISO 5667-9
<b>Deney Kapsamı</b> <i>Scope of Analysis</i>	:pH ,İletkenlik ,Çözünmüş Oksijen ,Kimyasal Oksijen İhtiyacı ,Biyolojik Oksijen İhtiyacı ,Yüzer Maddeler ,Renk ,Amonyum Azotu ,Toplam Kjeldahl Azotu ,Toplam Azot ,Sülfür ,Fosfat Fosforu ,Nitrat Azotu ,Florür ,Toplam Fosfor ,Mangan ,Selenyum ,Yağ ve Gres parametrelerinin analizi
<b>Deneyin Başlama/Bitiş Tarihi</b> <i>Start of the Test/ Finish of the Test</i>	:21.06.2019 - 05.07.2019
<b>Açıklamalar</b> <i>Remarks</i>	:FD-1 Noktası
<b>Raporun Sayfa Sayısı</b> <i>Number of the Pages of the Report</i>	:2
<b>Koordinatlar</b> <i>Coordinates</i>	:36.652695 / 29.113812
<b>Meteorolojik Koşullar</b> <i>Meteorological Conditions</i>	:Hava: AÇIK / Sıcaklık:30°C
Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney/ölçüm metotları bu raporun ilgili kısımlarında verilmiştir. The testing and / or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given in the related part of this report.	

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Ölçüm Belirsizliği Uncertainties	Analiz Metodu Test Method
pH	-	8,18	± 0,07	SM 4500 H <sup>+</sup> B
İletkenlik	µS/cm	49000	% ± 3,13	TS 9748 EN 27888
Çözünmüş Oksijen	mg/L	8,70	% ± 1,23	ASTM D 888-05
*Kimyasal Oksijen İhtiyacı	mg/L	<10	% ± 24,97	SM 5220 B
Biyolojik Oksijen İhtiyacı	mg/L	<3	% ± 31,0	SM 5210 B
*Yüzer Maddeler	-	Yüzer madde gözlenmemiştir.	-	İşletme İçerisi Metod Ta.186
Renk	Pt-Co	<5	% ± 23,2	SM 2120 C

Bu rapor Çınar Çevre Laboratuvarı A.Ş.'nin yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız, mühürlü raporlar geçersizdir.  
This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature are not valid.  
Rp.281 / Rev.04 -15.02.17/02.06.2019 Sayfa 1 / 2

Figure IV-13: FD-1 Point Analysis Results 1/2

Deney Raporu  
Test Report

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Ölçüm Belirsizliği Uncertainties	Analiz Metodu Test Method
Amonyum Azotu	mg/L	0,041	% ± 25,3	SM 4500 NH <sub>3</sub> F
Toplam Kjeldahl Azotu	mg/L	0,553	% ± 26,0	SM 4500 N <sub>org</sub> B
Toplam Azot	mg/L	0,553	-	SM 4500 N <sub>org</sub> B, SM 4110 B
*Sülfür	mg/L	<0,1	% ± 13,0	SM 4500 S <sup>2</sup> D
*Fosfat Fosforu	mg/L	<0,1	% ± 14,2	SM 4110 B
*Nitrat Azotu	mg/L	<0,1	% ± 15,6	
*Florür	mg/L	<0,1	% ± 10,5	
Toplam Fosfor	mg/L	<0,05	% ± 7,50	SM 4500 P B E
*Mangan	mg/L	<0,005	% ± 37,5	ISO 15587
*Selenyum	mg/L	<0,005	% ± 37,0	TS EN ISO 17294-1,2
Yağ ve Gres	mg/L	<10	% ± 27,9	SM 5520 D

\*İşaretili parametreler TÜRKAK Akreditasyon Belgesi kapsamı dışında olup standartlarına uygun gerçekleştirilmiştir.

<p>Raporu Kontrol Eden Checked by</p> <p>Damla ÇOLAK Kimyager/Lab.Kalite Yöneticisi</p>	<p>Raporu Onaylayan Approved by</p> <p>Egemen ÖZMEN Çevre Yök.Müh./Laboratuvar Müdürü</p>
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Bu analiz raporu laboratuvara gelen numuneyi temsil eder.  
This analysis report represents the sample accepted by the laboratory.  
Deney laboratuvarı olarak faaliyet gösteren ÇINAR ÇEVRE LABORATUVARI A.Ş., TÜRKAK'tan AB-0038-T TS EN ISO IEC 17025 standardına göre akredite edilmiştir.  
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The testing 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.

Numuneler 30 gün süre ile TS EN ISO 5667-3 – Su Kalitesi – Numune Alma – Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları çerçevesinde saklanır. Bu süre içerisinde kimyasal, mikrobiyolojik ve fiziksel açıdan bozulan veya tehlike arz eden numuneler, numune saklama süresinin bitimi beklemeden imha edilir.  
The samples are stored for 30 days in accordance with TS EN ISO 5667-3 - Water Quality - Sampling - Part 3: Conservation and Transport Rules of Samples. Samples that are chemically, microbiologically and physically disruptive or dangerous during this time shall be destroyed without waiting for the end of the sample storage period.

Bu rapor Çınar Çevre Laboratuvarı A.Ş.'nin yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız, mühürlü raporlar geçersizdir.  
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Figure IV-14: FD-1 Point Analysis Results 2/2

Deney Raporu  
Test Report

<b>Müşterinin Adı/ Adresi</b> <i>Customer Name / Address</i>	:ÇINAR MÜHENDİSLİK MÜŞAVİRLİK A.Ş./Bağlıca Mah. Çambayırı Cad. Çınar Plaza No:66/5 Etimesgut/Ankara
<b>Numunenin Adı ve Örnekleme Tarihi</b> <i>Name And Sampling Date of the Sample</i>	:S26694 - Deniz Suyu - 20.06.2019
<b>Numunenin Alındığı Yer</b> <i>Sampling Location</i>	:FD-2 NOKTASI
<b>Numuneyi Alan Kuruluş</b> <i>Sampled by</i>	:Çınar Çevre Laboratuvarı A.Ş.(Mert Lapaloğlu-Yasin Mergen)
<b>Proje No</b> <i>Project Number</i>	:P 8310 - Fethiye Atık Su Arıtma Tesisi Projesi :21.06.2019
<b>Numunenin Kabul Tarihi</b> <i>Date of Sample Acceptance</i>	:21.06.2019
<b>Numunenin Teslim Koşulları</b> <i>Delivery Conditions of the Sample</i>	:Numune, TS EN 5867-3 – Su Kalitesi – Numune Alma – Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları standardında belirtilen sürede ve mühürlü (Mühür No: CNR 011512) olarak teslim edilmiştir.
<b>Numunenin Alınış Şekli ve Amacı</b> <i>Way and Aim the Sampling</i>	:ANLIK ve KONTROL AMAÇLI alınmıştır.
<b>Numune Alın Standardı</b> <i>Standard of Sampling</i>	:TS ISO 5687-9
<b>Deney Kapsamı</b> <i>Scope of Analysis</i>	:pH ,İletkenlik ,Çözünmüş Oksijen ,Kimyasal Oksijen İhtiyacı ,Biyolojik Oksijen İhtiyacı ,Yüzer Maddeler ,Renk ,Amonyum Azotu ,Toplam Kjeldahl Azotu , Toplam Azot ,Sülfür ,Fosfat Fosforu ,Nitrat Azotu ,Florür ,Toplam Fosfor ,Mangan ,Selenyum ,Yağ ve Gres parametrelerinin analizi
<b>Deneyin Başlama/Bitiş Tarihi</b> <i>Start of the Test/ Finish of the Test</i>	:21.06.2019 - 05.07.2019
<b>Açıklamalar</b> <i>Remarks</i>	:FD-2 Noktası
<b>Raporun Sayfa Sayısı</b> <i>Number of the Pages of the Report</i>	:2
<b>Koordinatlar</b> <i>Coordinates</i>	:36.649643 / 29.114870
<b>Meteorolojik Koşullar</b> <i>Meteorological Conditions</i>	:Hava: AÇIK / Sıcaklık:30°C
Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney/ölçüm metodları bu raporun ilgili kısımlarında verilmiştir. The testing and / or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given in the related part of this report.	

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Ölçüm Belirsizliği Uncertainties	Analiz Metodu Test Method
pH	-	8,32	± 0,07	SM 4500 H'B
İletkenlik	µS/cm	54300	% ± 3,13	TS 9748 EN 27888
Çözünmüş Oksijen	mg/L	10,5	% ± 1,23	ASTM D 888-05
*Kimyasal Oksijen İhtiyacı	mg/L	<10	% ± 24,97	SM 5220 B
Biyolojik Oksijen İhtiyacı	mg/L	<3	% ± 31,0	SM 5210 B
*Yüzer Maddeler	-	Yüzer madde gözlemlenmemiştir.	-	İşletme İçeriği Metod Ta.166
Renk	Pt-Co	9,43	% ± 23,2	SM 2120 C

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Figure IV-15: FD-2 Point Analysis Results 1/2

Deney Raporu  
Test Report

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Ölçüm Belirsizliği Uncertainties	Analiz Metodu Test Method
Amonyum Azotu	mg/L	<0,016	% ± 25,3	SM 4500 NH <sub>3</sub> F
Toplam Kjeldahl Azotu	mg/L	0,601	% ± 26,0	SM 4500 N <sub>org</sub> B
Toplam Azot	mg/L	0,601	-	SM 4500 N <sub>org</sub> B, SM 4110 B
*Sülfür	mg/L	<0,1	% ± 13,0	SM 4500 S <sup>2-</sup> D
*Fosfat Fosforu	mg/L	<0,1	% ± 14,2	SM 4110 B
*Nitrat Azotu	mg/L	<0,1	% ± 15,6	
*Florür	mg/L	<0,1	% ± 10,5	
Toplam Fosfor	mg/L	<0,05	% ± 7,50	SM 4500 P B E
*Mangan	mg/L	<0,005	% ± 37,5	ISO 15587
*Selenyum	mg/L	<0,005	% ± 37,0	TS EN ISO 17294-1,2
Yağ ve Gres	mg/L	<10	% ± 27,9	SM 5520 D

\*İşaretli parametreler TÜRKAK Akreditasyon Belgesi kapsamı dışında olup standartlarına uygun gerçekleştirilmiştir.

Raporu Kontrol Eden  
Checked by

Damla ÇOLAK  
Kimyager/Lab.Kalite Yöneticisi

Raporu Onaylayan  
Approved by

Egemen ÖZMEN  
Çevre Yük.Müh./Laboratuvar Müdürü

Bu analiz raporu laboratuvara gelen numuneyi temsil eder.

This analysis report represents the sample accepted by the laboratory

Deney laboratuvarı olarak faaliyet gösteren ÇINAR ÇEVRE LABORATUVARI A.Ş., TÜRKAK'tan AB-0038-T TS EN ISO IEC 17025 standardına göre akredite edilmiştir.

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Deney ve / veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

The testing 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.

Numuneler 30 gün süre ile TS EN ISO 5667-3 - Su Kalitesi - Numune Alma - Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları çerçevesinde saklanır. Bu süre içerisinde kimyasal, mikrobiyolojik ve fiziksel açıdan bozulan veya tehlike arz eden numuneler, numune saklama süresinin bitimi beklemeden imha edilir.

The samples are stored for 30 days in accordance with TS EN ISO 5667-3 - Water Quality - Sampling - Part 3: Conservation and Transport Rules of Samples. Samples that are chemically, microbiologically and physically disruptive or dangerous during this time shall be destroyed without waiting for the end of the sample storage period.



Deney Raporu  
Test Report

<b>Müşterinin Adı/ Adresi</b> <i>Customer Name / Address</i>	:ÇINAR MÜHENDİSLİK MÜŞAVİRLİK A.Ş./Bağlıca Mah. Çambayın Cad. Çınar Plaza No:06/5 Etimesgut/Ankara
<b>Numunenin Adı ve Örnekleme Tarihi</b> <i>Name And Sampling Date of the Sample</i>	:S26695 - Deniz Suyu - 20.06.2019
<b>Numunenin Alındığı Yer</b> <i>Sampling Location</i>	:FD-3 NOKTASI
<b>Numuneyi Alan Kuruluş</b> <i>Sampled by</i>	:Çınar Çevre Laboratuvarı A.Ş.(Mert Laptaoğlu-Yasin Mergen)
<b>Proje No</b> <i>Project Number</i>	:P 8310 - Fethiye Atık Su Arıtma Tesisi Projesi :21.06.2019
<b>Numunenin Kabul Tarihi</b> <i>Date of Sample Acceptance</i>	:21.06.2019
<b>Numunenin Teslim Koşulları</b> <i>Delivery Conditions of the Sample</i>	:Numune, TS EN 5867-3 – Su Kalitesi – Numune Alma – Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları standardında belirtilen sürede ve mühürlü (Mühür No: CNR D11509) olarak teslim edilmiştir.
<b>Numunenin Alınış Şekli ve Amacı</b> <i>Way and Aim the Sampling</i>	:ANLIK ve KONTROL AMAÇLI alınmıştır.
<b>Numune Alım Standardı</b> <i>Standard of Sampling</i>	:TS ISO 5667-9
<b>Deney Kapsamı</b> <i>Scope of Analysis</i>	:pH ,İletkenlik ,Çözünmüş Oksijen ,Kimyasal Oksijen İhtiyacı ,Biyolojik Oksijen İhtiyacı ,Yüzer Maddeler ,Renk ,Amonyum Azotu ,Toplam Kjeldahl Azotu ,Toplam Azot ,Sülfür ,Fosfat Fosforu ,Nitrat Azotu ,Florür ,Toplam Fosfor ,Mangan ,Selenyum ,Yağ ve Gres parametrelerinin analizi
<b>Deneyin Başlama/Bitiş Tarihi</b> <i>Start of the Test/ Finish of the Test</i>	:21.06.2019 - 05.07.2019
<b>Açıklamalar</b> <i>Remarks</i>	:FD-3 Noktası
<b>Raporun Sayfa Sayısı</b> <i>Number of the Pages of the Report</i>	:2
<b>Koordinatlar</b> <i>Coordinates</i>	:36.653920 / 29.113288
<b>Meteorolojik Koşullar</b> <i>Meteorological Conditions</i>	:Hava: AÇIK / Sıcaklık:30°C

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney/ölçüm metotları bu raporun ilgili kısımlarında verilmiştir.  
The testing and / or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given in the related part of this report.

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Ölçüm Belirsizliği Uncertainties	Analiz Metodu Test Method
pH	-	8,06	± 0,07	SM 4500 H'B
İletkenlik	µS/cm	19100	% ± 3,13	TS 9748 EN 27888
Çözünmüş Oksijen	mg/L	7,19	% ± 1,23	ASTM D 888-05
*Kimyasal Oksijen İhtiyacı	mg/L	<10	% ± 24,97	SM 5220 B
Biyolojik Oksijen İhtiyacı	mg/L	<3	% ± 31,0	SM 5210 B
*Yüzer Maddeler	-	Yüzer madde gözlenmemiştir.	-	İşletme İçi Metod Ta.168
Renk	Pt-Co	8,25	% ± 23,2	SM 2120 C

Bu rapor Çınar Çevre Laboratuvarı A.Ş.'nin yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız, mühürlü raporlar geçerlidir.  
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Figure IV-17: FD-3 Point Analysis Results 1/2



**Deney Raporu**  
*Test Report*



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TS EN ISO/IEC 17025  
AB-0038-T

AB-0038-T

3677/19

17.07.2019

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Ölçüm Belirsizliği Uncertainties	Analiz Metodu Test Method
Amonyum Azotu	mg/L	0,497	% ± 25,3	SM 4500 NH <sub>3</sub> F
Toplam Kjeldahl Azotu	mg/L	1,340	% ± 26,0	SM 4500 N <sub>org</sub> B
Toplam Azot	mg/L	2,46	-	SM 4500 N <sub>org</sub> B, SM 4110 B
*Sülfür	mg/L	<0,1	% ± 13,0	SM 4500 S <sup>-2</sup> D
*Fosfat Fosforu	mg/L	<0,1	% ± 14,2	SM 4110 B
*Nitrat Azotu	mg/L	1,12	% ± 15,6	
*Florür	mg/L	<0,1	% ± 10,5	
Toplam Fosfor	mg/L	<0,05	% ± 7,50	SM 4500 P B E
*Mangan	mg/L	<0,005	% ± 37,5	ISO 15587
*Selenyum	mg/L	<0,005	% ± 37,0	TS EN ISO 17294-1,2
Yağ ve Gres	mg/L	<10	% ± 27,9	SM 5520 D

\*İşaretili parametreler TÜRKAK Akreditasyon Belgesi kapsamı dışında olup standartlarına uygun gerçekleştirilmiştir.

Raporu Kontrol Eden  
*Checked by*

Damla ÇOLAK  
Kimyager/Lab.Kalite Yöneticisi

Raporu Onaylayan  
*Approved by*

Egemen ÖZMEN  
Çevre Yük.Müh./Laboratuvar Müdürü

Bu analiz raporu laboratuvara gelen numuneyi temsil eder.

*This analysis report represents the sample accepted by the laboratory*

Deney laboratuvarı olarak faaliyet gösteren ÇINAR ÇEVRE LABORATUVARI A.Ş., TÜRKAK'tan AB-0038-T TS EN ISO IEC 17025 standardına göre akredite edilmiştir.

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*The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and the International Laboratory Accreditation (ILAC) for the Mutual recognition of test reports.*

Deney ve / veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

*The testing 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.*

Numuneler 30 gün süre ile TS EN ISO 5667-3 - Su Kalitesi - Numune Alma - Bölüm 3: Numunelerin Muhafaza ve Taşıma Kuralları çerçevesinde saklanır. Bu süre içerisinde kimyasal, mikrobiyolojik ve fiziksel açıdan bozulan veya tehlike arz eden numuneler, numune saklama süresinin bitimi beklemeden imha edilir.



*The samples are stored for 30 days in accordance with TS EN ISO 5667-3 - Water Quality - Sampling - Part 3: Conservation and Transport Rules of Samples. Samples that are chemically, microbiologically and physically disruptive or dangerous during this time shall be destroyed without waiting for the end of the sample storage period.*

Bu rapor Çınar Çevre Laboratuvarı A.Ş.'nin yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız, mührsüz raporlar geçersizdir.  
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Bölge Mah. Çarşıbaşı Cad. No:66-1 Etiler/Beşiktaş/İSTANBUL/TÜRKİYE  
Tel: 0 312 472 77 97 Fax: 0 312 472 54 53 Ofis GSM: 0 530 326 40 08  
web: [www.cinargm.com.tr](http://www.cinargm.com.tr), mail: [info@cinargm.com.tr](mailto:info@cinargm.com.tr)

**Bu Rapor Çevre Mevzuatlarına İlişkin Resmi İşlemlerde Kullanılamaz.**

Figure IV-18: FD-3 Point Analysis Results 2/2

	<p><b>FETHİYE ADVANCED BIOLOGICAL WASTE WATER TREATMENT PLANT 2ND STAGE UNITS APPLICATION PROJECT</b></p> <p><b>ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT</b></p>	
<p><b>REPORT NO: CNR-MGL-ESIA-001 Rev-01</b></p>	<p><b>Page 106</b></p>	

#### **IV.1.9. Protected Areas**



The World Association for Protection of Nature (IUCN), which is one of the most effective institutions in the world on the concept of protected area, has developed a global definition that has been agreed upon to eliminate confusion.

According to the definition of IUCN for the year 1994: The protected areas are terrestrial and/or marine areas, which serve to ensure the continuity and protection of biological diversity, natural and related cultural resources, and are managed by legal or other effective means.

According to the updated definition of IUCN for the year 2008: Protected areas are the areas that are clearly defined, devoted and managed by legal or other effective methods, with clearly defined geographical boundaries for the long-term protection of nature and associated ecosystem services services and cultural values.

Studies and world conservation experiences show that the protected areas have many economic, ecological, cultural and social benefits. These benefits can be summarized as follows:

- 1- They are safe shelters for plant and animal species whose habitats are under threat. 80% of the species in the IUCN red list are in protected areas.
- 2- They protect and support the habitats that host many main food sources (plants, fish and medicinal plants).
- 3- They contribute to the protection of cultural, architectural and traditional lives.
- 4- They are drinking water sources. Recent studies have been made in 105 major cities of the world (New York, Beijing, Los Angeles, Istanbul, etc.) It shows that 33 of them provide drinking water resources from protected areas. In Peru, about 2.7 million people use water from 16 protected areas. Its annual value is 81 million USD. The cost of water management/balancing services provided by the meadows in New Zealand Te Papanul Conservation Park (22,000 ha) was calculated as US \$ 95 million.
- 5- They are one of the most important tools to fight poverty by providing economic support and job opportunities. In recent years, they have become one of the important tools in the fight against poverty by offering economic opportunities to local people living in and around protected areas in many different sectors. For example, the Maya Biosphere Reserve in Guatemala has an annual income of 47 million USD and employs 7,000 people. The field guidance applications implemented in national parks in Turkey is a good example too.
- 6- They reduce the effects of natural disasters by creating barriers and buffer zones against storm, flood and drought.
- 7- They are sample places where the most successful examples of sustainable development are applied.

	<p>FETHİYE ADVANCED BIOLOGICAL WASTE WATER TREATMENT PLANT 2ND STAGE UNITS APPLICATION PROJECT</p> <p>ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT</p>	
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8- They offer the best management models and examples with participatory decision-making and management approach.

9- They are places that offer resting opportunities. Protected areas offer you many possibilities to be alone with nature or to do sports.



10- They are important tools in the resolution of conflicts. In particular, conflicts from the past have been forgotten for the management of many protected areas. Cross-border protected areas, parks for peace, etc.

Turkey has a rich biological diversity as well as historical and social aspects since it is a bridge and junction point of the Earth with three of 37 different plant geographical regions (Europe-Siberian, Mediterranean and Iran-Turan). In addition, three of the 34 rich biodiversity hotspots in urgent need to be taken under protection in the world (the Caucasus, the Mediterranean, Irano-Anatolian) are located in Turkey. With this feature, Turkey, along with China and South Africa, is one of the three hotspots within the borders of the three countries hosting is one of the most important countries in terms of biodiversity and endemic species in their generation.

The biodiversity values hosted by our country are under protection with different conservation area statuses and different laws. Some of these protection statuses were created according to national legislation and some based on international conventions.

With the work performed within the Project "Turkey's Protected Areas Information System" in the year 2012 by the National Parks General Directorate of Nature Conservation, the size of our country's terrestrial protected area has been identified as 5 million 647 thousand 568 hectares. The ratio of this area to the country's surface area is 7.24%. In this case, it can be said that 7.24% of Turkey's land area is under official protection.

The areas protected by legal legislation in our country are National Parks, Nature Conservation Areas, Wildlife Development Areas, Wild Animal Settlement Areas, Nature Parks, Nature Monuments, Ramsar Areas and Special Environmental Protection Areas. In our country, there are important areas such as Important Plant Areas (ÖBA), Important Bird Areas (IBA), Important Nature Areas (KBA), etc., which have not been protected by legal regulations in our country but determined as a result of the works of non-governmental organizations and associations with nature protection strategies. In this report, areas that are not protected by legal legislation but important in terms of the species they host (ÖBA, IBA, KBA, etc.) were also evaluated along with the areas protected by legal legislation and a complementary study was carried out on behalf of "Nature Conservation".

	<b>FETHİYE ADVANCED BIOLOGICAL WASTE WATER TREATMENT PLANT 2ND STAGE UNITS APPLICATION PROJECT</b> <b>ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT</b>	
<b>REPORT NO: CNR-MGL-ESIA-001 Rev-01</b>	<b>Page 108</b>	

The project area is not located within any National Parks, Nature Conservation Areas, Wildlife Development Areas, Wild Animal Settlement Areas, Nature Parks, Nature Monuments and Ramsar Areas. On the other hand, the project area is located in Fethiye Göcek Special Environmental Protection Area. One of the breeding areas of *Caretta caretta*, and *Chelonia mydas* species, which is protected by the Bern Convention and CITES, is Fethiye Beach. The Liquidambar orientalis (Log tree) forests, which grow in Fethiye-Göcek SEPA creeks, deltas and high groundwater, are among the endemic species.

No significant impact is expected if the mitigations measures described for biodiversity and protected areas especially the discharge limits.



According to the Google Earth Application, the protected areas within the project area are given in Figure IV-19, and Special Environmental Protection Areas in Figure IV-20. The air distances to protected areas of the project area are shown in Table IV-5. In addition, the project area is not included in Important Plant Areas (ÖBA), Important Bird Areas (IBA) and Important Nature Areas (KBA), which are areas that are not protected by legal legislation (see Figure IV-20).

Turkey is in a position that can be considered rich compared to European and Middle Eastern countries in terms of wetlands. It became a party to Ramsar Convention as a first step to protect the wealth and Turkey has taken its place in the international arena.

The only legal regulation directing the protection of wetlands in our country is the "Regulation on the Protection of Wetlands", which was published in 2002 and revised in 2005 and 2010. According to the regulation, all relevant groups have the responsibility to contribute and support in the protection of wetlands. Besides Turkey, the world prepared the National Wetland Strategy is one of the rare countries.

The legislation envisaging the protection of wetlands in our country is based on the following legal regulations:

- RAMSAR Agreement
- Law No. 4856 on the Establishment and Organization of the Ministry of Environment and Forestry
- Land Hunting Law No. 4915
- Environmental Law No. 2872 (Amended by Law No. 5491)
- Regulation on Protection of Wetlands
- 1993/1 Prime Ministry Circular
- 2. Wetlands Communiqué (Official Gazette dated 05.04.1995 and numbered 22249)
- 3. Wetlands Communiqué (Official Gazette dated 15.04.1998 and numbered 23314)

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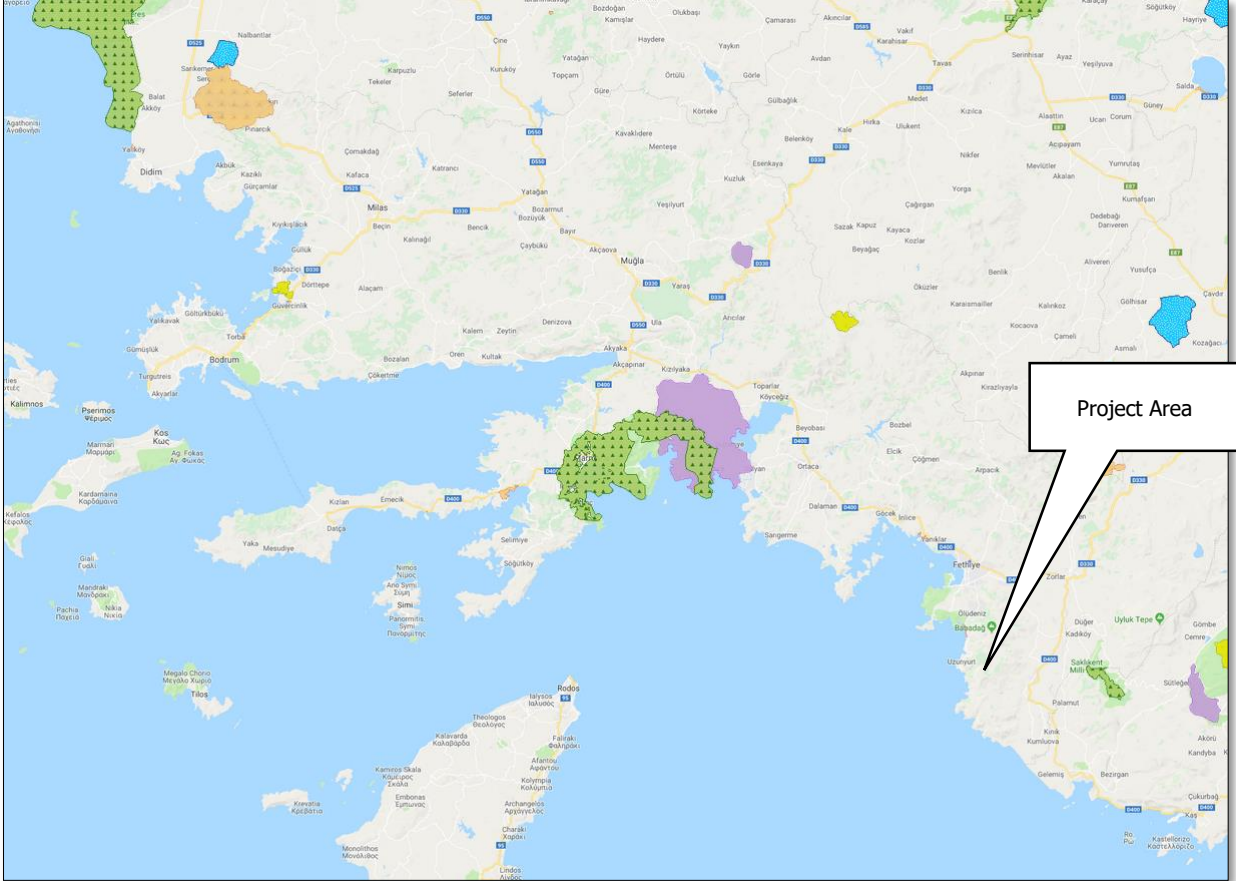
- 5. Wetlands Communiqué (Official Gazette dated 20.06.2009 and numbered 27264)
- 6. Wetlands Communiqué (Official Gazette dated 31.01.2013 and numbered 28545)

According to the regulation, the definition of wetland; Wetland: (Amended: 04.04.2014 / 28962 O.G.) Areas that are ecologically considered as wetlands covering natural or artificial, continuous or temporary, still or flowing waters, sweet, bitter or salty, swamps, reeds and turbines, which are important for living things, especially waterfowl, that cover depths not exceeding six meters in the tidal movement of the seas from the coastal border line towards the land side. In this context, the project site does not remain in the wetlands. The closest wetlands to the project area are Küçük Menderes Delta, Büyük Menderes Delta and Bafa Lake, and no impact is expected on these areas.

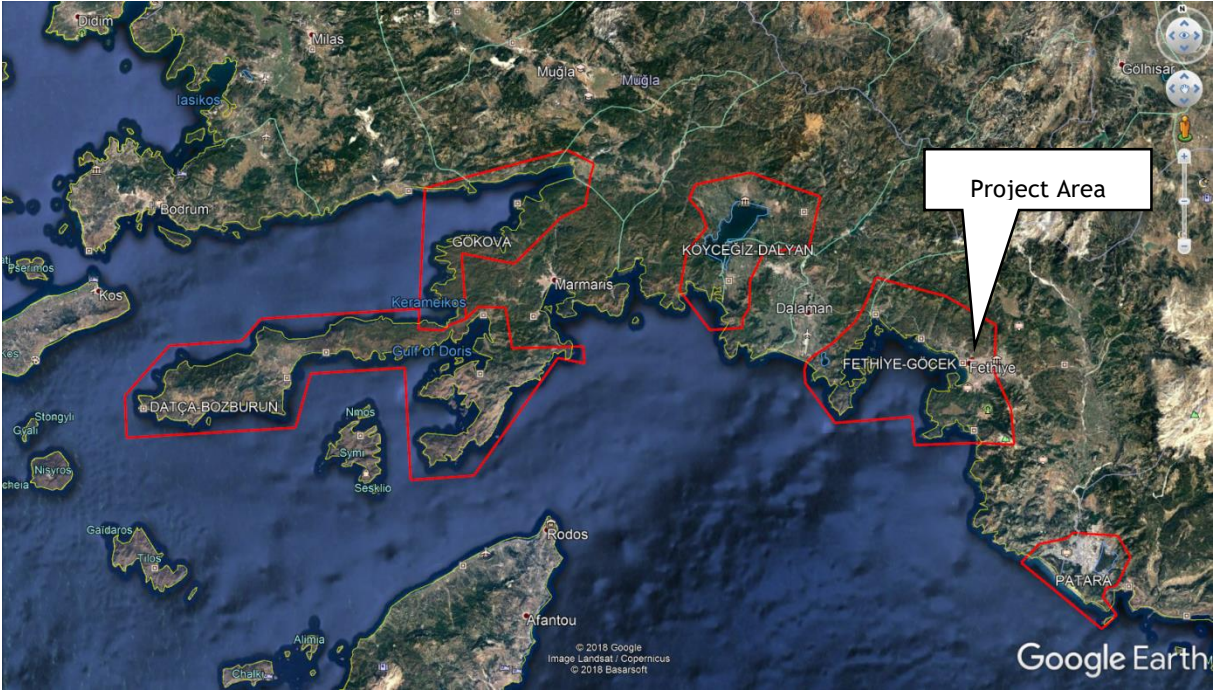
**Table IV-5. Distance of the Project Area to Protected Areas**

Protected Area	Distance to Project Area*
Marmaris National Park	56.4 km
Lake Bafa Nature Park	168.1 km
Küçük Kargı Nature Park	11.5 km
Ömer Eşen Nature Park	11.8 km
Katrancı Bay Nature Park	10.6 km
Ölüdeniz Kıdrak Nature Park	13.3 km
Güvercinlik Nature Park	147.7 km
Usuluk Bay Nature Park	154.5 km
Kovanlık Nature Park	111.4 km
İnbükü Nature Park	94.2 km
Çubucak Natural Park	93.4 km
Kartal Lake Nature Protection Area	53.3 km
Sırtlandağı Halep Çamı Nature Protection Area	148.3 km
Köyceğiz Wildlife Development Area	48.1 km
Yılanlı Çakmak Wildlife Development Area	74.8 km
Fethiye Göcek Special Environmental Protection Area	<b>Inside the area</b>
Köyceğiz Dalyan Special Environmental Protection Area	36.8 km
Gökova Special Environmental Protection Area	77.9 km
Datça Bozburun Special Environmental Protection Area	105.1 km

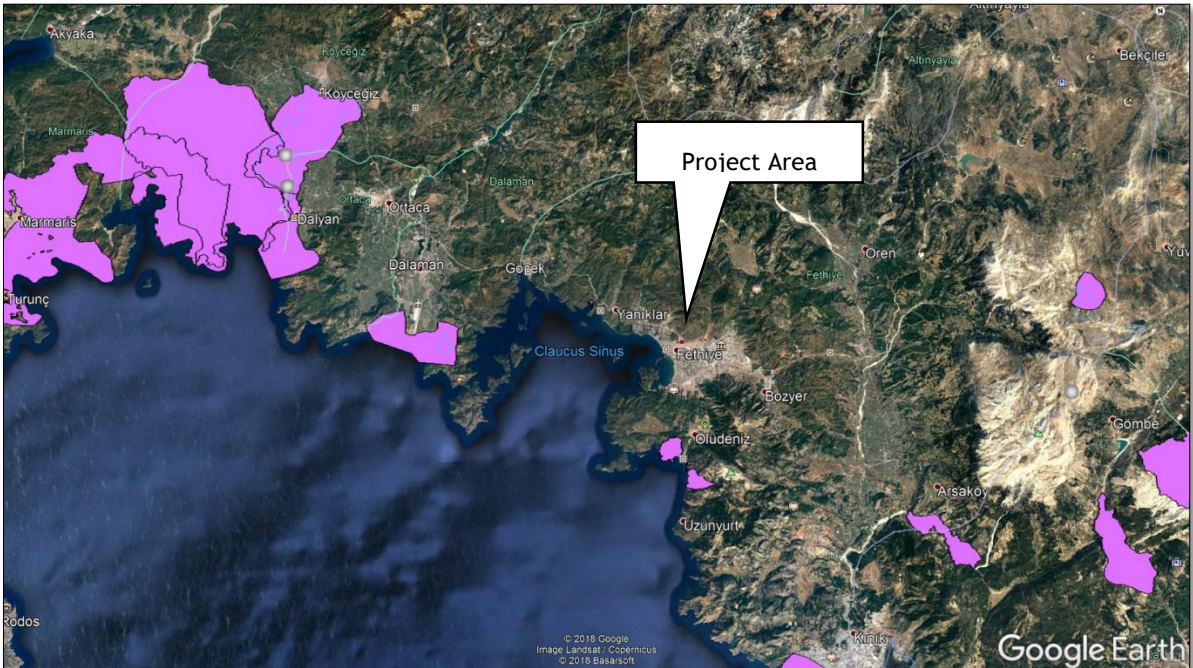
\*distances are taken as air distances



**Figure IV-19: Protected Areas Around the Project Area**



**Figure IV.1.7.2. Special Environmental Protection Areas Around the Project Area**



**Figure IV-20: KBAs and IBAs around the Project Area**



#### IV.1.10. Meteorology and Climate Properties

Muğla province is under the influence of the Mediterranean climate. “Main Mediterranean Climate” is felt in areas up to the height of 800 m and “Mediterranean Mountain Climate” in higher areas. Maximum-minimum temperature values, humidity, rainfall and dominant wind directions vary according to the local geographical conditions. Muğla, which has a precipitation rate of more than 1,000 mm for a square meter, is one of Turkey's richest forests in terms of rates. However, the vast majority of precipitation falls in winter, and drought of summer is significant.

The driest month is July with 7 mm of rain. The highest amount of precipitation is seen in December with an average of 257 mm of precipitation.



The warmest month of the year is July with an average temperature of 26.3°C. In January, the average temperature is 5.6 C as the lowest average of the year (Table IV-6).

Table IV-6. Temperature and Precipitation

Parameter	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	5.6	6.4	8.9	12.8	17.7	22.7	26.3	26	22	16.5	11.1	7.1
Min Temperature (°C)	1.6	2	3.7	7	11	15.5	19	18.8	14.8	10.1	5.8	3.2
Max Temperature (°C)	9.6	10.9	14.2	18.6	24.4	29.9	33.6	33.3	29.3	22.9	16.4	11.1
Precipitation (mm)	224	173	116	61	43	20	7	7	16	62	123	257

Source: <https://tr.climate-data.org/asya/tuerkiye/mugla/mugla-179/#climate-table>

The precipitation rate between the driest month and the wettest month of the year is 250 mm and the average temperature changes around 20.7 during the year.

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#### IV.1.11. Baseline Soil Quality

In order to determine the existing pollution situation in the soil structure in the project area, a total of 2 samples were taken from inside and outside the project area (see. Figure IV-21). The result of the analysis is given below and no pollution has been detected in the aforementioned area.



Figure IV-21: Sampling Points

The samples taken from the points shown above have been evaluated within the scope of the Regulation on Control of Soil Pollution and Point-Sourced Contaminated Sites. This regulation actually considers the site that have been determined as contaminated by Provincial Directorates of Environment and Urbanization. If a site is determined as contaminated by a Provincial Directorate, further actions could be demanded for reduction of the pollution.

These actions can be demanded based on the scenarios examined in the regulation which include intake and absorption of soil with the skin contact specified in the relevant regulation, inhalation of volatile substances in the external environment, inhalation of fugitive dust in the external environment, transport of pollutants to groundwater and groundwater (SF = 10) and transport of pollutants to groundwater and groundwater intake (SF = 1).

It should be remembered that limit values of these scenarios of the regulation do not mean level of pollution or contamination. This study was conducted to have a baseline status of the area. After the completion of the construction. Soil samples from the areas that could reflect the status of the WWTP (inside & outside of WWTP) must be taken and if a drastic increase in any of the baseline parameter is seen or if the site is suspected to be contaminated, Provincial Directorate must be informed.

The results are presented in Table IV-7.

**Table IV-7. Soil Analysis Results**

Parameter	Unit	GT-1	GT-2
pH	-	8.52	9.58
Mercury	mg/kg	0.589	1.4
Lead	mg/kg	10.75	<0.05
Antimony	mg/kg	<0.05	<0.05
Beryllium	mg/kg	0.505	0.094
Vanadium	mg/kg	14.3	2.52
Nickel	mg/kg	<0.1	<0.1
Cobalt	mg/kg	<0.05	<0.05
Silver	mg/kg	<0.1	<0.1
Thallium	mg/kg	<0,05	<0.05
Barium	mg/kg	84.7	<2
Selenium	mg/kg	<0.05	<0.05
Chromium	mg/kg	<0.05	<0.05
Copper	mg/kg	<0.1	<0.1
Arsenic	mg/kg	<0.05	<0.05
Cadmium	mg/kg	<0.05	<0.05
Zinc	mg/kg	4.04	<0.5
Uranium	mg/kg	<0.05	<0.05
Boron	mg/kg	<2	<2
Tin	mg/kg	0.469	0.175
Titanium	mg/kg	446	133
Molybdenum	mg/kg	<0.05	<0.05
BTEX	mg/kg	<0.1	<0.1
Benzene	mg/kg	<0.1	<0.1

Parameter	Unit	GT-1	GT-2
Toluene	mg/kg	<0.1	<0.1
Ethylbenzene	mg/kg	<0.1	<0.1
Xylene	mg/kg	<0.1	<0.1
TPH	mg/kg	<100	<100
Moisture	%	2.24	0.82
LOI	%	6.54	0.736

Soil intake and absorption by skin contact

Inhalation of volatile substances in the external environment

Leak dust inhalation in outdoor environment

Transport of pollutants to groundwater and removal of groundwater (SF = 10)

Transport of pollutants to groundwater and groundwater intake (SF = 1)

It should be noted that lowest Soil quality guidelines and check values for barium (mg·kg<sup>-1</sup>) for Agricultural use is determined as 6,800 mg/kg according to Canadian Soil Quality Guidelines for Barium Protection of Human Health Scientific Criteria Document<sup>2</sup>. Moreover, lowest limit value was determined as 75 mg/kg for Beryllium by Canadian Soil Quality Guidelines or the Protection of Environmental and Human Health<sup>3</sup>. This fact shows that there is no risks and potential contamination regarding the soil quality.

<sup>2</sup>

[https://www.ccme.ca/files/Resources/supporting\\_scientific\\_documents/pn\\_1493\\_basgg\\_scd\\_prob\\_1.0.pdf](https://www.ccme.ca/files/Resources/supporting_scientific_documents/pn_1493_basgg_scd_prob_1.0.pdf)

<sup>3</sup> <http://cegg-rcqe.ccme.ca/download/en/354>

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Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Test Method
Çinko	mg/kg	3,87	EPA 3051 A EPA 8020 B
Gümüş	mg/kg	<0,1	
Kalay	mg/kg	0,081	
Kadmiyum	mg/kg	<0,05	
Kobalt	mg/kg	37,2	
Krom	mg/kg	174	
Kurşun	mg/kg	<0,05	
Molibden	mg/kg	<0,05	
Nikel	mg/kg	910	
Selenyum	mg/kg	<0,05	
Talyum	mg/kg	<0,05	
Titanyum	mg/kg	81,2	
Uranyum	mg/kg	<0,05	
Vanadyum	mg/kg	4,85	
Benzen	mg/kg	<0,1	EPA 5021 A EPA 8260 C
Toluen	mg/kg	<0,1	
Etilbenzen	mg/kg	<0,1	
Kaolen	mg/kg	<0,1	
BTEX	mg/kg	<0,1	
TPH	mg/kg	<100	TS EN 14039
LOI	%	10,75	TS EN 12879
Nem	%	12,23	TS 9548 EN 12880
Kuru Madde Muhtevası	%	87,27	

Bu rapor Çınar Çevre Laboratuvarı A.Ş.'nin yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız, mührsüz raporlar geçersizdir.  
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Tele: 0 312 472 77 97 Faks: 0 312 472 54 53 Ofis GSM: 0 530 328 40 06  
web: www.cinarlab.com.tr mail: lab@cinargcl.com.tr

Bu Rapor Çevre Mevzuatlarına İlişkin Resmi İşlemlerde Kullanılamaz.

Figure IV-22: FT-1 Point Analysis Results 1/3



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Test Report

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<b>Numunenin Adı ve Örnekleme Tarihi</b> <i>Name And Sampling Date of the Sample</i>	:S26898 - Toprak Numunesi - 20.06.2019
<b>Numunenin Alındığı Yer</b> <i>Sampling Location</i>	: FT-1 NOKTASI
<b>Numuneyi Alan Kuruluş</b> <i>Sampled by</i>	:Çınar Çevre Laboratuvarı A.Ş.(Yasin Mergen)
<b>Proje No</b> <i>Project Number</i>	:P8310
<b>Numunenin Kabul Tarihi</b> <i>Date of Sample Acceptance</i>	:21.06.2019
<b>Numunenin Teslim Koşulları</b> <i>Delivery Conditions of the Sample</i>	:Numune, TS 9923 – Numune Alma – Bölüm 15: Toprak Numunelerinin korunması ve muamele edilmesi için kılavuz. Numunelerin Muhafaza ve Taşıma Kuralları standardına uygun, soğuk ortamda, mühürlü (Mühür No: ÇNR 011516) olarak teslim edilmiştir.
<b>Numunenin Alınış Şekli ve Amacı</b> <i>Way and Aim the Sampling</i>	:ANLIK ve KONTROL AMAÇLI alınmıştır.
<b>Numune Alım Standardı</b> <i>Standard of Sampling</i>	:TS 9923
<b>Deney Kapsamı</b> <i>Scope of Analysis</i>	:pH ,Antimon ,Arsenik ,Bakır ,Baryum ,Berilyum ,Bor ,Civa ,Çinko ,Gümüş , Kalay ,Kadmium ,Kobalt ,Krom ,Kurşun ,Molibden ,Nikel ,Selenyum ,Taliyum ,Titanium ,Uranium ,Vanadyum ,Benzen ,Toluen ,Etilbenzen ,Ksilen ,BTEX , TPH ,LOI ,Nem ,Kuru Madde Muhtevası parametrelerinin analizi
<b>Deneyin Başlama/Bitiş Tarihi</b> <i>Start of the Test/ Finish of the Test</i>	:21.06.2019 - 03.07.2019
<b>Açıklamalar</b> <i>Remarks</i>	:FT-1 NOKTASI
<b>Raporun Sayfa Sayısı</b> <i>Number of the Pages of the Report</i>	:3
<b>Koordinatlar</b> <i>Coordinates</i>	:36.687007 / 29.133612
<b>Meteorolojik Koşullar</b> <i>Meteorological Conditions</i>	:Hava: AÇIK / Sıcaklık:30°C
Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney/ölçüm metodları bu raporun ilgili kısımlarında verilmiştir. The testing and / or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given in the related part of this report.	

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Test Method
pH	-	9,00	TS 8332 ISO 10390
Antimon	mg/kg	<0,05	EPA 3051 A EPA 6020 B
Arsenik	mg/kg	<0,05	
Bakır	mg/kg	<0,1	
Baryum	mg/kg	<2	
Berilyum	mg/kg	0,088	
Bor	mg/kg	<2	
Civa	mg/kg	0,866	

Bu rapor Çınar Çevre Laboratuvarı A.Ş.'nin yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız, mühürlü raporlar geçerlidir.  
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Figure IV-23: FT-1 Point Analysis Results 2/3

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17.07.2019

<b>Raporu Kontrol Eden</b> <i>Checked by</i>  Damla ÇOLAK Kimyager/Lab.Kalite Yöneticisi	<b>Raporu Onaylayan</b> <i>Approved by</i>  Egemen ÖZMEN Çevre Yük.Müh./Laboratuvar Müdürü
<p><b>Bu analiz raporu laboratuvara gelen numuneyi temsil eder.</b> <i>This analysis report represents the sample accepted by the laboratory</i></p> <p><b>Deney laboratuvarı olarak faaliyet gösteren ÇINAR ÇEVRE LABORATUVARI A.Ş., TÜRKAK'tan AB-0038-T TS EN ISO IEC 17025 standardına göre akredite edilmiştir.</b> <i>ÇINAR ÇEVRE LABORATUVARI A.Ş. accredited by TÜRKAK under registration number AB-0038-T for TS EN ISO IEC 17025 as test laboratory</i></p> <p><b>Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.</b> <i>The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and the International Laboratory Accreditation (ILAC) for the Mutual recognition of test reports.</i></p> <p><b>Deney ve / veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.</b> <i>The testing 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.</i></p>	

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Tel: 0 312 472 77 97 Fax: 0 312 472 84 53 Ofis GSM: 0 530 326 40 08  
web: [www.cinargab.com.tr](http://www.cinargab.com.tr) mail: [lab@cinargab.com.tr](mailto:lab@cinargab.com.tr)

**Bu Rapor Çevre Mevzuatlarına İlişkin Resmî İşlemlerde Kullanılamaz.**

**Figure IV-24: FT-1 Point Analysis Results 3/3**

Deney Raporu  
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<b>Müşterinin Adı / Adresi</b> <i>Customer Name / Address</i>	: ÇINAR MUHENDİSLİK MÜŞAVİRLİK A.Ş. Bağlica Mah. Çambayırı Cad. Çınar Plaza No:66/5 Etimesgut/Ankara
<b>Numunenin Adı ve Örnekleme Tarihi</b> <i>Name And Sampling Date of the Sample</i>	: S26897 - Toprak Numunesi - 20.06.2019
<b>Numunenin Alındığı Yer</b> <i>Sampling Location</i>	: FT-2 NOKTASI
<b>Numuneyi Alan Kuruluş</b> <i>Sampled by</i>	: Çınar Çevre Laboratuvarı A.Ş. (Yasin Mergen)
<b>Proje No</b> <i>Project Number</i>	: P8310
<b>Numunenin Kabul Tarihi</b> <i>Date of Sample Acceptance</i>	: 21.08.2019
<b>Numunenin Teslim Koşulları</b> <i>Delivery Conditions of the Sample</i>	: Numune, TS 9923 – Numune Alma – Bölüm 15: Toprak Numunelerinin korunması ve muamele edilmesi için kılavuz. Numunelerin Muhafaza ve Taşıma Kuralları standardına uygun, soğuk ortamda, mühürlü (Mühür No: ÇNR 011517) olarak teslim edilmiştir.
<b>Numunenin Alınış Şekli ve Amaç</b> <i>Way and Aim the Sampling</i>	: ANLIK ve KONTROL AMAÇLI alınmıştır.
<b>Numune Alın Standardı</b> <i>Standard of Sampling</i>	: TS 9923
<b>Deney Kapsamı</b> <i>Scope of Analysis</i>	: pH, Antimon, Arsenik, Bakır, Baryum, Berilyum, Bor, Civa, Çinko, Gümüş, Kalay, Kadmiyum, Kobalt, Krom, Kurşun, Molibden, Nikel, Selenyum, Talyum, Titanyum, Uranyum, Vanadyum, Benzen, Toluen, Etibenzen, Ksilen, BTEX, TPH, LOI, Nem, Kuru Madde Muhtevası parametrelerinin analizi
<b>Deneyin Başlama/Bitiş Tarihi</b> <i>Start of the Test/ Finish of the Test</i>	: 21.06.2019 - 10.07.2019
<b>Açıklamalar</b> <i>Remarks</i>	: FT-2 NOKTASI
<b>Raporun Sayfa Sayısı</b> <i>Number of the Pages of the Report</i>	: 3
<b>Koordinatlar</b> <i>Coordinates</i>	: 36.666733 / 29.134515
<b>Meteorolojik Koşullar</b> <i>Meteorological Conditions</i>	: Hava: AÇIK / Sıcaklık: 30°C

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney/ölçüm metodları bu raporun ilgili kısımlarında verilmiştir.  
The testing and / or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given in the related part of this report.

Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Test Method
pH	-	8,01	TS 8332 ISO 10390
Antimon	mg/kg	<0,05	EPA 3051 A EPA 6020 B
Arsenik	mg/kg	<0,05	
Bakır	mg/kg	<0,1	
Baryum	mg/kg	<2	
Berilyum	mg/kg	0,081	
Bor	mg/kg	<2	
Civa	mg/kg	1,23	

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Figure IV-25: FT-2 Point Analysis Results 2/3





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Parametre Parameter	Birim Unit	Analiz Sonucu Test Result	Analiz Metodu Test Method
Çinko	mg/kg	21,1	EPA 3051 A EPA 6020 B
Gümüş	mg/kg	<0,1	
Kalay	mg/kg	0,124	
Kadmiyum	mg/kg	<0,05	
Kobalt	mg/kg	26,7	
Krom	mg/kg	195	
Kurşun	mg/kg	<0,05	
Molibden	mg/kg	<0,05	
Nikel	mg/kg	974	
Selenyum	mg/kg	<0,05	
Talyum	mg/kg	<0,05	
Titanyum	mg/kg	70,0	
Uranyum	mg/kg	<0,05	
Vanadyum	mg/kg	7,20	
Benzen	mg/kg	<0,1	EPA 5021 A EPA 8260 C
Toluen	mg/kg	<0,1	
Etilbenzen	mg/kg	<0,1	
Ksilen	mg/kg	<0,1	
BTEX	mg/kg	<0,1	
TPH	mg/kg	<100	TS EN 14039
LOI	%	5,28	TS EN 12679
Nem	%	4,39	TS 9546 EN 12880
Kuru Madde Muhtevası	%	94,72	

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Figure IV-26: FT-2 Point Analysis Results 2/3

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17.07.2019



<p><b>Raporu Kontrol Eden</b> <i>Checked by</i></p> <p style="text-align: center;">Damla ÇOLAK Kimyager/Lab.Kalite Yöneticisi</p>	<p><b>Raporu Onaylayan</b> <i>Approved by</i></p> <p style="text-align: center;">Egemen ÖZMEN Çevre Yük.Müh./Laboratuvar Müdürü</p>
<p><b>Bu analiz raporu laboratuvara gelen numuneyi temsil eder.</b> <i>This analysis report represents the sample accepted by the laboratory</i></p> <p><b>Deney laboratuvarı olarak faaliyet gösteren ÇINAR ÇEVRE LABORATUVARI A.Ş., TÜRKAK'tan AB-0038-T TS EN ISO IEC 17025 standardına göre akredite edilmiştir.</b> <i>ÇINAR ÇEVRE LABORATUVARI A.Ş. accredited by TÜRKAK under registration number AB-0038-T for TS EN ISO IEC 17025 as test laboratory</i></p> <p><b>Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.</b> <i>The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and the International Laboratory Accreditation (ILAC) for the Mutual recognition of test reports.</i></p> <p><b>Deney ve / veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metodları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.</b> <i>The testing 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.</i></p>	

Bu rapor Çınar Çevre Laboratuvarı A.Ş.'nin yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız, mühürsüz raporlar geçersizdir.  
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Bağcıbaşı Mah. Çarşıbaşı Cad. No:66-1 Etiler/Beşiktaş/ANKARA/TÜRKİYE  
Tel: 0 312 472 77 97 Fax: 0 312 472 84 83 Ofis GSM: 0 530 326 40 06  
web: [www.cinardis.com.tr](http://www.cinardis.com.tr) mail: [lab@cinardis.com.tr](mailto:lab@cinardis.com.tr)

**Bu Rapor Çevre Mevzuatlarına İlişkin Ream/İşlemlerde Kullanılamaz.**

**Figure IV-27: FT-3 Point Analysis Results 3/3**

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#### IV.1.12. Baseline Noise Level

Within the scope of Fethiye WWTP Project, noise measurements were carried out in two selected receiving environments in order to determine the existing noise level in the region (see Figure IV-28). Receiving environments are two settlements located near 70-100 meter to the project area.



Figure IV-28: Measuring points

Environmental noise measurements were made in accordance with TS 9315 ISO 1996-1 & TS ISO 1996-2 Standards. TS 9315 ISO 1996-1 standard describes the basic quantities to be used for the description of the noise in the community, and explains the basic determination processes. TS ISO 1996-2 standard covers methods for how sound pressure levels can be measured directly, how the measurement results can be calculated by external estimation (extrapolation) or determined only by calculation, to provide a basis for the assessment of environmental noise.

The evaluation of the measurements was made according to the Regulation on Assessment and Management of Environmental Noise (WGG) and WBG General HSE Guidelines.

**Table IV-8. Results of the measurements**

Point Name	Coordinate (WGS84-UTM Zone 35)		Time Period	Hour	Duration	Leq (dBA)	WBG Value	EHS
	East	North						
EN-1	690639	4060176	07.00 - 22.00	09:41:14	10 min	56.0	55	
			22.00 - 07.00	:22:13:52	10 min	48.5	45	
EN-2	690841	4060143	07.00 - 22.00	10:16:12	10 min	50.2	55	
			22.00 - 07.00	22:25:52	10 min	47.8	45	

According to the results of the measurement in question. Only in daytime hours at EN-1 point, the WBG EHS limit was exceeded by 1 decibel, and it is thought to be due to the fact that the related measurement area is a roadside or that the measurement time is limited. It should be noted that, project area is not in any industrial area. Baseline calculations were made for 10 minutes of period to obtain an only indicative values for the project location.

#### **IV.1.13. Air Quality**

Air pollution, which is now one of the increasing environmental problems increasing day by day, seriously threatens the world of the future and confronts ecological hazards. In parallel with the rapid increase in the world population, increasing energy use, industry development and air pollution caused by urbanization have negative effects on human health and other living things.

Air pollution is the change of the natural composition of the air for various reasons and presence of solid, liquid and gaseous foreign substances in the air in the concentrations and periods that may be harmful to human health, nature, ecological balance and goods.

Although air pollution is caused by introduction of foreign substances into the atmosphere, location and topographic structure also affect with meteorological factors such as temperature, pressure, precipitation, wind, humidity and solar radiation. Unplanned urbanization and insufficient green spaces and the fuels used also affect air pollution. Due to air pollution, local, regional and global level problems are observed.

Considering the data given in the Muğla Province Environmental Status Report for 2017, it is observed that there is no pollution in terms of SO<sub>2</sub> parameter and it is in the “Sensitive” category according to the Air Quality Index (HKI) in January in terms of PM<sub>10</sub> parameter (Table IV-9, Figure IV-29).

Table IV-9. Air Quality Index

Index	AQI	SO <sub>2</sub> [µg/m <sup>3</sup> ] - 1 Hourly Average	PM <sub>10</sub> [µg/m <sup>3</sup> ] 24 Hourly Avg.
1 (Good)	0 - 50	0-100	0-50
2 (Medium)	51 - 100	101-250	51-100L
3 (Sensitive)	101 - 150	251-500L	101-260U
4 (Unhealthy)	151 - 200	501-850U	261-400U
5 (Bad)	201 - 300	851-1100U	401-520U
6 (Dangerous)	301 - 500	>1101	>521

L: Limit Value

B: Knowledge Threshold

U: Warning Threshold

Source: Muğla Province Environmental Status Report for 2017

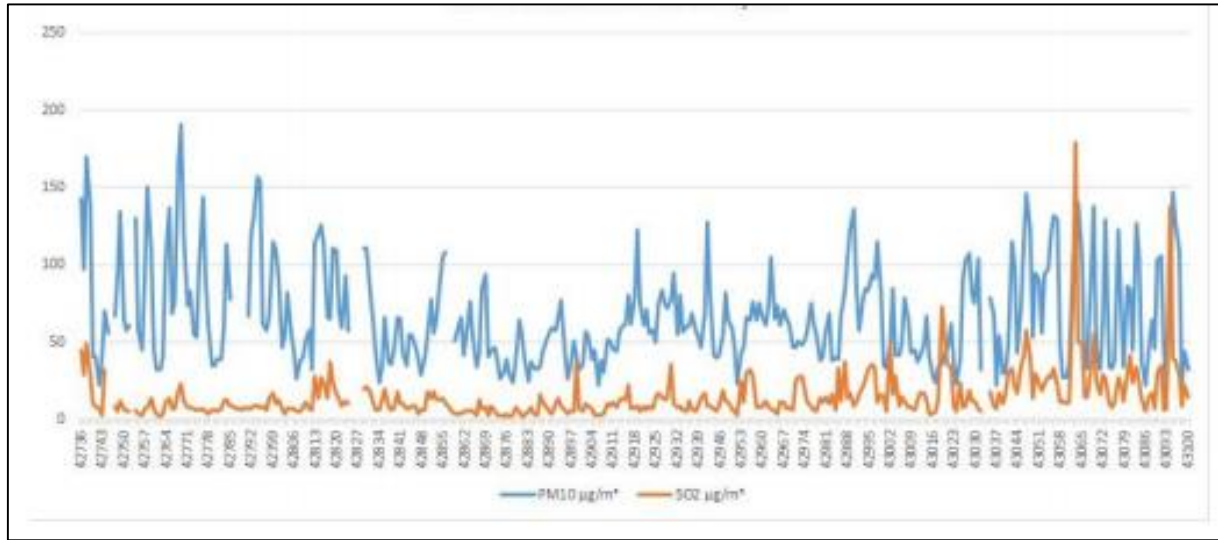


Figure IV-29: Muğla Province Air Quality Index Data

Source: Muğla Province Environmental Status Report for 2017

Within the scope of Fethiye WWTP Project, PM<sub>2,5</sub> measurements were carried out in two selected receiving environments (locations) in order to determine the ambient air quality.



Figure IV-30: Air Quality Measurement Points

Ambient air quality measurement locations have been selected in accordance with the standards approved by the Ministry, technically error free and enabling connections for measurement. Locations are two settlements located 70-100 meter away from the project site.



The evaluation of the measurements was made according to 24-hour PM<sub>2.5</sub> limit values given in WBG General HSE Guidelines. Since the mentioned project area is a tourism center, the busiest period is summer months. In addition, the measurements were made in the summer due to the warm climate of the region and the population declining at very low rates in the winter months.

Table IV-10. Air Quality Measurement Results

Measurement Location	Coordinate*		Sampling Date	Duration	Measured Value (µg/Nm <sup>3</sup> )	Limit Value (µg / Nm <sup>3</sup> )
	East	North				
FH-1	690678	4060054	20.06.2019	24 hours	13.18	25*
FH-2	690759	4060025	20.06.2019	24 hours	13.92	25*

\* Datum and System: WGS84-UTM Zone 35

According to the aforementioned measurement results, the ambient air quality values in terms of PM<sub>2.5</sub> within the project area are below the limit values.

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## **IV.2. Ecology and Biodiversity**

Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units are planned to take place in the area of the wastewater treatment plant in Fethiye Neighborhood, Günlükbaşı Neighborhood's Square No. 2907, Parcel No. 1 in Fethiye district of Muğla by Muğla General Directorate of Water and Sewerage Administration (MUSKI). Floristic-faunistic assessment studies of the project were performed by Dr. Levent BİLER.

### **IV.2.1. Description of the Study Area**

In this report, results obtained within the scope of biological/terrestrial fauna baseline studies of Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units are presented. The aim of the project is to increase the capacity of the wastewater treatment plant and to solve the wastewater problem in the region.

Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Units Application Project is located within the boundaries of Fethiye District of Muğla Province and it is planned on an area of 32,657 m<sup>2</sup> located on the square No. 2907 parcel no 1 in Günlükbaşı neighborhood. The aforementioned project area is located within the existing Wastewater Treatment Plant owned by MUSKI.

In order to determine the biological baseline conditions of the project area and its surroundings, an area of 1 km in diameter was chosen as study area. This study area was chosen to see the immediate impacts of the project. Moreover, features of the Fethiye Göcek SEPA was also considered.



Figure IV-31: View from the Project Area-1





Figure IV-32: View from the Project Area-2



Figure IV-33: View from the Project Area-3



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Figure IV-34: View from the Project Area-4



## Habitat

EUNIS, which consists of the initials of the European Natural Information System, is a system for definition and classification of the habitat types in Europe. The classification area is quite large and covers all mainland and seas of Europe. For example; shore islands (Cyprus, Iceland, excluding Greenland) and the archipelago of the European Union member states (Canary Islands, Madeira and Azores Islands), and the European mainland covering the most possible east of Ural Mountains including Turkey and the Caucasus.

Accordingly, there are 10 different EUNIS 1 Level habitat types in the region covering the mainland and seas of Europe and Turkey and the Caucasus (Davies et al., 2004). Of these, marine (A) and inland water (C) habitats are aquatic and the other 8 habitat types are terrestrial groups.

The project area is circled with a diameter of 1 km and EUNIS Habitats were determined in this determined area and evaluations were carried out for this area.

Terrestrial habitats and ecosystems field data were collected for:

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- Verifying the EUNIS level 2 habitat classification map;
- Explaining the actual data on habitats that are considered to be important by the local laws and regulations or the corresponding national or international experts in Turkey.

#### *Information Source*

The data in this report were created by compiling the data obtained in field studies and literature studies.



#### *Terrestrial Habitat and Ecosystems Analysis Methodology*

The habitats, terrestrial fauna and flora that were identified and transferred to the GIS environment during desk studies were verified by the data obtained in the baseline studies. Analysis of flora species communities has helped to classify habitats and to identify phytosociological units and critical habitats. Verification of 10% of each habitat type during the field studies provided the preparation of the habitat map as a main result. In addition, the analysis of fauna and flora species communities enabled to identify critical habitats according to IFC, 2012.

The literature used for determining terrestrial habitats and ecosystems and including distribution of plant species and other information are Akman et al., 1978; Akman et al., 1979; Barkman et al., 1986, Davies et al., 2004 and Quezel et al., 1980 in alphabetical order.

#### **Terrestrial Flora**

Turkey, considering the geographical zone where the plant in terms of diversity, has an extremely rich floristic structure. The European botanists who have realized this wealth have come to Turkey to collect plants since the 16th century. The first comprehensive research on the flora of Turkey was made by Swiss botanist Boissier and research results were published between the years of 1867-1888 with the five-volume work named "Flora Orientalis". In this work, there are nearly 5,000 species recorded in Turkey. The most extensive study was carried out by British botanists PH Davis on Turkey. Davis wrote the 10-volume "Flora of Turkey and The East Aegean Islands" between 1965 and 1988. In this work, there are 1,146 native families as well as 8,575 native species spread in Turkey. After publication of the Flora of Turkey prepared by Davis, new taxa from Turkey has continued to be published every year. In 2000, Turkish botanists published the 11th additional volume in which newly published taxa were compiled. In this additional volume, the number of taxa has reached 10,754 and the number of endemic taxa has reached 3,708. In the "Turkish Plants List" published by Turkish botanists in the year 2012, the number of taxa and species occurring naturally in the species and subspecies level in Turkey has increased to 11,466 and the number of endemic taxa has reached 3,649.

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The fact that the identification of a large number of new species continues to be made in Turkey every year shows that Turkey still has an interesting structure in terms of flora. Although it is much smaller than in Europe, the features which make Turkey different in the geographical zone where it is located are briefly as follows:

- Being under the influence of three different plant geographies from each region (Mediterranean, Euro-Siberian, Iranian-Turan)
- Effect of 3 different types of bioclimate (Mediterranean, Oseyanik, Terrestrial),
- Anatolia being a bridge between Asia and Europe continents and accordingly, the continuation of mutual plant migration between the two continents,
- Anatolia being the gene center of many breeds and sections in our country and accordingly, the number of endemic species being high,
- The fact that the ancestors or natural forms of many cultivated species are in the position of the gene source,
- Edaphic factors are very diverse,
- Ecosystem and vegetation diversity is high,
- Height difference varying between 0-5000 m,
- The main factors are that it was not affected by the glacial period as much as Europe.

Terrestrial flora field study data are collected for the following purposes:

- To verify the presence and distribution of terrestrial flora species distributed in natural and critical habitats with the determined 1 km diameter area;
- To determine the endemic, critical (CR) and endangered (EN) species within the 1 km area.

#### *Information Source*



Baseline field studies were carried out mainly in an area of 1 km diameter.

The information presented in this report were created through the field studies carried out in 2019 vegetation period and related national - international laws, regulations, contracts, standards and principles, database researches and various publications.

#### *Terrestrial Flora Sampling Methodology*

Flora vegetation data were collected by standard quadrat method (Sutherland, 2006). The sample sizes were determined as 10 m<sup>2</sup> because the project area has a meadow/pasture feature.

EUNIS 2nd level habitat type map has been the starting point for flora field studies. In the field studies, the following methodology was used. The general approach is summarized as follows:

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- Field studies are planned to be carried out during the flowering season (May-June).
- Coordinates of the determinations were taken using GPS.
- Data were collected for monitoring studies.
- The ecological status of the area has been determined (sensitivity of plant species and habitat in the area).
- The flora species that make up the vegetation are sometimes only herbaceous, sometimes tree and herbaceous, sometimes shrub and herbaceous, and sometimes herbaceous, shrub and tree species. In the study, each layer was specified separately.

In addition, when a species of endemic, limited area distribution, CR or EN is encountered, distribution areas are investigated.

When an endemic, limited area, CR or EN species is encountered, the following data are obtained:



- GPS coordinates of the population;
- Relative overlap of Braun-Blanquet (Sutherland, 2006).

Photographs that highlight the diagnostic features of the species were taken to facilitate the identification of the species (for example flower, leaf).

In determination of IUCN categories of the endemic and non-endemic species which are however distributed in a limited area distribution, "Red Data Book of the Plants in Turkey" published by Ekim et al., 2000 was used as a basic reference.

The collected samples were identified using the related sources especially "Flora of Turkey and the East Aegean Islands" (Davis, 1965-1988) (Brummitt, 2001; Donner, 1990; Eken et al., 2006; October, 2007 ; Güner, 2012; Güner et al., 2012; Kaynak et al., 2007; Özhatay, 2006; Özhatay et al., 2003, Seçmen and Leblebici, 1997). Red Data Book of the Plants in Turkey (Ekim et al., 2000) was taken as reference for determination of the species that are endemic, non-endemic but spread in a limited area and the species under threat. As the Red Data Book of the Plants in Turkey was prepared in accordance with the IUCN 1994, the protection categories were revised according to IUCN 2001.

Endemic, rare and internationally protected species and important habitats have been identified. In addition, endemic, limited area distribution and CR and EN flora types that may be found according to the literature were also taken into consideration. Intense ecosystems and susceptible ecosystems were mentioned in the findings section. These areas were named as "Ecologically Sensitive Areas" (ESA). These areas are highly sensitive and are home to rare species. ESAs are areas designated exclusively for flora species, the presence of ESAs has also been considered in determining critical habitats.

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### *Sampling Stations*

Since the area where the project will be realized is a limited and small area, the whole area has been examined and evaluated.

### **Terrestrial Fauna**



#### *Mammals*

Mammals are a well-known group of the vertebrate class. All mammals are warm-blooded. Except for spawning mammals, they breed their offspring and feed on milk. Also, having hair and fur is another distinguishing feature. Mammals are widely distributed in all corners of the world and have approximately 5500 species (Wilson and Reeder 1993, 2005, Nowak 1999, IUCN 2011).

Turkey has a rich biodiversity as it covers Iran-Anatolian, Mediterranean and the Caucasus basins which are identified as three of 34 hotspots worldwide (Mittermeier et al. 2004). It is known that 168 mammal species, 128 of which are small mammals, are distributed in our country (Osborn 1964, Dođramacı 1989, Demirsoy 1996, Benda and Horacek 1998, Yiđit et al. 2006, Krystufek and Vohralik 2001, 2005, 2009). Six of them are endemic to Anatolia, and there are other species, the majority of which are within the boundaries of our country (Krystufek and Vohralik 2005). Compared with European countries, the number of mammal species spread in Turkey seems to be more. Mammals in Turkey are distributed into nine taxonomic groups in general: Soricomorpha, Erinaceomorpha, Chiroptera, Lagomorpha, Rodentia, Carnivora, Artiodactyla, Perissodactyla, Cetacea.

#### *Birds*

Turkey has great importance due to its geographical location, large land, topographic structure and hosting different climate zones. Turkey, which is located at the crossroads of Asia, Europe and Africa, forms a natural bridge connecting the West Palearctic belt with the southern belt that is the wintering area for the birds. Turkey is located on the major migration route of palaeartic belt. Also, its geographical structure and climate diversity provide a suitable habitat for many bird species (Beaman, 1997; Erdođan, 1998, Kizirođlu 1989, Roselaar, 1995). Both migration that occurs from Çoruh Valley and the Straits and bird density in certain wetlands emphasize Turkey's ornithological importance (Anonymous, 2004).

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A vast majority of approximately 500 species (453) from 23 European ordos of approximately 9,600 bird species from 27 ordos and 154 families distributed to the world are in Turkey (Aslan and Kiziroğlu, 2003; Beeman, 1997; Bilgin and Akçakaya, 1987; Erdogan, 1998; Heinzl and Parslow, 1995; Roselaar, 1995; Kirwan et al., 1998; Kiziroğlu, 1989). Among these species, 300 of them regularly nest in Turkey with 13 species whose status are not yet finalized, and only about 70 of them are seen during migration or winter. Although normally not present in Turkey, there are 40-45 species found in some years in a very rare manner with the impact of adverse weather conditions (Anonymous, 2004).

Distribution of the birds in Turkey shows significant differences based on seasons and years. The bird communities, which are seen commonly especially in the coastal areas in winter, reach the highest numbers in autumn (September-November) when they migrate to the south. A similar influx of birds can be observed in spring (February-April), but at a lower level. While spring migration takes place over a longer period of time, the migrations to the south in autumn are made as crowded and regular herds and for a very short time (Anonymous 2004).



### *Reptiles*

Turkey has a biological diversity comparable to the continents since it is located at the intersection point of three different biogeographic regions such as Europe - Siberia, Iran - Turan and the Mediterranean, many different landforms occur at very short distances, accordingly different local climates occur, it is a bridge between Southwest Asia and Europe and fauna migration due to its location. In addition, the animals that fled from the glaciers descending from Northern Europe to the Mediterranean in various ways and used our country as a kind of refuge while thousands of species have disappeared and caused the opposite diversity in our country because of the fact that our country has not been affected by the four glacial periods experienced by the earth from the last 1 million years to 12 thousand years ago. Turkey, which is an interception point of many faunal elements from many different origins, has a potential as much as almost the European continent itself with about 129 species of reptiles that it hosts (Baran & Atatur, 1998; Sindaco et al., 2000).

The reptiles are a class of vertebrates that are between amphibians and birds. They have fully adapted to the land life. Turtles, lizards, and snakes that have very different physical structures in general are included in this class. While most of the reptiles live on land, some of them are adapted to aquatic life.

In Turkey, there are a total of 11 turtle species living on land, in the sea and freshwater, total of 63 lizard species fully adapted to the terrestrial life and 55 snake species.



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### *Amphibians*

Turkey is both a natural bridge and a barrier between the Europe and Asia due to its geographic location. Turkey is very important in terms of biological diversity due to its different climatic and topographic features because it is in the transition zones and at the junction of the three continents within Iran - Turan, Europe - Siberia and the Mediterranean bio-geographies. Important geographical location of Turkey has also positively affected the species richness of amphibians.

Amphibian fauna in relation to Turkey, has a wealth can be considered almost equivalent to Europe. A total of 29 amphibian species are present throughout Turkey. Of these, 14 are salamander species belonging to the Urodela ordo and 15 are tailless frogs that form the Anura ordo of frogs. They need water or a humid environment to breed.

The aim of the terrestrial fauna studies is to collect data and information through selected sensitivity elements in order to determine the baseline conditions of the component by desktop and field studies.

Terrestrial fauna field studies;

- To determine the presence and distribution of terrestrial fauna species living in natural and critical habitats in the designated 1 km diameter area;
- To identify the endemic, limited-range fauna species in the designated 1 km diameter area, in the CR and EN categories according to the IUCN Red List, forming immigrants and colonies;
- If habitats requiring conservation are found on a global or national scale, they have been carried out to determine the boundaries of these habitats.

### *Information Source*



Baseline field studies were carried out mainly in the corridor with a diameter of 1 km.

The information presented in this report were created through the field studies carried out in 2019 vegetation period and related national - international laws, regulations, contracts, standards and principles, database researches and various publications.

### **Terrestrial Fauna Sampling Methodology**

Terrestrial fauna baseline field studies methodologies were created to reveal the existing fauna and identify suitable habitats that support their populations. Mammals, birds, reptiles and amphibians are treated as priority taxa.

Field studies were carried out by sampling in all critical habitats in a 1 km diameter corridor and in approximately 10% of the predetermined EUNIS 2nd level natural habitats.

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#### A) *Mammals*

Based on the information obtained from desk-top studies, the species likely to be found in the corridor with a diameter of 1 km have been identified.

Literature analysis results, species likely to be found in the corridor with a diameter of 1 km and habitats with possible target types were tried to be determined.

After potential habitats were identified, special field studies were conducted to confirm the presence of target species in a 1 km diameter corridor.

Observational methods, especially direct observation and defecation, trace and other signs were defined for medium and large mammals.

Observations were carried out in different defined habitats. In these areas, work has been carried out for at least 30 minutes to record all traces of mammals (nest, feces, food residues, live observation).

Locations were recorded via GPS. In the study, information obtained from local people, especially hunters and foresters, was also taken into consideration.

#### B) *Birds*

Based on the information obtained from the office work, the types likely to be found in the corridor with a diameter of 1 km were determined according to the provinces.

The results of the literature analysis made it possible to identify the presence of potential species in the corridor with a diameter of 1 km and the habitats harboring potential bird target species.



In cases where potential habitats are confirmed; special field studies were carried out to confirm the presence of target species in the corridor with a diameter of 1 km.

In general, two different sampling techniques were used; “Point count method” and “transect count method” (Bibby et al., 1998).

The study at each point was continued for approximately 30 minutes.

Also; bird marks (nests-offspring, feathers, pence marks, vomits and feces, identifiable bone fragments), and signs of feeding were used to identify suitable habitats such as mud flats and rocky areas. The available information obtained from the local community was also considered in the study.

Locations were recorded via GPS. Bird species were determined with the help of binoculars and telescopes and information about their habitats were collected. In addition, the species were photographed where possible.

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### *C) Reptiles*

The geographical distribution and habitats of endemic, limited area distribution, critically endangered and endangered species (target species) were determined by detailed literature study.

The results of the literature analysis made it possible to identify the presence of potential species in the corridor with a diameter of 1 km and the habitats (ecologically suitable areas within the distribution area of the species and which meet the habitat needs of the species).

EUNIS and IFC habitat classifications were taken into consideration in the selection of areas designated for observation.

Locations were recorded via GPS. In addition, the species were photographed where possible.

### *D) Amphibians*

The geographical distribution and habitats of endemic, limited area distribution, critically endangered and endangered species (target species) were determined by detailed literature study.

The results of the literature analysis made it possible to identify the presence of potential species in the corridor with a diameter of 1 km and habitats that host potential amphibian target species.

EUNIS and IFC habitat classifications were taken into consideration in the selection of areas designated for observation.

Locations were recorded via GPS. In addition, the species were photographed where possible.



### **Target Species (SCC = Species of Conservation Concern)**

The target species in this study include; national and globally endangered (CR and EN category according to IUCN Red List), limited distribution and endemic species, species protected by national and international laws and treaties, or those identified under risk of extinction by national and international experts and activation of protection mechanisms have been proposed.

In this study, it is aimed to make potential and existing distribution maps (in GIS layers) of threatened and endemic terrestrial fauna species on a global and national scale.

In line with the criteria for determining critical habitats (IFC, 2012), the following fauna species were prioritized during field studies:

- The danger of extinction on a global scale, according to the IUCN Red List and is located in CR and EN categories and/or rarely seen according to the Red Books of Turkey, which is highly threatened or endemic species;

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- Endemic and limited-range species,
- Species of migrants and colonies in which a significant number of individuals move from one geographic area to another, predictable and periodically, and their individuals meet in large groups periodically or regularly and/or in predictable periods.

Before the field studies were carried out, many steps were taken:

- a. Priority habitat assessment: In the priority habitat assessment, it is assumed that this species will be present in this area if the habitat supports the habitat requirements of the species. Species habitats are defined as species, location, size and habitat status.
- b. Evaluation of the species: With the identification of potential faunistic habitats of the species, specific field studies for taxa were planned for the acceptance and verification of these habitats:
  - Faunistic boundaries of the species, CR, EN, endemic, limited distribution, migrant and colony forming in a 1 km diameter corridor;
  - Major threats to the area;
  - Protection status of the species studied.

Critical habitats were a priority in the planning of field studies. CR, EN, endemic, limited area distribution, migrant and colony forming species in critical habitats in 1 km diameter corridor were evaluated. Habitats determined to be suitable for other species were also evaluated.

Field studies were carried out during the periods when the species were active in order to facilitate the identification of the species. GPS coordinates were taken to facilitate the identification of the ecological conditions of the areas where the species that are distributed in endemic, endangered and limited areas are observed.

Species sensitivity is graded as low, medium and high considering the endemism, threatening factors and rarity.

### *Sampling Stations*

Since the area where the project will be realized is a limited and small area, the whole area has been examined and evaluated.

#### IV.2.2. Ecological Researches

The explanations about the criteria used in the tables given in the findings section in the scope of the researches [Types of Flora-Fauna and Endemic, Endangered and Endangered Flora and Fauna Categories (IUCN, BERN, CITES, MAKK, RDB)] are given below.

##### a) Endemic, Rare or Endangered Plant Species

Turkey is rich in endemic and rare plants because it is a transcontinental country in the transition region location. According to TÜBİVES, there are 1251 plant taxa in Muğla Province and 265 of them (approximately 21.18%) are endemic. Considering that the rate of endemism in our country is around 33%, it is seen that Muğla Province has a medium density in terms of endemism (Figure IV-35).

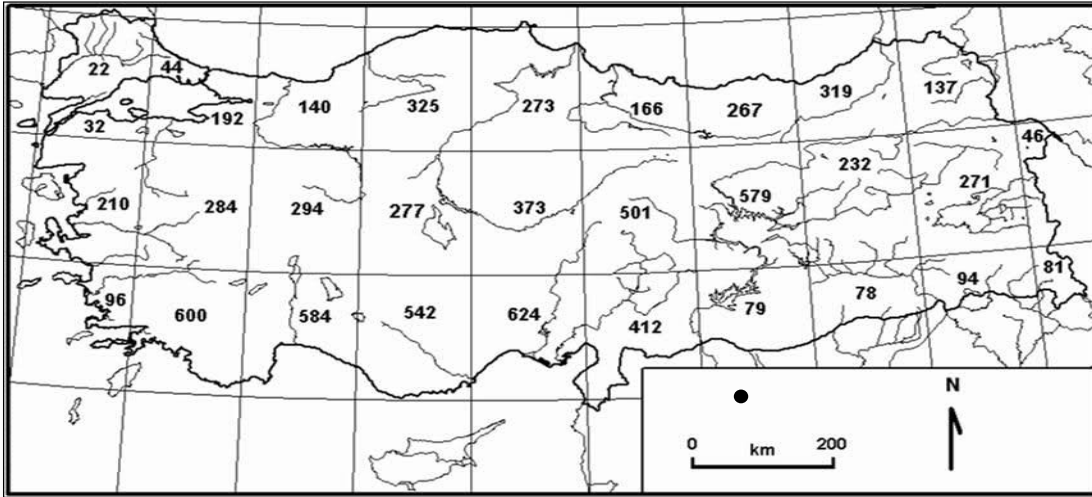




Figure IV-35: Distribution of the endemic plant species according to the grid system

##### b) Endemic, Rare or Endangered Fauna Species

The fauna species determined to be distributed within the project area and impact area will be evaluated in their own parts.

##### c) IUCN Hazard Categories

IUCN Red List Classes are a system created to classify species with high burnout risks. IUCN Red List (Red List) category and description of the species identified in the project area and domain are summarized in Table IV-11 and shown in Figure IV-36.

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**Table IV-11. IUCN Red Data Book Categories**

<b>EX Extinct</b>	<p>If there is no doubt that his last individual has died, this taxon is in the EX category.</p>
<b>EW Extinct in The Wild</b>	<p>If taxa can not be found in the places where it can be found and in the detailed researches carried out at different times of the year, that is, if it has lost its nature and continues to live in a culture only, it is included in this group.</p>
<b>CR Critically Endangered</b>	<p>If a taxa is at risk of extinction in the very near future, it is placed in this group.</p>
<b>EN Endangered</b>	<p>A taxon is at a very high risk and is in danger of extinction in the near future, but if it is not yet in the CR group, it is placed in the EN group.</p>
<b>VU Vulnerable</b>	<p>Although it cannot be placed in CR and EN groups, the taxa which are under high threat in the medium term in nature are included in this group. In our country, some species known to be under threat in the medium term and known from more than one locality are included in this category. In addition, some species that are not under treat for now are included in this category to ensure their future protection.</p>
<b>NT Near Threatened</b>	<p>Candidates who could not be placed in the previous group but close to the VU category.</p>
<b>LC Least Concern</b>	<p>Those who do not require any protection and are not threatened.</p>
<b>DD Data Deficient</b>	<p>If the information about the distribution and abundance of a taxa is insufficient, the taxon is placed in this group. Even if the biology of a taxon in this category is well known, information about its spread and abundance is insufficient. For this reason, placing a taxon in the DD category implies that more information should be collected about it than it is under threat. Once the information has been obtained, the taxon should be placed in another category appropriate for its situation.</p>
<b>NE Not Evaluated</b>	<p>Those who cannot be evaluated by any of the above criteria.</p>

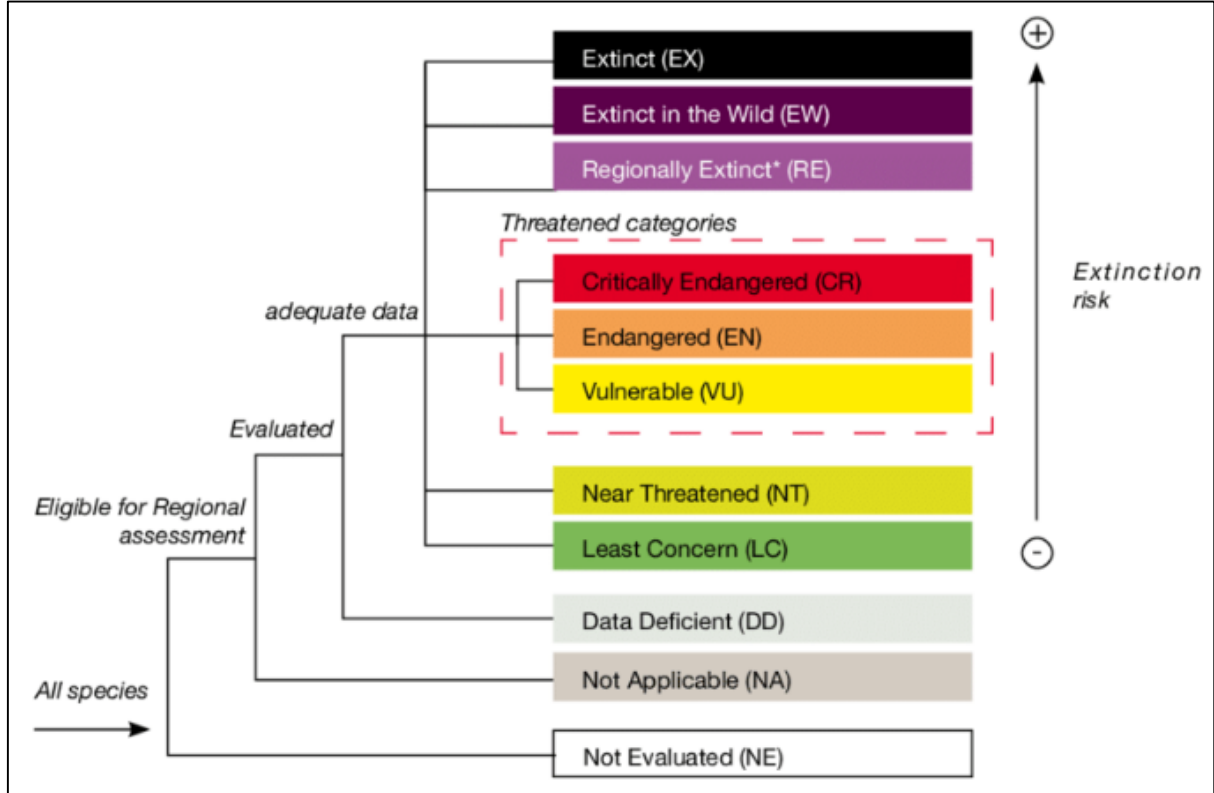




Figure IV-36: IUCN Risk Classes

#### Descriptive Information About Some Criteria

Additional criteria accepted to be placed in the **CR** , **EN** and **VU** categories are:

For **CR** Category - The plants that are in danger of disappearing in a very short time in nature can be decided according to the following criteria.

- a. If the population is decreasing as a result of the following threats; Possibility of 80% loss in the population within 10 years due to the following reasons.
  - a-Change of habitat property and decrease of the degree of closure of the species;
  - b-It is under the threat of actual and potential aggregation;
  - c- Another taxon is under the threat of invasion, crossbreeding, disease, seed sowing, contamination, competitors and parasites;
- b. If the total spreading area of the plant is less than 100 km<sup>2</sup> and the single spreading area is less than 10 km<sup>2</sup>, very fragmented or known from a single location.

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For **EN** Category - Under the high risk of the above-mentioned hazards, it is thought that there will be a 50% reduction in the population in the past 10 years or in 3 generations; if the distribution area is 5000 km<sup>2</sup> or 500 km<sup>2</sup> in a single area, the number of individuals is below 2500 or at most 5 locations.

For **VU** Category - It is thought that there will be a 20% reduction in the population in the last 10 years or 3 generations against the threats mentioned above; Species whose distribution area does not exceed 10 locations, the distribution area is totally 20.000 km<sup>2</sup>, the number of mature individuals is less than 10,000, or 10% decrease in population within 100 years during field studies.

*d. Convention on the Protection of Europe's Wildlife and Habitats (BERN)*

Bern Convention is a contract that will protect the wild flora-fauna and their habitats, that is, their habitats, will take necessary precautions for the endangered or potentially endangered species, and will also expand the training of wild flora-fauna. Bern Convention Appendix lists and descriptions are given in Table IV-12.



**Table IV-12. BERN Contract Supplement Lists and Descriptions**

ANNEX-I	Strictly Protected Fauna Species
ANNEX-II	SPFS- Strictly Protected Fauna Species
ANNEX-III	PFS- Protected Fauna Species

*e. Convention on the International Trade of Endangered Wild Animal and Plant Species (CITES)*

The CITES Convention is a contract that links the import and export of wild animals and plant species between the parties to the contract, and their international trade, in particular, to certain permits and documents. CITES Convention Appendix lists and descriptions are given in Table IV-13.



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**Table IV-13. CITES Contract Supplement Lists and Descriptions**

<b>ANNEX-I</b>	Includes all species that are affected or may be affected by trade and which are threatened with extinction . It is imperative that the trade of specimens of these species be subject to particularly strict regulations and to be allowed only in exceptional cases, so as not to expose their generation to further danger.
<b>ANNEX-II</b>	(a) Although they are not currently in danger of being exhausted, their species may become extinct unless the trade is strictly regulated to prevent uses that are incompatible with the continuation of their generation;  (b) Includes the other species that must be subject to legislation in order to effectively control the Trade of samples of certain species mentioned in (a).
<b>ANNEX-III</b>	Includes any species that any Party states that it is regulated within its jurisdiction to prevent or restrict its use and requires cooperation with other Parties in the control of its trade.

**f. 2019-2020 Central Hunting Commission Decision (MAKK)**

The Central Hunting Commission convenes every year within the framework of its authorization from the Land Hunting Law No. 4915 to determine the principles and procedures of hunting animals to be protected domestically, hunting animals that can be hunted and their hunting times, times and days, hunting amounts, prohibited fishing gear and equipment, hunting areas to be banned, hunting for combat purposes ([www.milliparklar.gov.tr](http://www.milliparklar.gov.tr)). Central Hunting Commission Decision and Statement are given in Table IV-14.

**Table IV-14. Central Hunting Commission Decisions and Disclosures**



<b>EK-1</b>	Game animals under protection by the Central Hunting Commission
<b>EK-2</b>	Game animals allowed for hunting determined by the Central Hunting Commission

**g. Red Data Book Categories and Descriptions Used for Ornithofauna (RDB)**



Red Data Book categories determined by Prof. Dr. İlhami Kiziroğlu regarding the bird species are given below. The explanation of the symbols used for the protection status and status of the bird species in the table is as follows.

**A.1.0** = These are the species that disappeared without any doubt and are no longer seen in their natural life.



**A.1.1** = Natural populations are domesticated, domesticated, species that have now been depleted or are no longer seen in their natural habitat for at least the last fifteen or twenty-five years, but survive in other artificial conditions.

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- A.1.2** = Population of this species has decreased across Turkey. They are represented by 1 individual- 10 couples (= 1- 20 individuals) in the regions where they are monitored.
- A.2** = The number of these species varies between 11-25 pairs (22-50 individuals) in the regions where they are observed. These are under great threat of extinction.
- A.3** = general population in Turkey such, they are observed in the region in general (ranging from 52- 500) individuals. These are also susceptible to extinction, with a high risk of extinction in the wild.
- A.3.1** = There is a decrease in the populations of these species in the regions where they are observed. The population of these species also varies between 251- 500 pairs (502- 1000 individuals).
- A.4** = Although the density of these species to IUCN and ATS criteria is not yet threatened with extinction in the regions where they are observed, they are a local decrease in their populations and are candidates to be threatened with extinction over time. Populations of these species range from 501 to 5000 pairs (= 1002 to 10 000 individuals) in the regions where they are observed.
- A.5** = There is no such situation in the observed populations of these species, such as decrease and threat of exhaustion.
- A.6** = Includes species that have not been adequately researched and do not have healthy data about them. Since they are based on only one or at most two observations as "random species = RT", there is currently no chance for a reliable assessment and needs to be investigated.
- A.7** = It is not currently possible to make an assessment of these species; because of such records obtained in Turkey is not fully healthy and reliable. The species that fall under the NE: (not evaluated) category according to IUCN criteria are included in this group. These include the above species that have not been fully evaluated for the criteria. It is marked with "\*" in the related tables.
- The species in group "B" are either winter visitors or transit nomads. These species are under great threat of extinction and will be subject to evaluation in the "A" group. For this reason, criteria in B.1.0 - B.7 steps will be used for the species in group "B":
- B1.0** = entering this status before Turkey's own record even though the barracks they found, there is an example of the kind of exhaustion that we can give today.

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- B.1.1** = uses Turkey as this species of wintering or passage; however, their populations are threatened with significant extinction. The natural populations of the birds in this group in the winter areas are now extinct: but volier, domesticated, domestic species that live in cages and other artificial conditions. These species have no chance to survive in the wild. If they are released into the wild, it is no longer possible for them to comply with the natural conditions.
- B.1.2** = population of this species is very low in Turkey in general, in regions where they observed 10 pairs of individuals needing 1 (1- 20 individuals) are represented by. The line of this type is under great threat of extinction, it must be protected in Turkey.
- B.2** = The number of these species varies between 11- 25 pairs (22-50 individuals) in the regions where they are observed. These species are under great threat of extinction.
- B.3** = This type of population they are observed in regions throughout Turkey in general 26- 50 pairs (52- 500 individuals) varies. There is a great danger of extinction in the wild. These species are also susceptible to extinction and are of great danger of extinction in the wild.
- B.3.1** = There is a decrease in the regions where these species are observed in their populations. Their population varies between 251-500 couples (502- 1000 individuals). Includes species that tend to decrease in the regions where they are observed, compared to older records.
- B.4** = Although the population densities of these species have not yet been threatened with extinction in the areas where they are observed, there is a local decrease in their populations. These are candidates to be threatened with extinction over time. Populations of these species range from 501-5000 couples (1002-10000 individuals) in the regions where they are observed.
- B.5** = There is no such situation as a decrease and threat of extinction in the observed populations of these species.
- B.6** = Includes little researched and insufficiently registered species. As they only rely on less than two observations as "random type = RT", there is currently no chance for a reliable assessment and needs to be investigated.
- B.7** = It is not currently possible to make an assessment of these species; because his records are very few, not sure and healthy.
- K** : These species are winter visitors, more and western origin and winter, warm with Turkey, the Lake District and more particularly in the south, including wetlands, are kind of coming to pass in the hot zone.
- T**: Transit migrants; These species use Anatolia on the migration route in spring and autumn migrations.

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**R:** Random types; Specific irregular records are specific to them and the number of individuals is very low.

**N:** Rare species are species that do not fall within the above statuses, are not confident, adequate and healthy.

In order to determine the biological characteristics of the project, field work was carried out during the vegetation period (May 2019). Images from the field studies are given below.



Figure IV-37: View from the field studies-1



Figure IV-38: View from the field studies-2



Figure IV-39: View from the field studies-3





Figure IV-40: View from the field studies-4



Figure IV-41: View from the field studies-5

In addition to the species identified within the scope of the studies, literature information near the area and with the same habitat feature was also used. The results are discussed in detail in the findings section.

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### IV.3. Socioeconomic Conditions

The main purpose of the baseline socioeconomic studies is to determine the current social and economic conditions of the settlements and households within the Project Area. This is also a central part of the planning and implementation process because it provides a basic benchmark in which project performance and the positive (beneficial) and negative effects on people and communities can be measured through regular monitoring and evaluation throughout the life of the Project.

#### IV.3.1. Administrative Structure

Muğla was given the status of metropolitan with the Law No. 6360, which was accepted on 12.11.2012 and published in the Official Gazette dated 06.12.2012 and numbered 28489, and it consists of a total of 13 districts, Menteşe being the central district, by administrative restructuring.

Districts of Muğla Province are Bodrum, Dalaman, Datça, Fethiye, Kavaklıdere, Köyceğiz, Marmaris, Menteşe, Milas, Ortaca, Seydikemer, Ula and Yatağ. Fethiye district, which covers the project application area, consists of 41 neighborhoods and the planned treatment plant is within the borders of Günbaşıbaşı neighborhood.

In Fethiye, which is within Turkey's first dangerous earthquake zones, a large part of the town, especially the residential areas, was demolished with the earthquake occurred on 24 April 1957. The reconstruction process started after the earthquake in 1957 and the city was planned with an understanding consisting of two regions, the commercial center and the residential area, starting from the Karagözle District. After 1980, a fast construction process started in Fethiye. The urbanization process that started in Karagözler District started to take shape with the development plans made by the Special Environmental Protection Agency. Urban development continued to expand in the north and northeastern directions of the plain base with Fethiye 2nd Stage implementation zoning plan, thus the urbanization movement spreading over the plain began to accelerate.<sup>4</sup>

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<sup>4</sup> Koruma-Kentleşme Döngüsünde Zamana Bir Yolculuk: Fethiye-Göcek Özel Çevre Koruma Bölgesi Örneği, Iğdır Üniversitesi Fen Bilimleri Enstitüsü Dergisi, 2018



In the studies conducted in direction of the development of urbanization movements in the historical process in Fethiye, it was stated that the green areas are decreasing, the coastal bands are commercial areas, and in some zoning applications, light green areas are given little space where there is no texture in the city due to rapid and distorted constructions due to arbitrariness and politics. It is stated that urbanization movements spread to the city of Çalış, until 1985-2000, and to Taşyaka-Patbalık neighborhoods after 2000, and after 2010, urbanization started towards the slopes with the decrease of the lands to be opened for development. It is stated that with the appreciation of the lands thanks to tourism, many people who have a greenhouse transform their agricultural lands into tourism or turn their lands into multi-storey buildings.



#### IV.3.2. Population

According to TURKSTAT's Address Based Population Registration System data, the total population of Muğla province is 967,487. As can be seen from Table IV-23, more than 200,000 population have increased since 2007<sup>5</sup>. In the province of Muğla, where the population tends to increase regularly by years, this is due to the high rate of internal migration.

Table IV-15. Population Data of Muğla Province

District	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Bodrum	105,474	114,498	118,237	124,820	130,990	136,317	140,716	152,440	155,815	160,002	164,158	171,850
Dalaman	31,318	32,367	33,451	33,980	34,815	34,839	35,362	35,958	37,406	37,364	39,089	41,351
Datça	14,836	16,008	15,901	16,475	17,004	17,357	17,983	20,156	20,029	20,513	20,799	22,261
Fethiye	173,426	181,415	183,184	188,259	192,886	195,419	140,509	145,643	147,703	151,474	153,963	157,745
Kavaklıdere	11,153	11,169	11,140	11,132	10,994	11,008	10,878	10,814	10,759	10,780	10,780	10,898
Köyceğiz	32,395	32,347	32,753	32,817	33,331	33,570	33,777	34,027	34,363	34,942	35,325	36,389
Marmaris	73,461	76,820	75,350	77,390	81,910	83,081	85,801	88,621	89,630	90,187	91,871	94,247
Menteşe							99,911	102,414	105,860	108,068	109,979	112,447
<b>Merkez (Center)</b>	<b>94,207</b>	<b>92,328</b>	<b>96,820</b>	<b>94,960</b>	<b>97,207</b>	<b>99,158</b>						
Milas	120,508	123,501	123,984	125,727	127,094	128,006	129,128	132,445	132,437	134,774	136,162	139,446
Ortaca	39,648	40,649	41,704	42,364	42,920	43,633	44,227	44,827	45,875	46,982	47,697	48,373
Seydikemer							59,660	58,771	61,019	60,306	59,994	62,246
Ula	23,455	24,219	23,969	23,749	23,438	23,410	23,418	23,610	23,618	23,877	24,419	25,294
Yatağan	46,275	46,103	45,888	45,830	45,735	45,347	45,295	44,783	44,363	44,504	44,515	44,940
<b>Total</b>	<b>766,156</b>	<b>791,424</b>	<b>802,381</b>	<b>817,503</b>	<b>838,324</b>	<b>851,145</b>	<b>866,665</b>	<b>894,509</b>	<b>908,877</b>	<b>923,773</b>	<b>938,751</b>	<b>967,487</b>

<sup>5</sup> [www.tuik.gov.tr](http://www.tuik.gov.tr): Address Based Population Registration System Results

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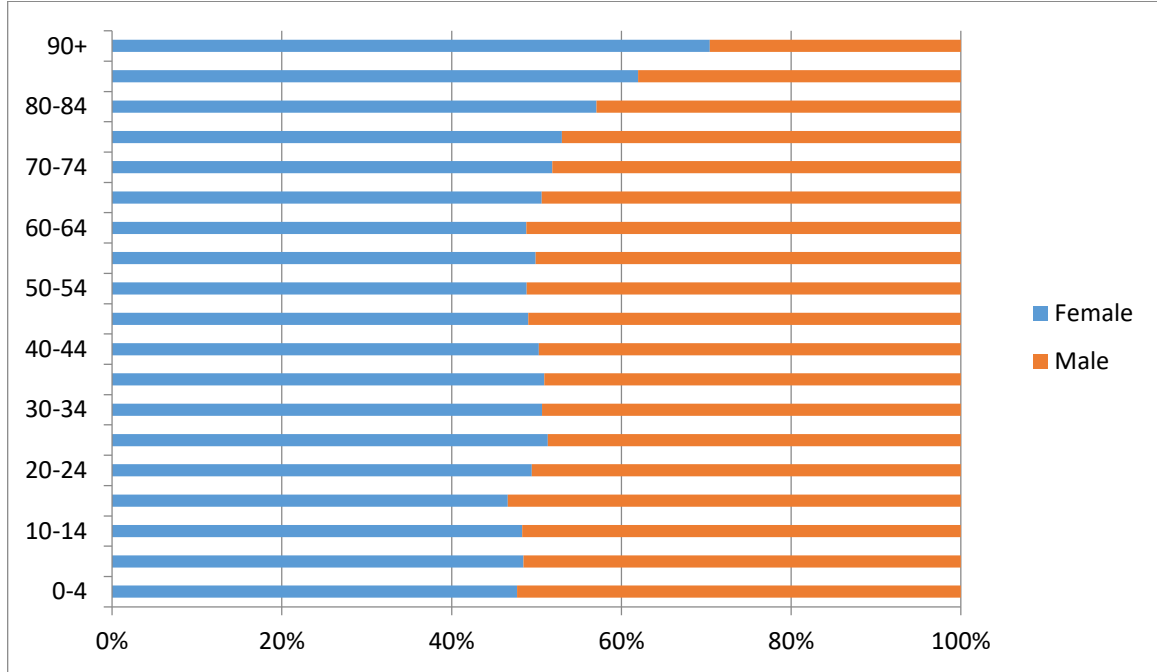
Muğla province is in a continuous internal migration movement based on many migration reasons, especially its geographical location, climate and economy. Considering the characteristics of the geography in which it is located, Muğla offers a green living space and develops in the fields of tourism and agriculture with the advantages of its climate. In addition, the fact that it contains some mines within its boundaries also contributes to the economic liveliness. For these reasons, Muğla feels the need for a permanent employee, especially due to its development in tourism and agriculture. In addition, due to its rich geography and favorable climatic conditions, the mission of being a quality living area is undertaken.

Considering the data of the TURKSTAT migration statistics for 2018, it is seen that the province of Mugla received 52,542 people, 34,302 people migrated, net migration is 18,340 and net migration rate is 191. It is one of the provinces where the net migration rate is high.



Considering the population change of Fethiye district, which covers the project area, it is seen that the population, which increased regularly from 2007 to 2013, experienced a significant decrease in 2013 and then showed an upward trend until 2018. This situation resulted from the administrative restructuring of Metropolitan status after December 2012 and the separation of the town of Seydikemer as a district.

The number of people per km<sup>2</sup> in the district of Fethiye (population density) is 174.15. While 50.32% of the total population is women, 49.68% are men. 33.43% of the population is young, 52.69% are middle age and 13.87% are elderly.

In consideration of the distribution chart of the district population of Fethiye by age group and gender, it is seen that in the age groups up to 65 years old, women are generally slightly less than the male population, while in the age group over 65, the female population is increasing more than the male population. This ratio makes a clear distinction in the age group of 85 and over.



Graphic IV-1: Distribution of the Population of Fethiye District by Age Group and Gender

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### IV.3.3. Tourism

Mugla is among the provinces that are developed in the first stage in terms of socio-economic development. Mugla, which is the eighth most developed city after Istanbul, Ankara, Izmir, Kocaeli, Antalya, Bursa and Eskisehir; it has various economic characteristics due to its geographical location. The first of these qualities is undoubtedly tourism. Located in the Aegean and Mediterranean belts, Muğla is one of the most important summer tourism destinations. In addition to tourism centers such as Fethiye, Marmaris, Datça and Bodrum, It has various tourism alternatives such as Dalyan, Ölüdeniz, Kayaköy, Akyaka, Saklıkent, Butterfly Valley, Sedir Island as well as the districts such as Datça, Köyceğiz, Milas, Seydikemer. Muğla is a complete tourism center with a coastline of 1124 km, its cultural heritage of civilizations it has hosted throughout history and over 60% of forest.

The tourism sector in Muğla hosts more than 3,600 accommodation facilities, of which 400 are Tourism Operation Certificates, with a total bed capacity of over 260,000 and an average of approximately 3.5 million foreign tourists annually.

When we look at the types of tourism; cave tourism, congress tourism, yacht tourism, belief tourism, air tourism, mountaineering tourism, river-rafting tourism and underwater diving tourism can be done within the borders of Muğla. Muğla, which has a warm weather in the spring-summer months and even until the middle of autumn due to its climate, hosts a lively sea tourism between May and November. Tour tourism is widespread not only due to the hotel tourism but also because it has many beautiful bays.

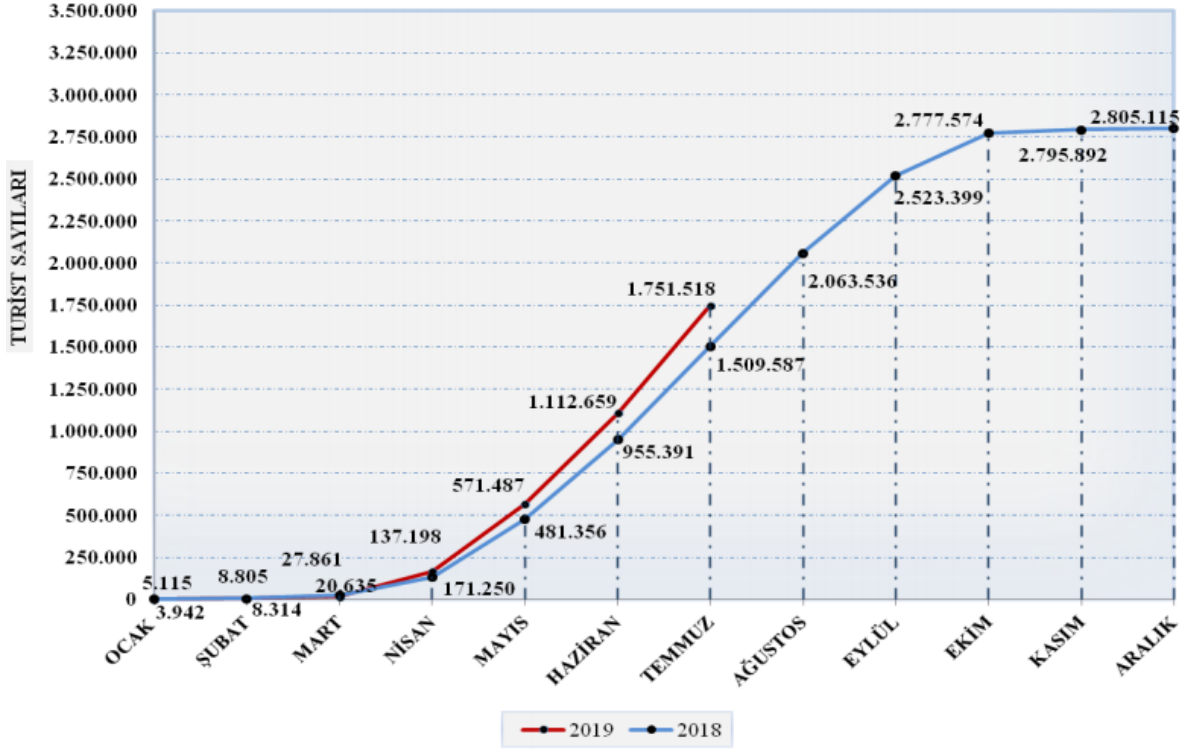
There are many museums, marina, hot springs, monumental tombs, ancient cities and ruins in the city. In addition, there are various tourism values such as Ölüdeniz, Butterfly Valley, Latvian Temple, Kayaköy, İztuzu Beach and Lake Bafa. In this context, it can be said that tourism is the most important economic factor of Muğla.

When we look at the number of tourists entering through Muğla border gates between 2009-2019, it is seen that it varies according to years. In general, the number of tourists, which tended to increase until 2016, reached the lowest level in 2016. It can be said that the number of tourists, which remained high in the past year, did not increase much compared to 10 years ago, but it remained the same.

**Table IV-16. Distribution of Tourists Entering from Muğla Border Gates between 2009-2019 by Years**

Years	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019*
Number	2,892,358	3,092,881	3,183,424	3,132,475	3,222,315	3,302,688	3,081,467	1,822,777	2,089,503	2,805,115	1,751,518
Increase	-2.5%	6.9%	2.9%	-1.6%	2.9%	2.5%	-6.7%	-40.8%	14.6%	34.2%	

\*First 7 months





Graphic IV-2: 2018-2019 Foreign Tourist Chart (Muğla Border Gates)

When the number of foreign tourists in 2018 and 2019 is compared, it is seen that the number of tourists entering through Muğla border gates in 2019 was higher in May, June and July compared to the previous year.

#### IV.3.4. Agriculture

Another economic element of Muğla is agriculture. Most of the plants compatible with the Mediterranean climate are grown in Muğla region. Polyculture farming is carried out especially in irrigable fields due to the suitability of the climate and soil structure. Olive, almond, citrus, plum, tobacco, grapes etc. such crops are grown widely in Muğla. In addition, livestock activities are carried out in Muğla, if not as much as the agricultural activities. Due to the roughness of the land structure and the presence of agricultural products with high added value, animal husbandry is gradually decreasing and continues mostly on the small cattle axis.

Muğla province is one of the most important centers of beekeeping in the world. 90% of the pine honey produced in our country is provided from Muğla province. Muğla, which ranks first in Marine Aquaculture production in Turkey, has a well advanced olive industry and it is the second in the field of olives for oil in Turkey. In Ortaca, Fethiye, Dalaman and Dalyan districts, citrus cultivation (orange, lemon, tangerine, grapefruit) is widely used.

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When the distribution of agricultural areas in TR32 Region by districts is examined, it is seen that Milas, Fethiye, Söke and Tavas districts come to the forefront. Approximately 26% of the agricultural areas in the Region are located in these districts. As of 2018, Fethiye district has 73,561 decares of beverage and spice plants area, 17,443 decares of vegetable area, 22,169 decares of cereal and other vegetable products production area.

In consideration of the production sizes and the shares in the production of the region of TR32 in Turkey, it is seen that Fethiye has an important share in vegetable production in the region and especially kidney beans, tomato, lettuce (iceberg) and a substantial portion of the eggplant are obtained from Fethiye. 92% of kidney bean production in the TR32 region, 39% of kidney bean production, 22% of okra production, 52% of table tomato production, 83% of lettuce production and 52% of eggplant production are met from Fethiye.

Olive, pomegranate, apple, walnut, cherry, almond and citrus farming are done in Fethiye district. In addition, walnut, almond and cherry cultivation came to the fore in the plateau villages. Industrial crops such as cotton, tobacco, sugar beet, anise, sesame, peanut and potatoes are also being cultivated, but due to reasons such as the land being too small and fragmented to be unsuitable for machine agriculture, the population living in agriculture and the increase in production inputs, being primarily cotton Accordingly, there were decreases in the cultivation areas of these industrial plants, and farmers turned towards fodder plants and fruit growing.

Vegetable production statistics carried out in Fethiye district from 2014 to 2018 are given in the table below. It is seen that the most produced vegetables are gum pumpkin, cucumber and eggplant as of 2018.

**Table IV-17. Vegetable Production in Fethiye District**

Vegetables	2014	2015	2016	2017	2018
Beans (fresh)	6,660	1,600	1,721	1,840	2,150
Kidney beans, fresh	560	240	375	334	375
Black eyed peas	100	15	20	25	20
Cabbage	5,200	6,500	7,459	6,600	6,300
Cauliflower	2,800	3,850	2,975	2,700	2,850
Lettuce belly	2,000	2,400	2,686	3,305	3,730
Cucumber, table	12,215	21,015	26,775	26,680	20,845
Eggplant	23,100	7,453	7,735	9,225	10,968
Pumpkin, chewing gum	5,780	28,515	28,115	27,769	25,725

Source: TURKSTAT, Crop Production Statistics

When the production amounts of grain and other vegetable products are analyzed in Fethiye district, it is seen that not much grain cultivation has been done. Although grains such as wheat, vetch, barley, corn are produced, it is not very high.

**Table IV-18. Grain and Other Herbal Products Production in Fethiye District**

Cereals and other herbal products	2014	2015	2016	2017	2018
Wheat (Except durum wheat)	6,853	4,669	4,209	4,286	3,723
Vetch, green herb	2,000	2,900	2,000	2,200	2,100
Corn (silage)	490	675	740	743	1,085

Source: TURKSTAT, Crop Production Statistics

When we look at the fruit production in Fethiye district by years, it is seen that the most orange, olive oil and cherry production are prominent. Production of pomegranate and table olives is also very common in the district.

**Table IV-19. Fruit Production in Fethiye District**

Fruits	2014	2015	2016	2017	2018
Orange, Washington	2,675	3,240	4,116	5,094	5,087
Cherry	2,070	1,984	2,007	1,616	2,158
Pomegranate	718	639	656	725	740
Table olives	2,302	1,246	2,522	5,372	900
Olive oil	10,875	4,968	8,161	14,744	5,000

Source: TURKSTAT, Crop Production Statistics

On the other hand, no impact was expected o any agricultural area as no land acquisition is planned.

#### IV.3.5. Industry

In addition to tourism, there is underground richness in Muğla. There are lignite coal in Yatağan district and chrome deposits in Fethiye district. Muğla is also famous for its important marble beds. In addition to the presence of marble beds, marble processing is also an important economic resource of the city. The paper factory in Dalaman district, thermal power plants in Yatağan, Yeniköy and Kemerköy are also important industrial elements and therefore economic resources of Muğla. There is Yatağan Thermal Power Plant in Yatağan, Yeniköy Thermal Power Plant in Yeniköy and Kemerköy Thermal Power Plant in Kemerköy.

#### IV.3.6. Education

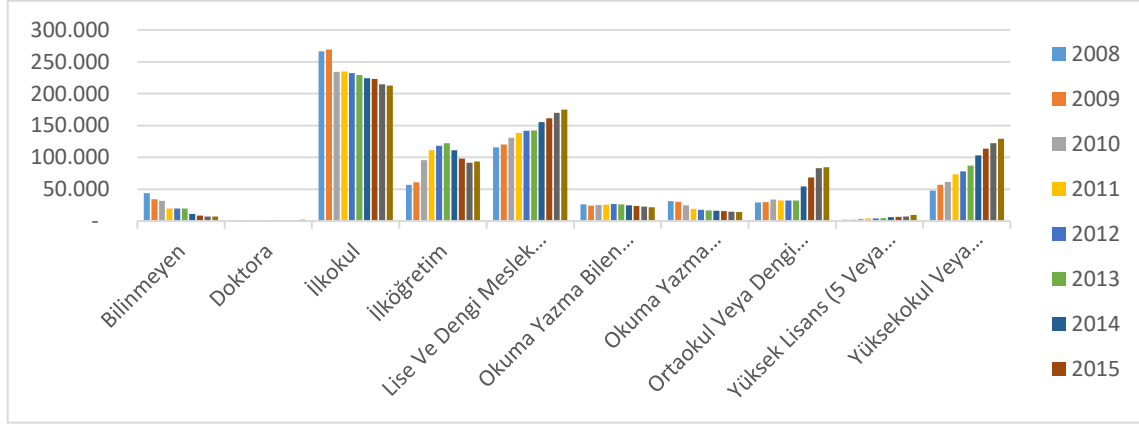
Considering the National Education Statistics of TURKSTAT, between 2008 and 2017, the vast majority of the local people in Muğla is a graduate of Primary School, Primary School, High School and High School and Faculty <sup>6</sup> (Table IV-20). It is seen that the majority of the population in the province is primary school graduates, but the number of high school and high school / faculty graduates is quite high.

Table IV-20. Educational Status of Muğla Province

STATUS	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Unknown	44,056	34,459	32,022	19,770	19,735	19,888	11,356	8,842	7,224	7,256
Doctorate	536	713	1,022	1,151	1,214	1,371	1,807	1,813	1,883	2,309
Primary school	266,395	269,322	234,459	234,802	232,466	229,057	224,038	223,325	214,751	212,653
Primary education	57,056	60,888	95,684	110,994	118,174	122,314	111,233	98,201	91,427	93,605
High School and Equivalent Vocational School	115,880	120,331	130,784	138,426	142,028	142,561	155,479	161,266	169,917	175,195
Literate but not graduated from a school	26,115	24,481	25,188	25,729	26,705	26,229	24,891	23,543	22,566	21,672
Illiterate	31,399	30,412	24,521	19,349	17,555	16,733	16,160	15,557	14,831	14,036
Secondary School or Equivalent Occupational Secondary School	29,381	29,612	33,932	32,266	32,333	32,109	54,582	68,537	82,849	84,439
Master's Degree (Including 5 or 6 Year Faculties)	2,051	2,350	3,440	3,947	4,100	4,869	6,186	6,723	7,327	9,620
School or Faculty	47,792	57,076	61,280	73,628	78,079	86,985	103,061	113,770	122,104	129,122

<sup>6</sup> [www.tuik.gov.tr](http://www.tuik.gov.tr): National Education Statistics Results





Graphic IV-3: Educational Status of Muğla Province

According to District National Education Directorate data, there are 91 educational institutions in total, 71 of which are primary schools and 20 are secondary schools. The distribution of these institutions affiliated to the Fethiye National Education Directorate is; There are 52 1-8 Class Primary Schools, 6 1-5 Class Primary Schools, 13 1-3 Class Primary Schools. Secondary education institutions; A total of 20 secondary education institutions including 3 high schools with formal and daytime education, 4 Anatolian High Schools, 1 Anatolian Teacher High School, 1 Anatolian Imam Hatip High School, 1 Municipal Science High School, 5 Vocational High Schools and 5 Multi-Program High Schools.



The distribution of private schools; there are a total of 11 private schools, 3 of which are nursery classes, 3 primary schools, 3 secondary schools, 1 high school and 1 Anatolian high school. Private schools have 1 teacher for 9 students and 1 school for 134 students.

Table IV-21. Educational Status of Fethiye Province

STATUS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Unknown	8,429	7,945	4,034	3,989	3,325	1,931	1,576	1,254	1,244	1,275
Doctorate	67	159	176	179	170	198	214	226	281	303
Primary school	66,881	59,896	60,785	60,195	34,551	34,007	32,900	31,720	31,070	28,425
Primary education	13,984	21,341	24,966	26,958	18,738	17,140	14,826	13,689	14,178	14,694
High School and Equivalent Vocational School	20,973	23,892	25,519	26,074	22,708	24,401	25,564	27,653	28,395	30,764
Literate but not graduated from a school	4,360	4,334	4,645	4,810	2,464	2,380	2,144	2,056	2,004	1,825
Illiterate	7,557	6,584	5,058	4,737	2,078	1,993	1,852	1,791	1,698	1,613

STATUS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Secondary School or Equivalent Occupational Secondary School	5,729	6,957	6,910	6,961	5,696	9,683	11,977	14,303	15,144	15,628
Master's Degree (Including 5 or 6 Year Faculties)	316	575	673	700	758	880	985	1,078	1,483	1,729
School or Faculty	10,654	11,639	13,931	15,047	14,903	17,324	19,554	21,222	22,580	24,286

When the above table showing the educational status of Fethiye is examined, there is an increase in the number of graduates from doctorate, primary education, high school and equivalent vocational school, secondary school or equivalent vocational secondary school, graduate, college or faculty from 2009 to 2018; It is observed that the number of primary school graduates, who are literate but not graduated from a school, and illiterate has increased significantly. There has been a sudden decrease in the proportion of primary school graduates, almost half, especially in 2013. As the most important reason for this sudden decrease, the factors such as the separation of the town of Seydikemer as a district as a result of the administrative restructuring that was included in the Metropolitan status after December 2012 can be shown.

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## V. ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROJECT AND MITIGATION MEASURES

### V.1. Impact Area

The Turkish EIA Regulation defines the impact area as "the area affected by the planned project before, during and after the operation". The impact area can vary according to different types of impacts and different environmental components (physical, biological, social) (World Bank ESMAP, December 2012).

In line with the OP 4.01 (Environmental and Social Risk and Impact Assessment and Management) set by the World Bank Group International Finance Corporation (IFC), the impact area will cover the followings:

- Area: (i) Project (e.g. Project areas, affected water and air environment or transport corridors), project sponsor activities that are a component of the project (eg tunnels, access roads, material and disposal sites, construction camps) and facilities that are directly owned, operated or managed (including contracted parties); (ii) impacts arising from unplanned but predictable developments caused by the project, which may occur later or in a different location; or (iii) indirect effects on the ecosystem or biodiversity to which the people affected by the project depend on their livelihood.
- Associated facilities that will not be built or expanded if the project is not realized, the project will not be valid if it is not available and not funded as part of the project.
- Areas or resources used or directly affected by the Project, cumulative impacts on planned, existing or identified developments during the identification of risks and impacts.

In this context, impacts of the project was assessed in this ESIA according to the obtained information . During the determination of the impact area, the wastewater treatment plant, all the locations in the wastewater treatment basin, and the existing discharge channel and point are taken into consideration. In this case, the settlements evaluated within the impact area are as follows;



Yanıklar	Babtaşı	Çamköy
Kargı	Tuzla	Çalica
Hürriyet	Taşyaka	Karaçulha
Karagedik	Patlangıç	Eldirek
Foça (Çalış)	Pazaryeri	Ölüdeniz
Yeni Mah	Camii	

Akarca

Çatalarık



Figure V-1: Project's Impact Area

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## V.2. Impact Assessment Methodology

Possible environmental and social impact assessments to be managed during the activities to be carried out during the land preparation, construction and operation phases of the project and measures to be taken against possible impacts are described in the following sections. Table V-1 outlines the interaction matrix showing each of the environmental and social impacts/elements outlined in the following sections and possible actions that cause or benefit from relevant impacts at different stages of the project. The environmental and social factors that the project may interact with, impact assessment studies on the relevant elements, general approach to the planned preventive mechanisms and planned mitigation measures are presented in the following sections.

While determining the impact significance during impact assessment studies, the magnitude and severity of the impacts are taken into consideration. In the evaluation made within the scope of the relevant ESIA study, the size of the impact determined according to the appropriate environmental and social factors using numerical and quantitative methods is determined as high, medium and low in line with the sensitivity/value of the receiver/resource exposed to the impact. Next, the significance of the impact (Table V-4) will be determined by the magnitude of impact (Table V-2) and the severity of the impact (Table V-3). The residual impacts after the mitigation measures are taken should also be considered in determining the magnitude and severity of the impact.

Within the scope of the project, the following mitigation hierarchy was used in design of the mitigation measures;

- Avoid (make changes so that impacts is avoided altogether),
- Minimize (apply measures to reduce the size of impacts),
- Repair (take action to repair and/or restore the affected environment) and
- Offset (implement measures to offset or compensate for the impact)

Where impact assessment determines possible effects, additional mitigation measures have been developed and steps and actions to be taken are described. If appropriate mitigation measures are identified and adopted, the possible impacts are re-evaluated and the mitigation measures are assumed to be implemented effectively as planned. In cases where the residual impact is of Moderate or High significance, a recurring process has been initiated for further investigation of mitigation measures.

**Table V-1. Environmental and Social Risk Assessment of Fethiye WWTP Project**

Impact Source and Activity	Environmental												Social			
	Land Use Properties	Topography	Soil Environment	Geology	Biological Environment	Surface Waters	Groundwater	Air Environment	Background Noise Level	Traffic Load	Landscape and Visual Elements	Ecological Impacts	Local Socio-economic Environment	Community Health and Safety	Occupational Health and Safety	National Economy
<b>Land Preparation and Construction Phase</b>																
Vegetable Soil Stripping and Construction Activities																
Procurement																
Water Use																
Energy Use																
Domestic Wastewater Production																
Solid Waste Production																
Hazardous Chemicals																
Local Procurement																
Materials, Equipment and Service																
Community Health and Safety																
Employment																
<b>Operational Phase</b>																
Water Source and Usage (Domestic)																
Domestic Wastewater Generation																
Solid Waste Generation																
Odor																
Materials, Equipment and Service																
Employment																

	Negative Impact
	Positive Impact

**Table V-2. Criteria for Determining the Magnitude of Impact**

Magnitude of Impact	Explanation
Wide (A)	Beyond the Project's Impact Area (Regional)
Local (B)	Project Impact Area
restricted (C)	Project Area (footprint)

**Table V-3. Criteria for Determining the Impact Severity**

Impact Severity	Explanation
High (3)	Very sensitive and valuable receiver/source
Medium (2)	Sensitive and valuable receiver/source
Low (1)	Slightly sensitive and slightly valuable receiver/source

**Table V-4. Interaction Matrix for Significance Assessment**



		Severity of Impact		
		High (3)	Medium (2)	Low (1)
Magnitude of Impact	Wide (A)	High (A3)	Medium (A2)	Medium (A1)
	Local (B)	High (B3)	Medium (B2)	Low (B1)
	Restricted (C)	Medium (C3)	Low (C2)	Low (C1)

### V.3. Impacts on the Physical Environment

The project activities and the impacts of the related components on the physical environment and the impacts of the physical environment on the project are examined in this section. All impacts, including positive and negative impacts during land preparation, construction and operation phases, will be explained in the following subsections. Environmental impact analysis and assessment generally refers to impacts based on existing data provided with reference to the content and scope tables of the previous section.

#### V.3.1. Topography, Soil and Land Use

Direct impacts on topography, soil and land use risks pose a problem, especially during the construction and operation phases of the project. Taking into account the existing conditions, the impact assessment for land preparation, construction and operation phases is given in the following sections.

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### ***V.3.1.1. Land Preparation and Construction Phase***

As the facility area to be constructed within the scope of the project will be built within the existing wastewater treatment plant area owned by MUSKI, there will be no land acquisition. The current project includes the construction of new buildings in the existing facility area and the renewal of the mechanization. Moreover, no access roads will be built or other additional extension will require land acquisition.

The topsoil of the project area is limited as the area where the construction works will be carried out is very limited. At this stage, as a first step, vegetation cleaning and topsoil stripping will be carried out in this area.

During the construction phase of the Wastewater Treatment Plant Project, there will be no significant change in the topography as the existing wastewater treatment area will be used.

Topography change due to excavations is limited to the project area. The provisions of the "Excavation Soil, Construction and Demolition Wastes Control Regulation" will be complied with in all activities including storage, transportation and reuse of excavation materials.



Within the scope of the mentioned activities, possible impacts and possible risks that will occur in the soil environment, if the necessary measures are not taken during the land preparation and construction phases of the project are summarized below:

- Soil compaction as a result of soil stripping, levelling, excavation and filling activities, work of construction machinery and increase in pedestrian traffic.
- Mixing of soil layers as a result of excavation and filling activities.
- Soil contamination as a result of oil and fuel leaks or spillage that may result from accidents or unexpected events.
- Soil pollution which might occur in case of uncontrolled storage or disposal of solid and/or liquid wastes to be generated within the scope of the project.
- The loss of organic matter content and productivity of soil as a result of improper topsoil stripping from the project area and improper temporary storage of the topsoil.

Significant erosion and sedimentation impacts are not foreseen in the project area due to the mitigation measures taken during the soil stripping and excavation activities and the subsequent improvement practices and the construction activity will be carried out in a very limited area. Within the scope of the project, since the impacts on the soil environment will occur in the project area, the impact size has been evaluated as "restricted".

In addition to the foreseen impacts mentioned above, soil samples were taken from the site and analyzed, and the past soil pollution potential of the project area is defined in Section IV. As mentioned in this section, there is no existing pollution situation in the area.



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The project area in question is a nonarable land, and its degree of erosion is "1" and it also has poor soil properties in terms of organic matter content.

In line with the assessments made, the significance of impacts have been determined. Considering the magnitude of impact limited to the project area and the severity of impacts (value of source), , different impacts in line with the specified properties of soil are summarized in Table V-5.

**Table V-5. Assessment of Impacts on Soil and Land Use**

Subject of Impact	Magnitude of Impact	Severity of Impact			Significance of Impact
		High (3)	Medium (2)	Low (1)	
Agricultural Suitability	Restricted (C)	Lands suitable for agricultural soil cultivation	Lands not suitable for agricultural soil cultivation	Lands not suitable for agriculture (nonarable lands)	Low (C1)
Erosion Potential	Restricted (C)	Erosion Level 3-4	Erosion Level 2	Erosion Level 1	Low (C1)
Top Soil Loss	Restricted (C)	Soil rich in organic matter content	Medium-rich soil in terms of organic matter content	Poor soil in terms of organic matter content	Low (C1)

As seen above, the significance of impacts are observed to be low that means as long as the legal requirements and safety criteria are met, the activity could continue without any additional mitigation measure as the site is already modified..



#### ***V.3.1.2. Operational Phase***

The activities carried out during the operational phase of the project will have a limited physical interaction with the environment. No additional impacts are expected under normal working conditions related to topography, land and land use.

However, soil pollution caused by oil and fuel spills spilled as a result of accidents and unexpected events and soil pollution caused by uncontrolled storage and disposal of solid and/or liquid wastes produced under the project are also possible sources of pollution.

#### ***V.3.1.3. Mitigation Measures to be taken during Land Preparation and Construction Phase***

Although the significance of impacts on soil and land use is considered "low", effective implementation of the mitigation measures described below will play an important role in reducing impacts.

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In order to minimize the impacts on the soil environment, the amount of soil that can be subject to compaction and contamination will be minimized by ensuring the use of only the designated work sites and routes for construction machinery and equipment and field personnel.

In order to avoid permanent impacts of construction activities on topsoil, before construction works started, productive topsoil layer will be stripped to the appropriate depth. Topsoil stripped from the project area will be temporarily stored in the topsoil storage area in piles not exceeding 2.5 meters in height, separated from other materials (e.g. subsoil, construction materials, etc.). Following the completion of construction and installation works, topsoil will be reused at the areas within the WWTP reserved for landscaping in order to provide restoration of these areas.

Waste and wastewater to be generated during the land preparation and construction phases of the project will be stored and disposed in a controlled manner in accordance with the appropriate regulations and management practices specified in this report. Thus, it will not be possible for wastes and wastewater to occur in the Project area to interact with the soil environment and cause any impact.

During the construction phase, the fuel needs of the construction machinery and vehicles to be used in the area will be supplied from the nearest station; if deemed necessary, the fuels storage in the construction site will be organised in the special reservoirs with adequate containment. The measures taken for leaks and spills that may arise from construction machinery and vehicles due to fuel storage and unexpected accidents will be explained in the area-specific emergency response plan prepared considering the framework plan given in this report.

After the completion of the construction. Soil samples from the areas that could reflect the status of the WWTP (inside & outside of WWTP) must be taken and if a drastic increase in any of the baseline parameter is seen or if the site is suspected to be contaminated, Provincial Directorate must be informed.



#### ***V.3.1.4. Summary of Assessment and Residual Impacts***

Summary of the impact assessment made on the soil environment is given in Table V-6. The significance of the identified impacts before and after the implementation of mitigation measures are also given in this table.

Table V-6. Summary of Impact Assessment on Soil Environment

Affected Component	Phase	Definition of Potential Impact	Impact Type	Impact Significance (Before Mitigation)	Mitigation Measures to be Taken	Significance of Residual Impact
Soil Environment	Land Preparation and Construction	Top Soil Loss	Adverse	Low	<ul style="list-style-type: none"> <li>During the construction phase, the fuel needs of the construction machinery and vehicles to be used in the area will be supplied from the nearest station; if deemed necessary, the fuels storage in the construction site will be organised in the special reservoirs with adequate containment.</li> <li>In the land preparation and construction phase of the project, the provisions of "Regulation on Control of Excavation Soil, Construction and Demolition Waste" will be complied with.</li> <li>The scope of the project will be in line with the provisions of "Regulation on Soil Pollution Control and Point-Sourced Contaminated Sites".</li> <li>Waste and wastewater to be generated during the land preparation and construction phases of the project will be stored and disposed in a controlled manner in accordance with the appropriate regulations and management practices specified in this report. Thus, it will not be possible for wastes and wastewater to occur in the Project area to interact with the soil environment and cause any impact.</li> <li>In order to minimize the impacts on the soil environment, the amount of soil that can be subject to compaction and contamination will be minimized by ensuring the use of only designated work sites and routes for construction machinery and equipment and field personnel.</li> <li>In order to avoid permanent impacts of construction activities on topsoil, before construction works started, productive topsoil layer will be stripped to the appropriate depth. Topsoil stripped from the project area will be temporarily stored in the topsoil storage area in piles not exceeding 2.5 meters in height, separated from other materials (e.g. subsoil, construction materials, etc.).</li> </ul>	Low

Affected Component	Phase	Definition of Potential Impact	Impact Type	Impact Significance (Before Mitigation)	Mitigation Measures to be Taken	Significance of Residual Impact
Soil Environment	Land Preparation and Construction	Erosion Potential	Adverse	Low	<ul style="list-style-type: none"> <li>Erosion measures will be taken in areas where vegetation cleaning is performed.</li> <li>By installing an appropriate drainage system in the area, the potential impacts of surface runoff will be minimized. In this context, drainage channels will be constructed in accordance with the topographic conditions of the area.</li> <li>Following the completion of construction and installation works, topsoil will be reused at the areas within the WWTP reserved for landscaping in order to provide restoration of these areas.</li> <li>After the completion of the construction. Soil samples from the areas that could reflect the status of the WWTP (inside &amp; outside of WWTP) must be taken and if a drastic increase in any of the baseline parameter is seen or if the site is suspected to be contaminated, Provincial Directorate must be informed.</li> </ul>	L o w

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### V.3.2. Air Quality

In this section, the potential impacts of the project on the air quality of the region are assessed. In this context, the construction and operation phases of the project were taken into consideration and the impacts were evaluated accordingly. This section includes the following:

- Potential emission amount and assessment,
- Assessment of potential impacts on air quality,
- Mitigation measures related to air quality,
- Residual impacts on air quality.

#### V.3.2.1. Legal Framework

In addition to Chapter 3 “Legal Framework”, the legal framework on air quality is set out below and is summarized with the standards that the regulations set targets.

Particles vary in size and composition. PM<sub>10</sub> standards (particulate matter with aerodynamic diameter less than 10 µm) have been set for human-breathing particles. PM<sub>10</sub> is the acceptable measurement of particles in the atmosphere. In this context, standards in terms of PM<sub>10</sub> are defined by Air Quality Assessment and Management Regulation and Industrial Air Pollution Control Regulation.



#### Regulation on Air Quality Assessment and Management (HKDYİ)

The Regulation on Air Quality Assessment and Management entered into force by being published in the Official Gazette dated June 6, 2008 and numbered 26898. The Regulation on Protection of Air Quality was abolished with this regulation. Long and short term standards have been set for harmonization of environmental regulations in the European Union accession process. However, the regulation sets a transition period for the implementation of these limit values.

#### Industrial Air Pollution Control Regulation (SKHKKY)

The “Industrial Air Pollution Control Regulation” (SKHKKY), published in the Official Gazette dated July 3, 2009 and numbered 27277, ensures the control of emissions in the form of work, dust, gas, steam and aerosol released to the atmosphere as a result of energy generation and industrial facility activities, and the environment and people. It includes topics such as protecting against air pollution, preventing and managing the negative effects of air pollution on public health, which cause important problems. With this regulation, “Industrial Air Pollution Regulation” was abolished.

According to the Regulation, threshold values related to mass flows have been defined to calculate the contribution to the air pollution originating from chimneys and places other than the chimney. In accordance with the provisions of the regulation, the amount of contribution to the air pollution must be calculated if the emission amount exceeds these threshold values. These values are given in Table V-7.

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**Table V-7. Mass Flows from Chimneys and Out of Chimneys (SKHKKY)**

Parameter	Mass Flow (kg/hour)	
	Chimney	Out of Chimney
Carbon monoxide (CO)	500	50
Nitrogen Dioxide (NO <sub>x</sub> )	40	4
Sulfur Dioxide (SO <sub>2</sub> )	60	6
Dust	10	1

In this context, emission amounts emitted as a result of the activities carried out within the scope of the project were calculated and compared with the values provided above.

#### **V.3.2.2. World Bank Standards**

In addition to Turkish legislation, the ambient air quality limit values given in the General Environment, Health and Safety (EHS) Guidelines of the World Bank Group (WBG) must be met. World Health Organization's Environmental Air Quality Guide limit values were used for the ambient air quality in the General EHS Guidelines. Limit values are given in Table V-8.



**Table V-8. Ambient Air Quality Limit Values - WBG HSE Guidelines**

Parameter	Time	(µg/m <sup>3</sup> )
SO <sub>2</sub>	10 minutes	500
	24 hours	20
NO <sub>2</sub>	Hourly	200
	Yearly	40
Particulate Matter (PM <sub>10</sub> )	24 hours	50
	Yearly	20
Particulate Matter (PM <sub>2.5</sub> )	24 hours	25
	Yearly	10
O <sub>3</sub>	8 hours daily peak	100

According to WBG General EHS Guidelines: “Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines “ so as local legislation is in place local legal requirements will be followed.

#### **V.3.2.3. Emission Sources in Land Preparation and Construction Phases**

Within the scope of the project, dust emissions might occur as a result of land preparation and construction works, and no other emissions are expected to be generated as there will be no other operations to resulting emissions.

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Within the scope of the land preparation and construction works of Fethiye WWTP Project, dust emission occurs during the excavation and loading of the materials in the excavation works to be carried out in the project unit locations. The emission factors used in the calculation of these dust emissions that may occur are calculated using the emission factors given in the Table 12.6 of the Industrial Air Pollution Control Regulation (SKHKKY), which came into force after being published in the Official Gazette No. 27277 dated 03.07.2009, and these factors are given in Table V-9.

Calculations are presented below under sub-headings.

Table V-9. SKHKKY Table 12.6: Emission Factors Used in Dust Emission Mass Flow Calculations

Sources	Emission Factors	
	Uncontrolled	Controlled
Dismantling (kg/ton)	0.025	0.0125
Loading (kg/ton)	0.01	0.005
Transport (round trip total distance) (kg/km-vehicle)	0.7	0.35
Unloading (kg/ton)	0.01	0.005
Storage (kg dust/ha.day)	5.8	2.9

The construction works to be carried out within the scope of the project are planned to be completed in approximately 18 months by working 10 hours a day, 25 days a month. In the dust calculations, the most unfavorable conditions were taken into consideration and it was thought that all the studies were carried out at the same time. The material density was taken as 1.6 ton/m<sup>3</sup> during the excavation works.

#### ***Dismantling***

Total amount of excavation material = 4,744 m<sup>3</sup>

$4,744 \text{ m}^3 \times 1.6 \text{ ton/m}^3 \times 0.0125 \text{ kg/ton} / 18 \text{ months} \times (250 \text{ hours/month}) = 0.0211 \text{ kg/hour}$



The total dust emission caused by dismantling of the material is **0.0211 kg/hour**.

#### ***Loading of Materials on Vehicles***

Total amount of excavation material to be stored = 2,126 m<sup>3</sup>

$2,126 \text{ m}^3 \times 1.6 \text{ ton/m}^3 \times 0.005 \text{ kg/ton} / 18 \text{ months} \times (250 \text{ hours/month}) = 0.0038 \text{ kg/hour}$

Total dust emission caused by loading the material on the vehicles is **0.0038 kg/hour**.

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### ***Transportation of the Material***

The materials to be removed will be sent to the excavation stock area. The average distance was taken as 500 m.

The amount of material to be removed per hour;

$$2126 \text{ m}^3 \times 1.6 \text{ ton/m}^3 / 18 \text{ months} \times 250 \text{ hours/month} = 0.756 \text{ tons/hour}$$

The material to be removed will be transported by trucks with a capacity of 30 tons. In this case, the number of hourly truck trips;

$$0.756 \text{ tons/hour} / 30 \text{ tons/trip} \approx 0.25 \text{ times/hour}$$

In this case, the emission resulting from the transportation of the excavated material is as follows;

$$= 0.35 \text{ kg/km} \times (2 \times 0.5 \text{ km/trip}) \times (0.25 \text{ trip/hour})$$

$$= 0.088 \text{ kg/hour}$$

Total dust emission due to the transportation of the material is **0.088 kg/hour**.

### ***Unloading of the Materials***

$$2.126 \text{ m}^3 \times 1.6 \text{ ton/m}^3 \times 0.005 \text{ kg/ton} / 18 \text{ month} \times 250 \text{ hour/month} = 0.038 \text{ kg/hour}$$

Total dust emission due to the unloading of the material from the vehicles is **0.0038 kg/hour**.

### ***Storage of the Material***

Within the scope of the project, some of the excavation material that will be generated during the construction of the facility is planned to be stored on the lands of MUSKI.

The total amount of material to be stored is 2,126 m<sup>3</sup>. Excavation will be stored in piles about 5 meters high. In this case, the storage space to be needed will be;



$$2,126 \text{ m}^3 / 5 \text{ m} = 425.2 \text{ m}^2$$

$$\begin{aligned} \text{Emission}_{\text{KFMA}} &= 425.2 \text{ m}^2 \times (1 \text{ ha}/10.000 \text{ m}^2) \times 2.9 \text{ kg dust/ha.day} \times (1 \text{ day}/24 \text{ hour}) \\ &= 0.0051 \text{ kg/hour} \end{aligned}$$

Total dust emission due to the storage of the material is **0.051 kg/hour**.

$$\begin{aligned} \text{TOTAL EMISSION} &= 0.0211 + 0.0038 + 0.088 + 0.0038 + 0.0051 \\ &= 0.1218 \text{ kg/hour} \end{aligned}$$



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In the “Industrial Air Pollution Control Regulation” (SKHKKY) Appendix 2, published in the Official Gazette dated 03.07.2009 and numbered 27277, Annex-2, it is mentioned that “the values representing air pollution, air quality values obtained by measurements, contribution to air pollution obtained by calculation values and the total pollution values formed with these values are not required if dust emissions from locations outside the chimney are less than 1 kg/hour”.

### **Conclusion and Evaluation**

Assuming that all operations will be carried out at the same time during the land preparation and construction works of Fethiye WWTP Project, the total dust emission amount to be generated from the works has been calculated as 0.1218 kg/hour.

In addition, in order to minimize emissions from vehicles, in accordance with the “Exhaust Gas Emission Control and Gasoline and Diesel Quality Regulation” published in the Official Gazette dated 30.11.2013 and numbered 28837; vehicles with traffic inspections, exhaust gas emission measurements will be used, and vehicles that need maintenance will be taken into maintenance after routine checks of vehicles and other vehicles will be used in the works until their maintenance is finished. In addition, it will be warned to operate in accordance with the Traffic Law, and pay special attention to loading according to the loading standards.



#### ***V.3.2.4. Emission Sources in Operation Phase***

It is not anticipated that the operation phase of the project will cause significant dust and exhaust emissions.

#### ***V.3.2.5. General Evaluation of Impacts on Air Quality***

Controlled dust emission amounts resulting from land-preparation and construction activities planned to last 18 months were calculated as 0.1218 kg/h, respectively. Along with taking dust suppression measures such as the establishment of an effective dust suppression system, carrying out the activities in a controlled manner will decrease the total emission amount. Therefore, no impact is expected outside the project area and the magnitude of impact is considered to be “restricted”.



The severity of impact was determined as “medium” considering the ambient air quality of the receiving environment as sensitive even though the measurement results were compatible with the regulatory limit values. For this reason, the significance of the anticipated impact due to dust emissions in the air environment is considered to be “low” (see Table V-10).

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**Table V-10. Assessment of the Impacts of Dust Emissions on Air Environment**

Subject of Impact	Magnitude of Impact	Receptor/Source				Significance of Impact
		Related Ecosystem Component	Severity of Impact			
			High (3)	Medium (2)	Low (1)	
Dust Emissions	Restricted(C)	Air Environment	Environments where the current air quality is bad (if the current pollutant concentration exceeds SHKKKY limit values)	Environments where the current air quality is medium (if the current pollutant concentration almost provides SHKKKY limit values)	Environments where the current air quality is good (If the current pollutant concentration provides SHKKKY limit values)	Low (C2)

Since emissions originating from the operation phase are evaluated as odor-generating emissions, the impacts are addressed under the heading V.3.3 Odor.

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### ***V.3.2.6. Mitigation Measures to be taken during Land Preparation and Construction Phase***

According to the assessments made above, although the project is not expected to have a significant impact on air quality, some measures should be taken to minimize the impacts on air quality. These include the following measures:

- Sufficient application of dust suppression methods (irrigation, sweeping etc.)
- Coating of interior roads with materials to prevent dust and keeping roads clean
- Speed limit application in the project area
- Keeping trees as wind barriers and planting new ones
- Loading / unloading without skidding
- Covering the stored excavation materials
- Checking the exhausts of the vehicles regularly
- The contractor will minimize unnecessary vehicle idling
- All engines will be turned off when not in use

The provisions of “Air Quality Assessment and Management Regulation” and “Industrial Air Pollution Control Regulation” should be followed in order to reduce the emission amounts generated by the construction machines operated during the construction phase and to ensure that these amounts do not exceed the limit values.

### ***V.3.2.7. Summary of Assessment and Residual Impacts***

Summary of the impact assessments on the air environment is presented in Table V-11. The significance of the identified impacts before and after the implementation of mitigation measures are also given in this table.



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Table V-11. Summary of Air Quality Impact Assessments

Affected Component	Phase	Definition of Potential Impact	Impact Type	Impact Significance (Before Mitigation)	Mitigation Measures to be Taken	Significance of Residual Impact
Air Environment	Land Preparation and Construction	Dust Emissions, Exhaust Emissions	Adverse	Low	<ul style="list-style-type: none"> <li>Sufficient application of dust suppression methods (irrigation, sweeping, etc.)</li> <li>Coating of interior roads with materials to prevent dust and keeping roads clean</li> <li>Speed limit application in the project area</li> <li>Keeping trees as wind barriers and planting new ones</li> <li>Loading / unloading without skidding</li> <li>Covering the stored excavation materials</li> <li>Checking the exhausts of the vehicles regularly</li> <li>Minimizing unnecessary vehicle idling</li> <li>All engines will be turned off when not in use</li> </ul>	Low

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### V.3.3.Odor

Odor impacts are expected to be observed during the operational phase of the Project. No odor impacts are expected during the land preparation and construction phase.

During the operation phase, the odor usually occurs in the sludge and treatment units of the wastewater treatment plants. The screen, aeration ponds, sedimentation tanks, sludge thickener and dewatering units and the processes carried out in these units can cause odor formation and also an uncomfortable effect around the treatment plant.

Wastewater contains high amounts of organic matter. During the biological treatment process, organic matter decomposes into odorous compounds by bacteria. Activated sludge contains high amounts of bacteria and organic matter that can be decomposed by bacteria in a short time. The fragrance is formed by the compounds formed during this process.

As mentioned in the previous section, wastewater treatment processes release hydrogen sulfide, methane, gaseous or volatile chemicals used for disinfection processes and bioaerosols. Among these, hydrogen sulfide and methane gases are the most important odor gases. Ammonia, sulfur compounds, fatty acids, aromatic compounds and some hydrocarbons may also cause odor in the wastewater treatment plant. Petroleum and organic solvents are also unpleasant sources of odor.

#### V.3.3.1. General Evaluation of Odor Impacts

During the operation phase, odor impacts can be observed at the wastewater treatment plant. However, the fact that pumping stations are underground structures, this significantly reduces odor impacts. Thus, it is estimated that no odor impacts are expected outside the project area and the magnitude of impact is defined as "restricted". However, the closest receptors being close to the recommended buffer zone (within 75 meters) (see Table V-12) the severity of impact is determined as "medium".

Table V-12. Assessment of Odor Impact

Subject of Impact	Magnitude of Impact	Severity of Impact			Significance of Impact
		High (3)	Medium (2)	Low (1)	
Odor	Restricted (C)	No home / workplace in the project area	No house/workplace within 75 meters	No home/workplace in the impact area	Low (C2)



### V.3.3.2. Mitigation Measures to be taken during Operation Phase

As seen in the assessments made above, there is no significant odor impact expected for the project. Impacts can be reduced further with the correct implementation of mitigation measures under normal operation conditions. The proposed mitigation measures are as follows:

- Prevention of wastewater exceeding the treatment plant capacity
- Reducing solid waste and activated sludge amounts
- Increasing the frequency of cleaning of screens
- Proper and timely disposal of sludge to prevent problems with flies and odors
- Adding chlorinated water to the sludge thickeners if the activated sludge unit is in the open area
- Adding lime to activated sludge
- Covering of the preliminary treatment unit

In addition, additional anaerobic ponds and additional final sedimentation tanks will be constructed to increase the capacity of the existing plant within the scope of the project. Thus, the current facility will become the targeted second stage. It is thought that the existing preliminary treatment units will be covered, preventing the spreading of the odor problem, which is thought to increase during the summer months when the population is most intense, and the dewatering efficiency will be increased by replacing the belt presses with decanters in the sludge dewatering building.

It can be said that the odor could be managed successfully and its formation can be prevented during the conceptual design phase. Nevertheless, additional measures will be taken as a result of unwanted odors. These measures will be applied in case the odor in the wastewater treatment plant is disturbed and complaints are received from nearby neighborhoods.

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- Addition of oxidizing agent (hydrogen peroxide, sodiumhypochlorite) (oxidizing agents prevent the formation of odor, in particular hydrogen sulfide). Addition of sodium hydroxide may also be considered. Sodium hydroxide will dissolve hydrogen sulfide gas in water.
- Control of pH levels of anaerobic bacteria formation or prevention by disinfection.
- Oxidation of fragrant compounds with the help of chemicals.
- Covering odor-emitting units as much as possible.

Distances of treatment plant units and settlements to the project area are given in

Table V-13. The distance of the treatment units to the nearest settlements is also in the table. As shown below, the nearest receivers are in the proposed buffer zone so that the mitigation measures are applied to reduce the burden on receivers.



**Table V-13. Recommended Distances to the Settlements for the Prevention of Odor and Nearest Receptors**

Treatment Unit	Nearest Residential Area (m)	Proposed Buffer Zone (m)
Sedimentation Tank	150	75
Aeration Pond	80	75

In the event that the odor is detected outside the boundaries of the area after all the above-mentioned measures are taken and normal working conditions are ensured, the covering of the aeration ponds and the biophosphorus tanks is seen as the last action plan to be implemented by MUSKI.

There are many different technologies that can be applied for the removal and control of odors in wastewater treatment and wastewater collection systems. Some purification techniques are used to purify scented liquids and gases from odor-forming compounds. These techniques can be grouped under three main headings: physical, chemical and biological.

When high efficiency is desired, process combinations can be applied, such as the combined use of chemical and biological processes. Other techniques are; absorption, adsorption, common and effective bio-filters, combustion, aqueous filtering, thermal (thermal) oxidation, chemical deodorization and various pH regulating systems.

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In order to control odor formation in wastewater collection systems, discharges in the collector lines should be regularly inspected according to discharge regulations. It may be necessary to design sewage systems to provide flow, to supply air to critical points of sewage systems or to apply pH control or disinfection processes to control the conditions that provide anaerobic microbial growth.

In addition, the selection of trees and plants that give fragrance during the landscape works of the wastewater treatment plant will shield the odor. Turbulence from free fall will be minimized by considering design details such as inlet and outlet weir structures, eliminating hydraulic splashes along pipes and channels, and control of water level in operating conditions.

Odor formation will be taken under control by ensuring the entry of pollution loads and flows suitable for the project during the operation phase to the treatment plant, increasing the aeration rate in biological treatment processes in case of excessive organic load in the process, increasing the capacity for the increase of the flow or commissioning the added units, performing the pump operations for the discharge of excess sludge, adding diluted chlorinated water, etc. in the sludge thickening process, controlling the release of aerosol compounds, and increasing the processes for the removal of screen and grit chamber wastes

In cases where the odor problem cannot be prevented at the source despite the measures listed above, the free odor in the treatment plants will be minimized by collecting and purifying the odor gases in collected in the closed units such as the pumping station and the sludge dewatering unit where there is odor or odor processes.

It has been determined that odor control in wastewater treatment plants and wastewater collection systems in our country is not generally taken into consideration during the project design phase and measures are taken to prevent odor due to the difficulties experienced during the implementation phase. Often, the odor complaints were supplemented by the results obtained in the morning and as a result of the responses from the facilities that were contacted. On the other hand, no complaints regarding odor has been received for the 1<sup>st</sup> phase of the project so far.

The yields obtained from the removal methods of the odor problem occurring in the treatment plants (%) are given below.<sup>7</sup>

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<sup>7</sup> National Environmental Sciences Research Journal, Number 1 (4): 185-188 p. (2018)



**Table V-14. Odor prevention efficiency of the treatment processes**

Technical Odor Elimination Efficiency	(%)
Condensation	60-90
Adsorption	80-95
Biofiltration	75-95
Bio-elimination	70-80
Bio-dripping	70-90
Thermal Oxidation	80-95
Catalytic Oxidation	80-95

By taking the above mentioned measures, it is not expected to observe any odor problems caused by the wastewater and sludge works. In addition to the measures and action plans mentioned above, necessary measures must be taken during the operation phase of the project to meet the provisions of the Regulation on Control of Odor-Emitting Emissions. There is no mandatory numerical standards for odor emissions or odor concentration in the ambient air in Turkey. If new limit values are determined in the future, the project will need to comply with the specified numerical standards.

With the realization of Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Capacity Expansion project, the treatment efficiency of the plant will increase, the areas that are not connected to the sewage network system will be included in the system, and groundwater pollution caused by the septic tanks, odor problems, threats to the public health and adverse impacts to the environment due to use of sewage trucks will be eliminated. Sustainability of the quality to adapt to the receiving environment from the stream to the sea will be ensured.

MUSKI will designate a liaison officer under the complaints procedure to evaluate odor-related complaints and, where necessary, to plan and implement confirmatory actions.



#### **V.3.3.3. Summary of Assessment and Residual Impacts**

Table V.18 provides a summary of the odor impact assessment.

The significance of the identified impacts before and after the implementation of mitigation measures are also given in this table.

Table V-15. Odor Impact Assessment Summary

Affected Component	Phase	Definition of Potential Impact	Impact Type	Impact Significance (Before mitigation)	Mitigation Measures to be Taken	Significance of Residual Impact
Air Environment	Operation	Odor	Adverse	Low	<p>Primary Level Measures:</p> <ul style="list-style-type: none"> <li>Prevention of wastewater exceeding the treatment plant capacity</li> <li>Reducing solid waste and activated sludge amounts</li> <li>Increasing the frequency of cleaning of screens</li> <li>Proper and timely disposal of sludge to prevent problems with flies and odors</li> <li>Increasing the aeration rate in biological treatment processes</li> <li>Adding chlorinated water to the sludge thickeners if the activated sludge unit is in the open area</li> <li>Adding lime to activated sludge</li> <li>Covering of the preliminary treatment unit</li> </ul> <p>In case that the disturbing impact of odor continues following the first level measures, secondary level measures will be taken:</p> <ul style="list-style-type: none"> <li>Addition of oxidizing agent (hydrogen peroxide, sodium hypochlorite) (oxidizing agents prevent the formation of odor, in particular hydrogen sulfide,). Addition of sodium hydroxide may also be considered. Sodium hydroxide will dissolve hydrogen sulfide gas in water</li> <li>Control of pH levels of anaerobic bacteria formation or prevention by disinfection</li> <li>Oxidation of fragrant compounds with the help of chemicals</li> </ul> <p>In case that the disturbing impact of odor continues following the first and second level measures, final level measures will be taken:</p> <ul style="list-style-type: none"> <li>Covering of aeration ponds and biophosphorus tanks</li> </ul> <p>As a general precaution: Implementation of a complaint procedure to manage odor-related complaints.</p>	Low

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### **V.3.4.Climate Change**

According to the Intergovernmental Panel on Climate Change (IPCC) -National Greenhouse Gas Inventory Preparation Guide, the waste sector includes the following components:

- Solid waste disposal (4A)
- Biological treatment of solid waste (4B)
- Burning and burning in open area (4C)
- Wastewater treatment and discharge (4D)
- Other (4E) (IPCC, 2006)

Within the scope of the ESIA study, components 4A, 4B and partly 4C, 4D and 4E were examined. Waste sector is the second largest source of greenhouse gas emissions in Turkey according to the data of 2007. However, there is no inventory of greenhouse gas emissions from the production and disposal of WWTP sludge.



In addition, activities such as monitoring, reporting and verification of the greenhouse gas emissions are presented under the title "Activities subject to Monitoring, Reporting and Verification of Greenhouse Gas Emissions" in Annex-1 of the "Regulation on the Monitoring of Greenhouse Gas Emissions" published in the Official Gazette No. 29003 dated 17 May 2014. Any component of the project is not listed in Regulation's Annex-1.

### **V.3.5.Noise**

In this section, the noise and vibration impacts of the land preparation, construction and operation phases of the project are assessed.

#### **V.3.5.1. Legal Framework**

The environmental noise in Turkey is regulated by "Regulation on Assessment and Management of Environmental Noise (ÇGDY)" published in the Official Gazette dated 04.06.2010 and numbered 27601. The purpose of this regulation is to ensure that necessary precautions are taken so that the peace and tranquility of the people are not disturbed as a result of exposure to environmental noise. For this reason, it specifies the procedures and principles for determining the levels of environmental noise exposure by using assessment methods, acoustic report, environmental noise level assessment report, and the preparation and implementation of action plans for preventing and reducing noise that may have negative effects on human health.

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The noise limit values mentioned in the ÇGDY Regulations, Annex VII, Table 4 are specified in Table V-16.



**Table V-16. Environmental Noise Limits for Industrial Plants**

Area	Ldaytime (dBA) (07:00-19:00)	Levening (dBA) (19:00-23:00)	Lnight (dBA) (23:00-07:00)
Noise-sensitive areas such as education, culture and health areas, as well as the areas where the summer resorts and camps are concentrated,	60	55	50
Among the areas where commercial buildings and noise-sensitive areas are together, areas where houses are densely located	65	60	55
Areas where workplaces are densely located, among the areas where commercial buildings and noise-sensitive areas are together	68	63	58
Industrial areas	70	65	60

Noise limit values stated in Annex-VII Table-5 of ÇGDY Regulation for construction activities are given in Table V-17

**Table V-17. Environmental Noise Limits for Construction**

Type of Activity (Construction, Demolition and Repair)	Ldaytime (dBA)
Building	70
Road	75
Other Resources	70

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### V.3.5.2. World Bank Standards

Noise limit values are specified in the World Bank Group's General EHS Guidelines under the title of 'noise'. Noise limit values are determined on the basis of the World Health Organization Community Noise Guidelines. The determined noise levels are given in Table V.21.

Table V-18. WBG's Noise Level Guidelines

Receiver	LAeq per hour (dBA)	
	Daytime 07:00 - 22:00	Night 22:00 - 07:00
Residential, institutional, educational	55	45
Industrial, commercial	70	70

### V.3.5.3. Land Preparation and Construction Phase



During the land preparation and construction phase of Fethiye WWTP project, noise generation from vehicles and equipment will be involved.

Machines and equipment that can cause noise within the scope of land preparation and construction works are given in Table V-19.

Table V-19. Noise Levels of Machinery and Equipment to be Used in Construction Works

MACHINE AND EQUIPMENT NAME	NUMBER	NOISE LEVEL (dB)
Truck & Mixer	2 Pieces	100
Tractor	2 Pieces	120
Excavator	1 Piece	105
Grader	2 Pieces	120
Concrete Pump	1 Piece	115
Generator	2 Pieces	95
Pumper	1 Piece	105
Loader	2 Pieces	115

**Source:** Sound power levels: The reference noise values of “the Regulation on Environmental Noise Emission Created by Equipment Used in Open Areas” and the manufacturers.

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Assuming that the machines and equipment to be used within the scope of the project work at the same time and in the same place, the total sound power level that will occur under the most negative conditions;

Calculated with help of  $L_{WT} = 10 \log \left( \sum_{i=1}^n 10^{L_{wi}/10} \right)$  formula.

$L_{wi}$  = Sound power level (dB) created by each machine

$L_{WT}$  = Total sound power level (dB)

After calculation of the total sound power level that will consist of all sources, the total sound pressure level ( $L_{PT}$ ) to be created by this sound power level will be calculated by using the formula below.

$L_{PT} = L_{WT} + 10 \log (Q/A)$

$A = 4\pi r^2$

$L_{PT}$  = Total sound pressure level at r distance from all construction machines

$Q$  = Direction coefficient (Semispherical distribution of the ground level sound source,  $Q = 2$ )

$r$  = Distance from source (m)

$A_{atm} = 7,4 \times 10^{-8} \times f^2 \times r / \phi$

$A_{atm}$  = Decrease in sound pressure level and atmospheric absorption (dBA)

$f$  = Frequency of the transmitted sound (500-4.000 Hz range)

$r$  = Distance from source (m)

$\phi$  = Relative humidity of air (% 71,9) <sup>(8)</sup>

The sound (noise) level is calculated with help of the formula below.

$L = L_{pt} - A_{atm} + DF$

$L$  = Sound (noise) level (dBA),

$DF$  = Correction factor

<sup>8</sup>Muğla Province Environmental Status Report, 2014

Sound level is the form of sound pressure level predominantly based on a certain curve. It is used to express the loudness of complex sounds with a single value. Weights that are proportional to the sensitivity of the ear are used and these weights are called A, B and C. The correction factor-frequency used to calculate the weighted sound (noise) levels is given in Figure V-2.

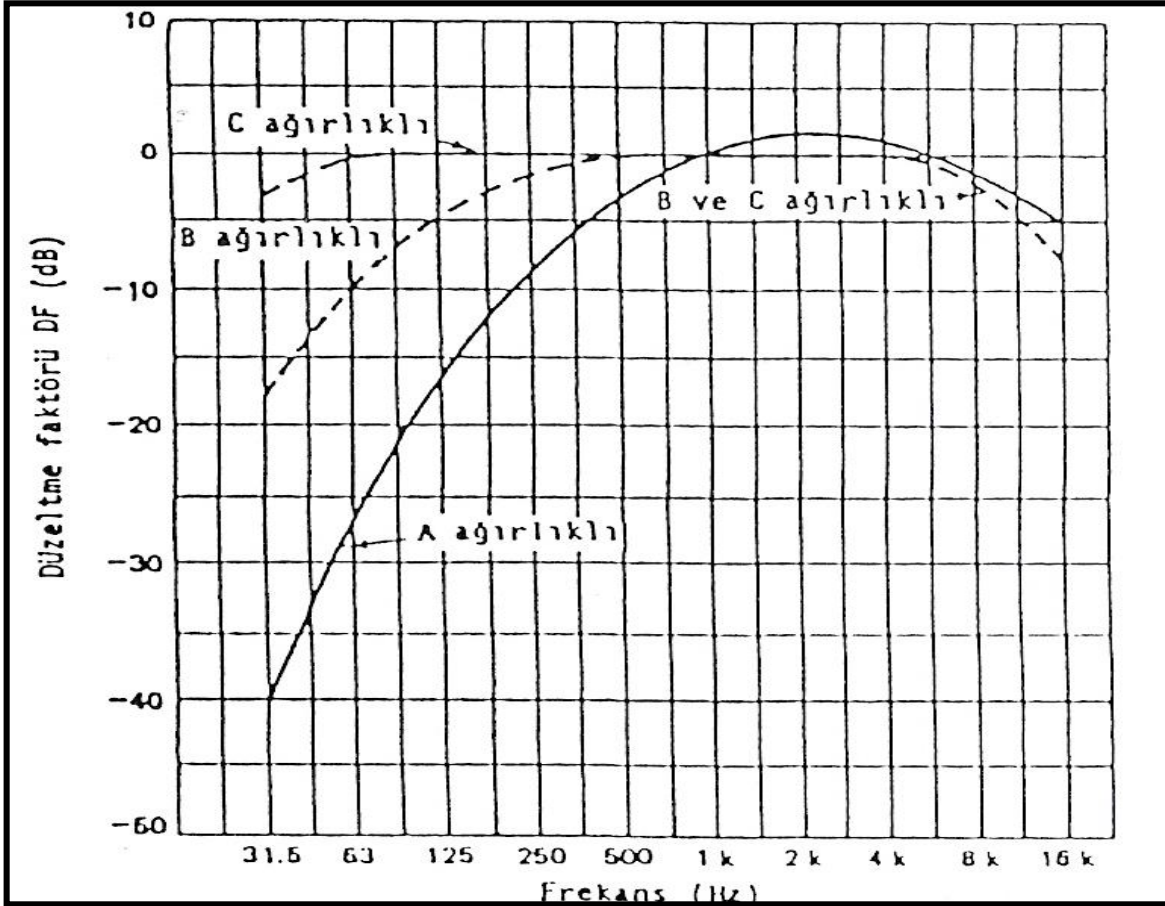


Figure V-2: Conversion Curves for A, B and C Weighted Sound (Noise) Levels (Özgülven, N. (Prof. Dr.), Industrial Noise Control)

Correction factors according to the graph given in Figure V-2; -3.6 dBA for 500 Hz, 0 dBA for 1,000 Hz, 1.2 dBA for 2,000 Hz and 1 dBA for 4,000 Hz.

The total sound (noise) level is calculated from the logarithmic total of sound (noise) levels at different distances calculated for 4 different frequencies.

$$L_T = 10 \left( \sum_{i=1}^n \log(10^{L_i/10}) \right)$$

$L_T$  = Total sound (noise) level (dBA),

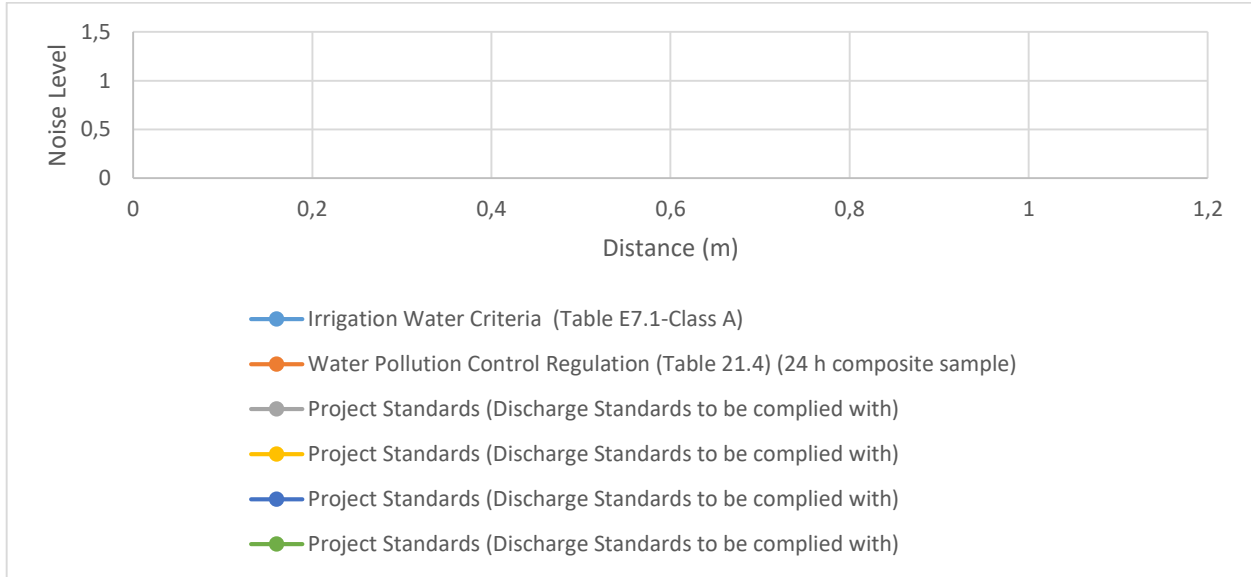
$L_i$  = Sound (noise) levels (dBA) at 4 different frequencies.

The change in the sound (noise) levels of the project, which will be generated by the tools and equipment to be used in land preparation and construction works, is given in Table V-20, and shown in Figure V-3, by considering also the distance to the nearest residential area (70m).

**Table V-20. Distribution of Total Sound (Noise) Level to be Composed of All Sources During Land Preparation and Construction Phase by Distance**

r (m)	L <sub>PT</sub> (dBA)	Aatm (dBA) (f:500)	DF (dBA) (f=500)	L (dBA) (f:500)	Aatm (dBA) (f:1000)	DF (dBA) (f=1000)	L (dBA) (f:1000)	Aatm (dBA) (f:2000)	DF (dBA) (f=2000)	L (dBA) (f:2000)	Aatm (dBA) (f:4000)	DF (dBA) (f=4000)	L (dBA) (f:4000)	L <sub>T</sub> (dBA)
1	80.89	0.00	-3.6	117.74	78.49	0	121.34	0.00	1.2	81.69	0.02	1	81.55	84.91
5	69.03	0.00	-3.6	99.94	66.63	0	103.54	0.02	1.2	69.81	0.08	1	69.64	73.03
10	65.01	0.00	-3.6	93.92	62.61	0	97.51	0.04	1.2	65.79	0.16	1	65.57	68.99
20	61.00	0.01	-3.6	87.90	58.60	0	91.48	0.08	1.2	61.75	0.33	1	61.45	64.94
30	58.65	0.01	-3.6	84.37	56.25	0	87.95	0.12	1.2	59.37	0.49	1	58.99	62.55
40	56.99	0.01	-3.6	81.87	54.58	0	85.44	0.16	1.2	57.68	0.66	1	57.21	60.83
50	55.70	0.01	-3.6	79.93	53.29	0	83.49	0.21	1.2	56.36	0.82	1	55.81	59.50
60	54.64	0.02	-3.6	78.35	52.23	0	81.90	0.25	1.2	55.27	0.99	1	54.65	58.41
70	53.75	0.02	-3.6	77.00	51.33	0	80.55	0.29	1.2	54.35	1.15	1	53.65	57.47
80	52.97	0.02	-3.6	75.84	50.56	0	79.38	0.33	1.2	53.55	1.32	1	52.77	56.66
90	52.29	0.02	-3.6	74.82	49.88	0	78.35	0.37	1.2	52.85	1.48	1	51.97	55.93
100	51.68	0.03	-3.6	73.90	49.27	0	77.42	0.41	1.2	52.21	1.65	1	51.25	55.29
125	50.39	0.03	-3.6	71.95	47.97	0	75.46	0.51	1.2	50.85	2.06	1	49.69	53.90
150	49.33	0.04	-3.6	70.36	46.91	0	73.85	0.62	1.2	49.73	2.47	1	48.35	52.75
200	47.67	0.05	-3.6	67.85	45.23	0	71.30	0.82	1.2	47.92	3.29	1	46.14	50.91
250	46.38	0.06	-3.6	65.90	43.93	0	69.31	1.03	1.2	46.49	4.12	1	44.30	49.46
300	45.32	0.08	-3.6	64.30	42.87	0	67.67	1.24	1.2	45.30	4.94	1	42.69	48.25
350	44.43	0.09	-3.6	62.95	41.97	0	66.28	1.44	1.2	44.27	5.76	1	41.25	47.23
400	43.65	0.10	-3.6	61.78	41.19	0	65.07	1.65	1.2	43.36	6.59	1	39.93	46.33
500	42.37	0.13	-3.6	59.82	39.88	0	63.03	2.06	1.2	41.79	8.23	1	37.54	44.80
600	46.47	0.15	-3.6	58.21	38.81	0	61.34	2.47	1.2	40.46	9.88	1	35.39	43.55
700	45.47	0.18	-3.6	56.84	37.89	0	59.90	2.88	1.2	39.29	11.53	1	33.40	42.47
800	44.60	0.21	-3.6	55.66	37.11	0	58.64	3.29	1.2	38.25	13.17	1	31.53	41.53
900	43.83	0.23	-3.6	54.61	36.41	0	57.51	3.71	1.2	37.29	14.82	1	29.75	40.70
1000	43.14	0.26	-3.6	53.67	35.78	0	56.50	4.12	1.2	36.41	16.47	1	28.04	39.95







**Figure V-3: Distribution Graphic of Total Sound (Noise) Level to be Composed of All Sources During Land Preparation and Construction Phase by Distance**

The noise to be generated from the works to be carried out within the scope of the land preparation and construction works of the project has been assessed according to the “environmental noise limit values for the construction site” given in Annex VIII, Table-5 of ÇGDY Regulation published in the Official Gazette dated 07.03.2008 and numbered 26809 (See Table V-21).

**Table V-21. Environmental Noise Limit Values for the Construction Site**

Type of activity (construction, demolition and repair)	Ldaytime (dBA)
Building	70
Road	75
Other Resources	70

When the total sound (noise) levels given in Table V-21 are compared with the given regulatory limits and international values, no significant impact is expected at a distance of 70 meters from the closest settlement area to the project area.

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Therefore, the noise generated might be limitedly felt in the said settlement areas and these impacts will continue only during the construction period and during the day. In addition, it is predicted that the noise level will be lower than the calculated value, considering that the machinery and equipment in question will never work in the same place and also a part of it will be absorbed by the trees and the hilly terrains around the project area.

#### **V.3.5.4. Operation Phase**

During the operation phase of the project, noise will occur from the equipment such as motors, compressors, pumps and blowers. During the plant's working hours (24 hours), the noise level resulting from these equipment is expected to be constant just like any other equipment.

During the operation of the plant, noise generating equipment will be placed in isolated and closed buildings and some of them will be under water. No obvious noise is expected during the operation of the wastewater treatment plant. Yet, since the baseline noise level is currently exceeding the WB EHS limits a noise level assessment was done via noise modelling.

In the noise assessment, internationally accepted methods and standards are used.

Sound PLAN 7.3 program was used to determine the total noise level that will occur during the operation period of the planned project.

In the operational phase, in order to evaluate the worst case scenario, evaluations were made by considering the noise sources were assumed to be located outside of the surface. The WWTP is assumed to be operational for 24 hours.



#### **SoundPLAN Model**

Firstly, elevation model of the natural ground was introduced which directly affects the noise distribution. In order to do so, topographical data was digitized.

After that, in order to introduce the data generated to the model, digital elevation model (DEM) was created. Then, the noise source was drawn by introducing the data in the software in accordance with the model standards.

As a result of these studies, noise calculation area was defined and receptor points were located. For the receiving points, noise levels arising from the machinery and equipment that will operate during the construction period and noise levels arising from the WWTP were calculated.

UTM WGS 84 coordinate system was used in the studies. Information about the data used for the model is given in the table below.

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**Table V-22. SoundPLAN Model Methodology**



Model Input		Data Source
Receptors		Established from aerial photo of the surrounding area (Google Earth view) and site visits
Calculation Method	Industry	ISO 9613-2: 1996
	Air absorption	ISO 9613
Temperature (°C)		25
Relative Humidity (%)		70
Air Pressure (mbar)		1013,3
Assessment		Lden EU (Ld & Ln)
Grid Noise Map	Grip Space (m)	10
	Height above ground	4

In the modeling of noise emissions, the settlements examined during the baseline studies have been identified as receptors and the noise emissions calculated at these points are given below. Comparison regarding the baseline noise levels were also given.

**Table V-23. Noise Emission Values Calculated in the Receptors during the Operation Phase**

Point Name	Coordinate (WGS84-UTM Zone 35)		Time Period	Baseline Leq (dBA)	Noise Modelling Leq (dBA)	WBG EHS Value
	East	North				
EN-1	690639	4060176	07.00 - 22.00	56.0	43.0	55
			22.00 - 07.00	48.5	43.0	45
EN-2	690841	4060143	07.00 - 22.00	50.2	45.0	55
			22.00 - 07.00	47.8	45.0	45

It is seen from the modelling studies that, in the operation phase, noise levels complies with WB EHS levels and do not exceed baseline noise levels. Therefore, during the operation, noise impact is considered to insignificant.

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In addition, topography and vegetation around the WWTP area prevent the noise from spreading to nearby environments. Within the scope of the project, additional noise barriers will be installed during the landscape activities to reduce possible impacts. During equipment selection and purchase, noise levels of the equipment will be taken into consideration.

The project activities will be carried out in accordance with the provisions of the RAMEN and the environmental noise limit values specified in the regulation and WBG General EHS Guidelines will be met.



In addition to noise, construction equipment, motors, pumps and mixers used in the construction and operation phases of the project might cause vibration. The abovementioned equipment will be kept in closed buildings. Thus, the vibration is not expected to be effective outside the building. The project work will be in line with the relevant provisions of RAMEN.

As a result, the significance of noise and vibration impacts during the operation phase will be “low”. Closest settlement to the project activity is within the 100 meters range. On the other hand, additional mitigation measure is not expected to be necessary as activities to be conducted in the operation is not expected to cause significant levels of noise. Yet, MUSKI will monitor the complaints regarding noise and additional mitigation measures such as as berms or noise barriers will be considered.

#### ***V.3.5.5. Mitigation Measures to be taken during Land Preparation and Construction Phase***

Machinery and equipment used during land preparation and construction activities will not be operated at the same point/location but they will be distributed homogeneously within the area. It is planned to ensure that the noise level remains at reasonable levels during the land preparation and construction phases of the project and that the relevant limit values determined by RAMEN are not exceeded. However, machinery and equipment will not be operated simultaneously, especially in WWTP area close to the surrounding buildings.

In order to minimize the noise that will occur within the scope of the project, machinery and equipment will be maintained regularly and the speed limits will be defined and followed by the construction vehicles. MUSKI will designate a liaison officer under the complaints procedure to evaluate noise-related complaints and, where necessary, to plan and implement confirmatory actions. The sound power levels of the equipment will be taken into consideration in the selection of equipment.

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During the land preparation and construction phases of the project, noise monitoring activities will be carried out in line with the monitoring plan, and the noise impact on the surrounding settlements will be checked / monitored. With help of the monitoring activities, necessary measures will be taken to reduce the noise level to the regulation limit values in case of any incompatibility with the relevant regulation limit values.

***V.3.5.6. Mitigation Measures to be Taken during Operation Phase***



In selection of pumps, blowers and other equipment, MUSKI will consider the sound power levels given in the technical specifications section of the equipment. MUSKI will monitor the complaints regarding noise and additional mitigation measures such as as berms or noise barriers will be considered.

***V.3.5.7. Summary of Assessment and Residual Impacts***

The summary of the noise impact assessment is given in Table V-24. The significance of the identified impacts before and after the implementation of mitigation measures are also given in this table.

Table V-24. Summary of Noise Impact Assessment

Affected Component	Phase	Definition of Potential Impact	Impact Type	Impact Significance (Before Mitigation)	Mitigation Measures to be Taken	Significance of Residual Impact
Local people Personnel	Land Preparation and Construction	Increase in Noise Levels	Adverse	Medium (as high number of machinery will be used near settlements 70-100 meters away from)	<ul style="list-style-type: none"> <li>Machinery and equipment used during land preparation and construction activities will not be operated at the same point/location but they will be distributed homogeneously within the area.</li> <li>Machinery and equipment will not be operated together in the WWTP area near buildings.</li> <li>Use of construction noise barriers around the receptors closest to the WWTP area</li> <li>Regular maintenance of construction machinery and equipment and definition of speed limits for construction vehicles</li> <li>MUSKI will designate a liaison officer under the complaints procedure to evaluate noise-related complaints and, where necessary, to plan and implement confirmatory actions.</li> </ul>	Low
	Operation	Increase in Noise Levels	Adverse	Low	<ul style="list-style-type: none"> <li>During equipment and machinery purchase, the sound levels given in the technical specifications section will be taken into account.</li> <li>The provisions and limit values of RAMEN and the World Bank Group General HSE Guidelines will be met during operation.</li> </ul>	Low

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### V.3.6. Water Resources

#### V.3.6.1. Water Supply Plan

Water supply to the project site is currently provided through the city network. Water supply will continue to be provided in the same way under this project.

#### V.3.6.2. Water Supply in Land Preparation and Construction Phase

During the land preparation and construction phase, water need will arise from personnel and for dust suppression purposes. The daily water requirement calculation was made by multiplying the maximum number of personnel and the daily water amount needed by a person (0.17 m<sup>3</sup>). Thus, the amount of daily water requirement during the land preparation and construction phase will be as calculated below;

$$80 \text{ personnel} \times 0.17 \text{ m}^3/\text{personnel.day} = 13.6 \text{ m}^3/\text{day}$$

The amount of water that will be needed daily during the land preparation and construction phase will be 23.6 m<sup>3</sup>/day, together with the need for dust suppression water expected to be needed as 10 m<sup>3</sup> per day. Drinking water will be provided by dispenser size waters.

The quality of the water to be provided for the Project will be in line with the provisions of the Regulation on Water for Human Consumption and the World Bank HSE Guidelines.

#### V.3.6.3. Water Supply in Operation Phase

The water requirement in the operation phase of the project will be largely due to personnel. During the operation phase of the project, 25 personnel are planned to work together in total. Thus, the daily water demand amount will be as follows;

$$25 \text{ personnel} \times 0.17 \text{ m}^3/\text{personnel.day} = 4.25 \text{ m}^3/\text{day}$$

In addition to the need of water of the personnel, the water need will result from operation requirements. These requirements are presented in Table V-25 according to the stages of the project.

**Table V-25. Water Requirement of the Project**

Project Phase	Purpose of Use	Source	Water Requirement		
			m3/hour	m3/day	m3/year
Land Preparation and Construction	Drinking Water / Domestic Water	Water Network	5.37	13.60	4,964
Land Preparation and Construction	Dust Suppression	Water Network	1.25	10.00	300
Operation	Drinking Water/Domestic Water	Water Network	0.18	4.25	1,550
Operation	Irrigation water	Water Network	6.00	144	52,560

It is planned to supply the water required for garden irrigation water requirement from the city network during the operation phase of the project. However, the use of purified water can also be evaluated in this context. In case of a decision in this direction, waste water quality will be evaluated by laboratory analyzes and Waste Water Treatment Facilities Technical Procedures Communiqué (Official Gazette Date: March 20, 2010, No: 27527) and the World Bank HSE Guidelines will be analyzed to check compliance with the provisions on waste water treatment.

#### **V.3.6.4. Treated Wastewater Discharge**

Discharge criteria of treated domestic wastewater to the receiving environment are defined under the Regulation on Control of Water Pollution (SKKY) Table 21 Wastewater Discharge Criteria. This table is divided into 4 separate sections according to pollution load and population and each section defines separate discharge criteria. Table 21.4, presented in Chapter II, is relevant to the project according to the calculated pollution load of the Project. Discharge criteria of the project are presented in Table V-26.



Table V-26. SKKY Table 21.4 Domestic Wastewater Discharge Criteria

Parameter	WB EHS	Urban Wastewater Treatment Regulation (for sensitive areas)	Irrigation Water Criteria (Table E7.1- Class A)	Water Pollution Control Regulation (Table 21.4) (24 h composite sample)	Project Standards (Discharge Standards to be complied with)
BOD5 (mg/l)	30	25	20	35	20
COD (mg/l)	125	125	-	90	90
Total Suspended Solids (mg/l)	50	35	-	25	25
Total Nitrogen (mg/l)	10	10	-	-	10
Total Phosphorus (mg/l)	2	1	-	-	1



#### V.3.6.5. Impacts of the Construction Phase

During the construction phase of the project, the water requirement will be very low. The water requirement within the scope of the project will be provided from the water network. For this reason, no direct impact on surface waters or groundwater is expected within the scope of the Project.

During the land preparation and construction phase of the project, the water to be used in dust suppression will be absorbed by the soil or will evaporate and disappear. For this reason, irrigation for dust suppression will not create surface runoff or wastewater generation will occur.

Domestic wastewater produced within the scope of the project will be sent to the wastewater system via the existing network and will be disposed of.

As a result, the significance of impacts on water resources during the construction phase is considered to be “low”.



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#### ***V.3.6.6. Impacts of the Operation Phase***

Since the planned Fethiye Advanced Biological Wastewater Treatment Plant will have advanced treatment units, it is predicted that the wastewater treatment plant's wastewater quality will be better than the legal limit values under normal working conditions. Along with the secondary treatment of nitrogen and phosphorus, other important pollutants to be treated will also reduce the risk of disease causing bacteria and viruses. Thus, an effective disinfection will be applied before discharge, in order not to have an impact on the tourism value of the region. In addition, with the realization of the Project, an increase in sea water quality is expected as secondary (advanced) treatment will be applied in the facility.

In the operation phase of the project, wastewater such as water originating from the surface cleaning of the project area and wastewater from personnel will be sent to the start of the plant for treatment. Thus, there will be no wastewater discharge during the operation phase of the project.

As a result, it was determined that the impacts of the Project during the operation phase will generally have a positive impact on the water resources. However, measures should be taken to prevent an unexpected deterioration in the receiving environment quality.

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#### ***V.3.6.7. Mitigation Measures to be taken during Land Preparation and Construction Phase and Operation Phase***

During the land preparation and construction phase of the project, the water to be used in dust suppression will be absorbed by the soil or will evaporate and disappear. Therefore, no surface runoff or wastewater generation will occur due to irrigation for dust suppression.

Domestic wastewater produced within the scope of the project will be sent to the wastewater system via the existing network and will be disposed of.

Durable concrete will be used in order to ensure the leak-proofness of the units of the project that are in contact with water, wastewater and chemicals by taking into account the appropriate cement ratio. Thus, there will be no leakage to soil and groundwater during the operation phase of the Project.

In the operation phase of the project, the following measures will be taken:

- a. MUSKI will aim to minimize bypass.
- b. The wastewater quality of the wastewater treatment plant will comply with applicable national requirements or internationally accepted standards and will be monitored continuously.
- c. System overflows will be avoided as much as possible using level measurement devices.



At all stages, the Project will follow national legislation provisions, the World Bank Group EHS Guidelines and international good practice.

#### ***V.3.6.8. Summary of Assessment and Residual Impacts***

A summary of the impact assessments on water resources is presented in Table V-27. The significance of the identified impacts before and after the implementation of mitigation measures are also given in this table.

**Table V-27. Impact Assessment Summary Table on Water Resources**

Affected Component	Phase	Definition of Potential Impact	Impact Type	Impact Significance (Before Mitigation)	Mitigation Measures to be Taken	Significance of Residual Impact
Water Resources	Land Preparation and Construction	Water requirement and wastewater production	Adverse	Low	<ul style="list-style-type: none"> <li>No surface runoff or wastewater generation will occur due to irrigation for dust suppression.</li> <li>Domestic wastewater produced within the scope of the project will be sent to the wastewater system via the existing network and will be disposed of. Durable concrete will be used in order to ensure the leak-proofness of the units of the project that are in contact with water, wastewater and chemicals by taking into account the appropriate cement ratio.</li> </ul>	Low
	Operation	Water requirement and wastewater production	Adverse	Low	<ul style="list-style-type: none"> <li>MUSKI will aim to minimize bypass.</li> <li>The wastewater quality of the wastewater treatment plant will comply with applicable national requirements or internationally accepted standards and will be monitored continuously.</li> <li>System overflows will be avoided as much as possible using level measurement devices.</li> </ul>	Low

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### V.3.7. Wastes

Different types of wastes will be generated during the project lifetime, including wastes to be generated as a result of construction and operation activities, and household wastes to be created in line with the needs of working personnel. To prevent waste-induced impacts on soil, water resources and flora-fauna elements, all waste generated during the land preparation, construction and operation phases of the Project must be properly managed in line with the requirements of national waste management legislation and international good practice. This Chapter describes the waste to be produced within the scope of the project and evaluates the impacts associated with waste generation. Waste management to be implemented according to relevant Turkish legislation and international standards (for example World Bank Group HSE Guidelines) is also described in this section.

Possible sources of various types of waste are listed below:



- Municipal solid waste
- Packaging waste such as wood, paper, cardboard and plastic
- Hazardous and special types of waste such as contaminated containers, rags, waste batteries, accumulators, waste oils, etc. that may occur during the land preparation, construction and operation phases of the project
- Excavation and construction wastes
- Final treatment sludge

#### V.3.7.1. Land Preparation and Construction Phase Impacts

During the land preparation and construction phases of the project, activities such as cleaning vegetation, leveling the area, construction of the units, supply, transportation and installation of the equipment will be carried out.

Solid waste types expected to be generated within the scope of the activities are; municipal waste, packaging waste of equipment (for example wood, cardboard, plastic, etc.), hazardous waste, special type waste, excavation and construction waste (for example scrap metal, wood, concrete waste, etc.) and system equipment waste (boards, cables electronic components). Hazardous and special types of wastes may include chemicals (for example paint, solvent) or packaging materials, rags contaminated with oils, waste oils resulting from the operation and maintenance of machinery, solvents, accumulators, batteries and filters.

According to the waste lists given in the annexes of Waste Management Regulation, waste types and waste codes that may occur in the site preparation and construction phase of the Project are listed in Table V-28.

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**Table V-28. List of Possible Waste Types to be Generated During Land Preparation and Construction Phase**

Waste Code	Waste Code Definition
13	<b>Oil Wastes and Liquid Fuel Wastes (excluding cooking oils, 05 and 12)</b>
13 02	Waste Engine, Transmission and Lubricating Oils
15	<b>Waste Packaging and Absorbents, Wiping Cloths, Filter Materials and Protective Clothing</b>
15 01	Packaging (Including Separate Packaging Wastes of the Municipality)
15 02	Absorbents, Filter Materials, Cleaning Cloths and Protective Clothing
16	<b>Wastes Not Specified Otherwise in the List</b>
16 06	Batteries and Accumulators
17	<b>Construction and Demolition Waste (Including Excavation Extracted from Contaminated Areas)</b>
17 01	Concrete, Brick, Tile, Ceramic
17 02	Wood, Glass and Plastic
17 04	Metals (Including Alloys)
17 05	Soil (Including Excavation Made in Contaminated Places), Stones and Dip Dredging Muds
17 06	Insulation Materials and Construction Materials Containing Asbestos
17 09	Other Construction and Demolition Waste
20	<b>Municipal Wastes Including Separate Fractions (Residential and Similar Commercial, Industrial and Institutional Wastes)</b>
20 01	Separated Fractions (except 15 01)
20 03	Other Municipal Waste

Within the scope of the Waste Management Regulation, municipal wastes are related to commercial, industrial and institutional waste content similar to domestic waste or domestic waste or the 20th waste code of the Waste List in Annex-4 of the Regulation and the responsibility belongs to the municipality.

According to TURKSTAT's municipal waste statistics in 2014, the average daily municipal waste per capita was calculated as 1.08 kg (TURKSTAT, 2014). Estimated amount of municipal waste that will occur during the land preparation and construction phase of the project is given below according to the number of people working in the field. This amount includes paper, cardboard, glass, metal, plastic, etc. It also includes biodegradable waste with separately collected fractions, such as:

- 80 people x 1.08kg/person\*day = 86.4 kg/day

There will be no dining hall at the construction site. Therefore, there will be no waste related to food preparation within the scope of the Project. Food needs will be provided through catering.

The general composition of municipal waste in Turkey is given below according to the results of the solid waste composition determination study made within the scope of the Solid Waste Master Plan Project. 34% of municipal waste consists of kitchen wastes. Separately collectable and recycled fractions such as paper, cardboard, bulky cardboard, plastic, glass and metal make up 25% of municipal waste.

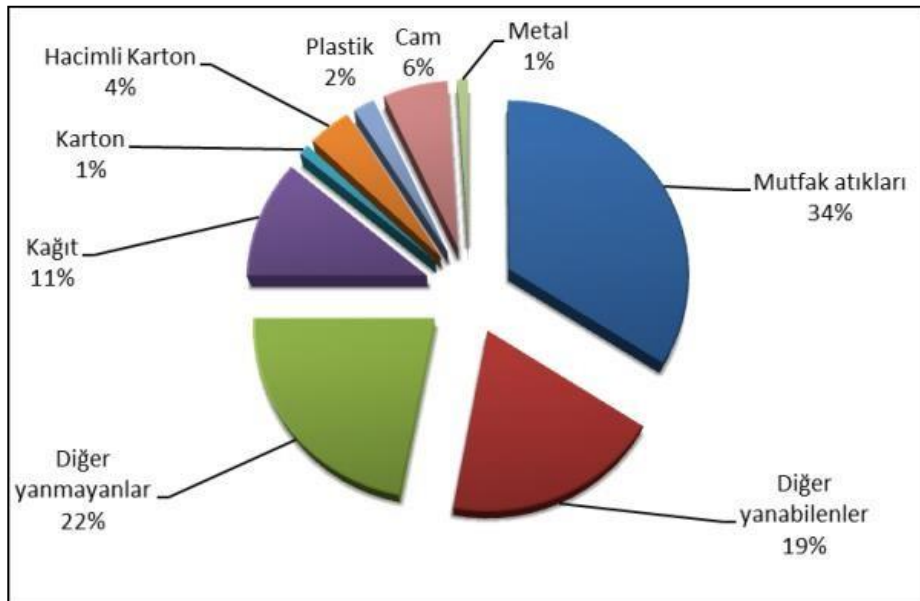




Figure V-4: Municipal Waste Composition (former Ministry of Science, Industry and Technology, 2014)

Considering the information given in Figure V.19, this also applies to municipal waste to be produced under the Project. The only difference will be the percentage of kitchen waste, as there will be no kitchen / dining hall at the construction site. The composition of municipal waste will be as follows (food waste is considered to be 5%):

- Food Waste: : %5
- Other Flammable Materials : %27
- Other Non-Flammable Substances : %31
- Paper : %16
- Cardboard : %2
- Bulk Cardboard : %6
- Plastic : %3

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- Glass : %8
- Metal : %2

Accordingly, it can be said that approximately 4.3 kg of food waste and 32 kg of collected and recyclable waste can be produced per day during the land preparation and construction phase of the Project.

Throughout the land preparation and construction activities, there will be no vegetable waste oil production as there will be no refectory. Since the replacement of the tires of construction machinery and other vehicles will be made in the facilities located for this purpose in the region, the production and storage of completed tires will not occur.

In addition, since there is no infirmary in the Project site, the nearest health center will be used for medical interventions in case of an unexpected accident during the activities. Therefore, no substantial medical waste will be generated under the Project. A negligible amount of medical waste may be generated due to first aid practices.

The annual amount of waste batteries per capita in Turkey is and this value corresponds to 140 grams (Ministry of Environment and Forestry, General Directorate of Environmental Management, 2009). Accordingly, the amount of annual waste batteries produced by 80 people during the land preparation and construction phase of the Project has been calculated as 11.2 kg.



As mentioned above, no significant impact due to waste generation is expected due to the nature and scale of the Project. For this reason, the significance of the impact that will occur during land preparation and construction stages is considered as "low". However, in order to prevent and/or minimize potential impacts, the following sections provide mitigation measures.

#### ***V.3.7.2. Operation Phase Impacts***

25 workers will be employed in the project's operation phase. Therefore, municipal waste generation will be 27 kg/day and using the same approach as in land preparation and construction, the recyclable portion of the municipal waste and the amount of food waste will be 10 kg/day and 1.35 kg/day, respectively. In addition, in addition to recycling municipal waste, recyclable waste such as packaging waste, paper, cardboard, plastic and scrap metals are expected to be taken into account.

Waste generation may result from damaged, defective or expired equipment, and materials that can be replaced and controlled during periodic maintenance or maintenance and repair activities performed in the event of a malfunction. In addition, the supply of new equipment (such as flocculants, disinfectants, etc.) will lead to the emergence of packaging waste. In addition, personal protective equipment, clothing and cloth pieces used during maintenance and repair work may result in limited waste.



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In the operational phase of the project, there will be limited amount of waste oil production due to oil change of equipment such as blower.

Table V-29 lists the waste types and waste codes that may occur during the operational phase of the Project, according to the waste lists given in the Waste Management Regulation's Annex.



**Table V-29. List of Possible Waste Types to be Generated During Operation Phase**

Waste Code	Waste Code Definition
<b>13</b>	<b>Oil Wastes and Liquid Fuel Wastes</b>
13-02	Waste Engine, Transmission and Lubricating Oils
13 03	Waste Insulation and Heat Conduction Oils
<b>15</b>	<b>Waste Packaging and Absorbents, Wiping Cloths, Filter Materials and Protective Clothing</b>
15 01	Packaging (Including Separate Packaging Wastes of the Municipality)
15 02	Absorbents, Filter Materials, Cleaning Cloths and Protective Clothing
<b>16</b>	<b>Wastes Not Specified Otherwise in the List</b>
16 02	Electrical and Electronic Equipment Waste
16 06	Batteries and Accumulators
<b>19</b>	<b>Waste from Waste Management Facilities, Offsite Wastewater Treatment Plants and Water Preparation Facilities for Human Consumption and Industrial Use</b>
19 08	Wastewater Treatment Plant Wastes Not Described otherwise
<b>20</b>	<b>Municipal Wastes Including Separate Fractions (Residential and Similar Commercial, Industrial and Institutional Wastes)</b>
20 01	Separated Fractions (except 15 01)
20 03	Other Municipal Waste

### **Waste Sludge Management**

The amount of sludge, which is approximately 20% dry, is 25 tons per day from Fethiye WWTP, and the excess sludge left daily is 700 cubic meters.

Regular storage is carried out in the field, and the relevant company from which the sludge is delivered also has competence and license certificates. Until the planned sludge drying & incineration facility is built, disposal is carried out annually with the disposal firms in a tender procedure.

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The most important waste that will be generated as a result of the activities of the wastewater treatment plant is screening wastes and sludge. Daily sludge flow to be sent to dewatering is, including current project, 1561 m<sup>3</sup>/day, and the daily dewatered sludge flow is 113.82 m<sup>3</sup>/day. The sludge to be formed is expected to have a density of approximately 6%. Treatment sludge will be sent to the stabilization unit first and then dewatering and then the solid content will be increased by thermal drying method. The solids content of the sludge will be increased to 25% after dewatering. The dewatered sludge will be directed to the sludge drying unit with the help of conveyors. After drying, the solids content of the sludge will be increased to 90%. The water removed from the sludge cake will be sent back to WWTP's entrance for purification. After drying, the sludge cake will be transferred to a closed and suitable container through the conveyor belt. Sludge, after drying, is firstly collected with trucks and sent to regular storage facilities through licensed companies.



Similarly, closed containers for final disposal will be transported by licensed transportation companies to licensed disposal facilities designated by the relevant authority. Regular storage operations are carried out at the licensed disposal facilities in question, and said waste sludge will be subject to the following operations;

1. Condensation
2. Minimization (Alkali, Ultrasonication, Microwave, Thermal, Enzyme, Ozonization)
3. Stabilization (Aerobic thermophilic, Anaerobic thermophilic, Compostization, Aerobic Mesophilic, Anaerobic Mesophilic, Lime, Pasteurization)
4. Treatment-Dewatering

#### Drying

MUSKI continues to explore more sustainable ways of sludge disposal. In this context, there is a possibility that the sludge to be formed will be directed to the sludge incinerator that MUSKI plans to establish. When MUSKI finds a better, sustainable and feasible solution for this issue in the future, it will share this information with Muğla Provincial Directorate of Environment and Urbanization and request its approval for its implementation.

In this context, MUSKI will prepare a Sludge Management Plan including the procedures to be followed and will make this management plan available before the operation.

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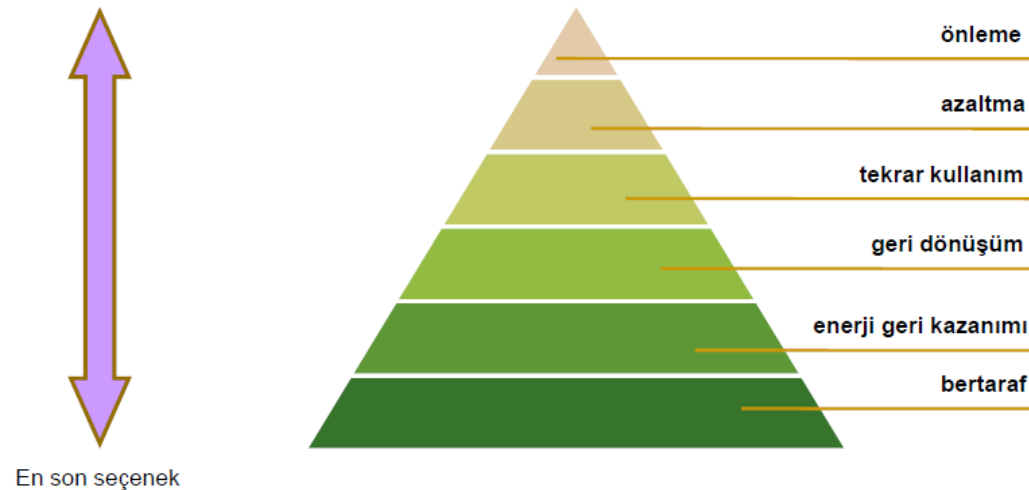
It will require the use of trucks to move the sludge from the WWTP to the nearest storage area. These vehicles are an emission source that will affect the air quality. There is a potential risk of soil contamination and odor emissions if the vehicles are not completely closed during transport. In general, air emissions from mud transport are of low importance.



Due to the nature and scale of the project, a significant impact due to waste generation is not expected. For this reason, the significance of the impact at the operation stage is considered to be “low”. However, mitigation measures will be proposed in the following sections to prevent and/or minimize potential impacts.

#### **V.3.7.3. Mitigation Measures to be taken during Land Preparation and Construction Phase and Operation Phase**

During the construction and operation phase, the wastes produced within the scope of the project will be managed in accordance with the waste management hierarchy. Within the scope of the waste management system to be established in line with the waste management hierarchy presented in Figure V-5, the basic principles to be adopted for waste management at the site begin with the prevention of waste at the source. In cases where it is not possible to prevent at its source, respectively alternatives such as minimizing waste generation, choosing materials that will not cause hazardous waste as much as possible in the selection of materials, collecting wastes separately according to their types (hazardous, non-hazardous, recyclable, etc.), ensuring the reuse of the generated wastes as much as possible, and where reuse is not possible, recycling and energy recovery. In the last step of the waste management hierarchy, in cases where reuse, recycling and energy recovery are not possible, ensuring the final disposal of waste in accordance with the relevant regulations. Moreover, MUSKİ and Contractor will prepare a waste management plan for the construction and operation phases of the project.

En öncelikli seçenek





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**Figure V-5: Waste Management Hierarchy**

The wastes to be generated within the scope of the project will be collected in closed containers suitable for the type of waste before the final disposal and stored in the Temporary Storage Area to be constructed within the project area. In this way, wastes will be protected from external conditions (for example, wind, rain, heat, etc.). Containers will be labeled for storage purposes. The general principles to be taken as basis in the management of wastes that will occur within the facility are summarized below:

- Wastes will be stored only temporarily on site, and final disposal will take place outside the facility.
- Recycling, transportation and disposal of waste will be carried out through licensed companies and/or relevant municipalities.
- It will definitely not be possible to burn or bury waste in the field, and to dispose of waste on nearby roads or water resources.
- Throughout the project, all practices that would put personnel or public health at risk will be avoided in all activities related to the collection, temporary storage, transportation and disposal of waste.
- Wastes that will be stored temporarily in the field will be delivered to licensed and suitable type of transportation vehicles to be removed from the site. Information regarding the transactions within this scope will be recorded and the records will be kept in the administrative building.

Limited amount of hazardous and special wastes likely to occur within the scope of the project (for example, waste electronic devices/parts, cables, filters, chemicals or packaging contaminated with oils or oils such as paint and solvents, rags, protective clothing etc.) will be stored in the Temporary Storage Area in special sections in containers separated from non-hazardous wastes. This area will have an impermeable base, be protected against surface runoff water and rain, and be drained as required. Hazardous or non-hazardous waste phrase, waste code, amount of stored waste, storage date and amount will be displayed on the wastes that are classified according to their characteristics. With the measures to be taken in the Temporary Storage Area, the wastes will be prevented from reacting with each other. Temporary storage permit will be obtained in Muğla Provincial Directorate of Environment and Urbanization for the storage of waste other than municipal waste and packaging waste (for example hazardous and other special wastes) in the Temporary Storage Area.

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In the temporary storage of waste, its transportation to disposal facilities and its final disposal, the provisions of the legislation in force will be complied with. The wastes to be generated within the scope of the project will be managed in accordance with the relevant legislation, and the current legislation on waste management is listed below.

- Packaging Waste Control Regulation
- Regulation on Control of Waste Electrical and Electronic Items
- Waste Management Regulation
- Regulation on Control of Waste Batteries and Accumulators
- Waste Oil Control Regulation
- Regulation on Control of Excavation Soil, Construction and Debris Wastes
- Regulation on the Control of Medical Wastes

### **Waste Sludge**

Waste sludge will be dried and stored by licensed companies. In this context, waste sludge analysis should be carried out in line with the parameters specified in Annex 2 of the “Regulation on Regular Storage of Waste” published in the Official Gazette dated 26.03.2010 and numbered 27533, and the final disposal method should be determined according to the results of the relevant analysis. Attention should be paid to the provisions of the Provisional Article 4 of the “Regulation on the Amendment of the Regulation on the Regular Storage of Waste”, which was published in the Official Gazette dated 11.03.2015 and numbered 29292.

Sludge transfer systems, such as conveyors, screw pumps and channels, will be kept clean to avoid odor.



In addition, the drying process in the dry season will be processed and dried properly.

The trucks will be covered to prevent odor during transportation.

Within the scope of the project, the sludge will be collected from the facility by the licensed disposal companies determined by MUSKI every year. Treatment sludge will be collected from the facility by transportation vehicles of licensed companies and disposed of. During the operation phase, documents related to the amount of sludge sent to the licensed disposal company will be prepared and related documents will be recorded within the scope of monitoring.

**Tablo V-30. Impact Assessment Summary Table on Waste Management**

Affected Component	Phase	Definition of Potential Impact	Impact Type	Impact Significance (Before Mitigation)	Mitigation Measures to be Taken	Kalan Etkinin Önemi
Waste Management	Land preparation and construction	Excavation formation and existing waste management infrastructure	Adverse	Low	<ul style="list-style-type: none"> <li>Excavation Soil will be transferred to the Excavation storage area of the relevant Municipality (Muğla MM or Fethiye Municipality) after being temporarily stored in the WWTP area within the scope of the Regulation on Control of Construction and Debris Wastes.</li> </ul>	Low
	Land preparation and construction and Operation	Waste generation and impact on existing waste management infrastructure	Adverse	Low	<ul style="list-style-type: none"> <li>Wastes will be stored only temporarily on site, and final disposal will take place outside the facility.</li> <li>Recycling, transportation and disposal of waste will be carried out through licensed companies and / or relevant municipalities.</li> <li>It will definitely not be possible to burn or bury waste in the field, and to dispose of waste on nearby roads or water resources.</li> <li>Throughout the project, all practices that would put personnel or public health at risk will be avoided in all activities related to the collection, temporary storage, transportation and disposal of waste.</li> <li>Wastes that will be stored temporarily in the field will be delivered to licensed and suitable type of transportation vehicles to be removed from the site. Information regarding the transactions within this scope will be recorded and the records will be kept in the administrative building.</li> </ul>	Low
	Operation	Waste Mud Formation	Adverse	Low	<ul style="list-style-type: none"> <li>Waste sludge will be dried and stored by licensed companies. In this context, waste sludge analysis should be carried out in line with the parameters specified in Annex 2 of the "Regulation on Regular Storage of Waste" published in the Official Gazette dated 26.03.2010 and numbered 27533, and the final disposal method should be determined according to the results of the relevant analysis.</li> <li>Mud transfer systems, such as conveyors, screw pumps and channels, will be kept clean to avoid odor.</li> <li>In addition, the drying process in the dry season will be processed and dried properly.</li> <li>The trucks will be covered to prevent odor during transportation.</li> </ul>	Low

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## V.4. Impacts on the Biological Environment

### 1. Habitat

Turkey, although has a much smaller area than Europe, is extremely rich both in biodiversity and terrestrial habitat diversity. Biodiversity is directly proportional to habitat diversity. The greater the variety of habitats in any region or country, the greater the species diversity. Because the living things prefer suitable habitats for their own lives. The main reasons for the surplus of habitat diversity in Turkey are given as follows; being under the influence of 3 different plant geography (Mediterranean, Euro-Siberian, Iranian-Turan), having the effects of three different bioclimatic type (Mediterranean, Oceanic, Terrestrial), soil is more than the bedrock diversity, differences in altitudes varying between 0-5000 m, it is not impacted from the ice age as much as Europe and these increase the habitat diversity.

Since the project is a point project, habitat diversity is weak. 2 different habitats were identified at EUNIS level 2, which represents terrestrial habitats in a 1 km diameter area (Table V-28 and Figure V-6).

Table V-31. EUNIS 2 Level habitat types determined in an area of 1 km diameter

NO	EUNIS CODE	EUNIS HABITAT TYPE
1	G5	Tree lines, small anthropogenic woodland, recently cut woodland, early woodland and swamp
2	H2	Rubble
3	J1	City, town and village buildings
4	J4	Transport networks and other built hard surface areas

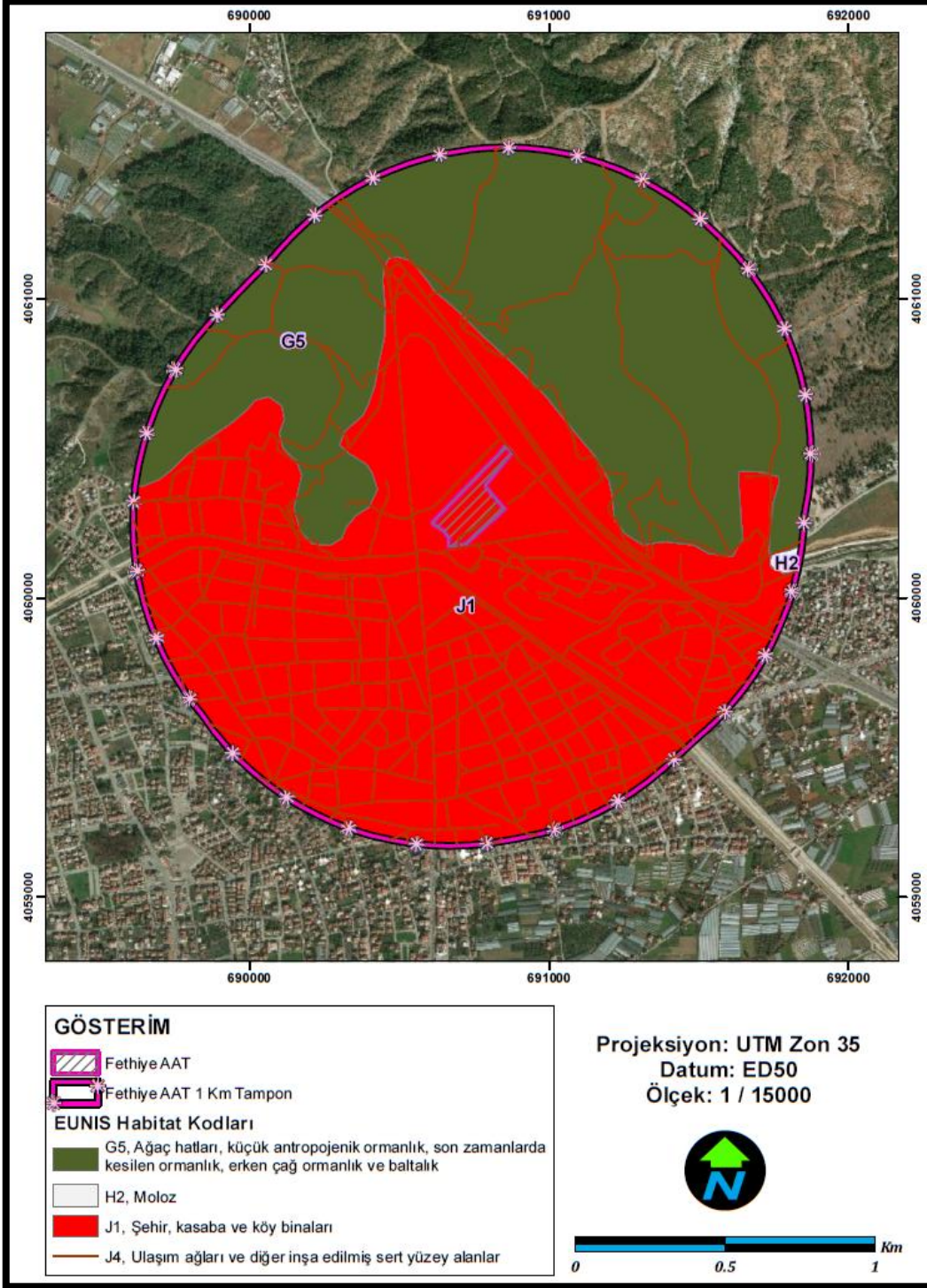




Figure V-6: EUNIS 2 Level habitat types determined in an area of 1 km diameter



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## Critical Habitats

Critical habitats are areas with high biodiversity value. These are;

- Habitats of great importance for species in the CR and/or EN category,
- Habitats of great importance for endemic and / or narrow spread species,
- Habitats with significant migratory species on a global scale and / or species are concentrated heavily,
- rare ecosystems that are highly threatened and/or unique in the world, and/or
- areas related to basic evolutionary processes (IFC, 2012).

Critical habitats are areas of high biodiversity value that may include at least one or more of the five values specified in Performance Standard 6 and/or other recognized high biodiversity values. Critical habitat criteria are as follows and should form the basis of all critical habitat assessments:

Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species

Criterion 2: Endemic and/or limited distribution species

Criterion 3: Migrant and/or colony-forming species

Criterion 4: Highly threatened and/or unique ecosystems

Criterion 5: Basic evolutionary processes



### *Criterion 1: Critically Endangered (CR) and Endangered (EN) Species*

Species that are threatened with extinction at the global level and are included in the CR and EN category in the Red List of IUCN Threatened Species are considered part of Criterion 1. Critically Endangered species face an extremely high risk of extinction in natural life. Endangered species face a very high risk of extinction in natural life.

Regarding Criterion 1, Cat 1 sub-criteria are defined as follows:

- Where a species included in the IUCN Red List as CR or EN has known and regular spreads and a habitat can be considered a discrete management unit for this species, it is the habitat required to maintain at least 10% of the global population of this species.
- Habitat, which has known and regular spreads of a species in the category CR or EN, and is one of the 10 or fewer discrete management units globally for this species.

Regarding Criterion 2, Cat 1 sub-criteria are defined as follows:

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- Habitat supporting the regular spread of a single individual of a species in the CR category in the IUCN Red List and / or containing regionally important communities of a species in the EN category in the IUCN Red List, which can be considered as a discrete management unit for this species.
- Habitat in the CR or EN category, which is of particular importance for species with a wide spread and/or population distribution of which is not well known, and that their long-term survival if potentially lost will potentially be affected.
- As appropriate, habitat containing important communities of species in the EN, CR or equivalent national / regional listing categories at the national / regional level.

#### *Criterion 2: Endemic and Limited Distribution Species*

An endemic species is defined as a species in the country or region where at least 95% of its global spread is analyzed. The sub-criteria for Floor 1 for Criterion 2 are defined as follows:

- A habitat that is known to survive at least 95% of the global population of an endemic or limitedly distributed species and can be considered as a discrete management unit for this species.

The sub-criteria for Floor 2 for Criterion 2 are defined as follows:



- A habitat that is known to survive at least 1% but less than 95% of the global population of an endemic or narrow-sprawled species in cases where sufficient data is available and / or expert opinion, and can be considered as a discrete management unit for this species.

#### *Criterion 3: Species Forming Immigrants and Colonies*

Migrant species are defined as the majority of its members move cyclically and predictably from one geographic area to another (within the same ecosystem).

Colony-forming species are defined as species that group individuals cyclically or in other regular and/or predictably large groups. For example:

- Species forming colonies,
- Species that form colonies for reproductive purposes and/or combine multiple individuals for non-reproductive purposes at the same time (for example, finding food, accommodation),
- Species moving through narrow passage areas and passing a large number of individuals within a short period of time (for example, during migration),

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- Species with large but clustered distributions in which a large number of individuals are gathered in one or more areas, but the rest of the species is widely spread,
- Source populations in which certain sites contain populations that disproportionately contribute to the reinforcement of species elsewhere.

The sub-criteria for Floor 1 for Criterion 3 are defined as follows:

- A habitat known to be a discrete management unit for this species, which is known to migrate or collect at least 95% of its global population at any point in its life cycle cyclically or in another order.



The sub-criteria for Floor 2 for Criterion 3 are defined as follows:

- In cases where sufficient data are available and / or depending on the expert opinion, a migrant or collected species is known to cyclically or at least 1% of its global population survive at any point in its life cycle, but less than 95%, Habitat, which can be considered as a discrete management unit for.
- A conditional threshold value for species with large but clustered distributions is set at least 5% of the global population for both land and marine species.

#### *Criterion 4: Highly Threatened and/or Unique Ecosystems*



Highly threatened or unique ecosystems are: (i) receiving a risk of significant decline in area or quality; (ii) has a small spatial width; and / or (iii) ecosystems containing unique communities of species, including communities or groups of species limited to biome. Irreplaceable or determined to be of high priority / significance, or by UBÇSEP, based on systematic protection planning techniques applied at landscape and / or regional level by government agencies, recognized academic institutions and / or other relevant qualified organizations (including internationally recognized NGOs). Areas expressed in this way in existing regional or national plans are considered critical habitats in accordance with Criterion 4.

Highly threatened or unique ecosystems are identified by a combination of factors that determine the importance of conservation action. Factors similar to those used for the IUCN Red List are used to prioritize rare and endangered ecosystems. Ecosystem prioritization factors include long-term trend, rarity, ecological status and threat. All these values contribute to the relative biodiversity and conservation value of a particular ecosystem. IUCN's Ecosystem Management Commission is attempting to bring together criteria and categories for threatened ecosystems.

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#### *Criterion 5: Basic Evolutionary Processes*

Structural features of a region such as topography, geology, soil, temperature and vegetation, and combinations of these variables can affect the evolutionary processes that lead to regional grouping and ecological features of the species. In some cases, the unique or peculiar spatial characteristics of the landscape are associated with genetically unique populations or subpopulations of plant and animal species. Physical or spatial properties are described as substitutes or spatial catalysts for evolutionary and ecological processes, and these properties are often associated with diversification of species. Preserving these fundamental evolutionary processes and occurring species (or sub-populations of species) naturally occurring in a landscape has become one of the main focuses in conservation of biological diversity and especially genetic diversity in the last 10-20 years. By maintaining the diversity of the species in a landscape, the processes that enable the formation of new species and the genetic diversity within the species provide evolutionary flexibility in a system, and this flexibility is particularly important in a rapidly changing climate.

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Critical habitat criteria are presented below.

Table V-32. Critical Habitat Criteria

Criterion	Description	Explanation	Data input
1	1. Critical (CR) / Endangered (EN) Species	Globally threatened species in the CR and EN category according to the IUCN Red List, or species that are included in the national or regional lists but without the hazard category according to IUCN.	Target species, or IUCN Red Book of Turkey (Birds, Butterflies and Flora), according to the EN C category and type, was examined under Criterion 1.
2	Endemic and limited-range species,	At least 95% of the global population of the species lives in the endemic species, the country or region analyzed.	Target species, endemic and limited area distribution according to IUCN or local expert opinion were examined under Criterion 2.
3	Migrant and/or colony-forming species	Migrant species are species whose vast majority of their members move cyclically and predictably from one geographic area to another (within the same ecosystem).	The bird species identified as target species are in migration behavior and are examined under Criterion 3.
4	Highly threatened and/or unique ecosystems	Highly threatened or unique ecosystems are: (i) receiving a risk of significant decline in area or quality; (ii) has a small spatial width; and / or (iii) ecosystems containing unique communities of species, including communities or groups of species limited to biome.	Besides Ramsar Areas, Important Bird Areas (IBA), Important Plant Areas (ÖBA), Important Butterfly Areas (ÖKEA), most of the Important Nature Areas (KBA) are evaluated as critical habitats with high biodiversity areas on a national scale (Guidance note 57).  National Parks, wetlands, YHGSs, KBA, ÖBA, ÖKA, ÖKEA's located in the LSA were examined under Criterion 4.
5	Basic evolutionary processes	In this criterion: (i) areas associated with a particular evolutionary process, a physical feature of the landscape it carries, and / or (ii) subpopulations of the species are phylogenetically or morphogenetically distant, or species with particular evolutionary concern in their evolutionary history. The second category includes evolutionarily important units (ESUs) and evolutionarily distinct and globally endangered (EDGE) species.	The number of endemic species in Turkey are quite numerous and are analyzed in areas with high rates of endemism. In addition, there are Serpentine steppes and gypsum steppes located in the EEA. These areas feature the basic evolutionary process areas that give their characteristic characteristics to the unique plant species they carry.  Analysis of these areas together with EDGE species has been examined under Criterion 5.



As a result of the detailed literature and field studies, no critical habitats were identified as a result of the evaluation according to the 5 criteria described above according to IFC Criteria.

## 2. Flora

As a result of habitat-based field studies in the project area, 19 taxa belonging to 12 families were determined. The detected and possible species are given below.

**Table V-33. Plant species in the project area and its surroundings**

Family	Species	Name	Element	Endemism	Bern, CITES	Detection Method
Apocynaceae	<i>Nerium oleander</i> L.	Oleander	-	-	-	Observation
Asteraceae	<i>Crepis foetida</i> L.	Kohum	-	-	-	Observation
Asteraceae	<i>Tolpis virgata</i> (Desf.) Bertol.	Tolpis	Akd.	-	-	Observation
Boraginaceae	<i>Echium plantagineum</i> L.	Paterson's Curse	Akd.	-	-	Observation
Brassicaceae	<i>Hirschfeldia incana</i> (L.) Lagr.-Foss.	Shortpod Mustard	-	-	-	Observation
Brassicaceae	<i>Raphanus raphanistrum</i> L.	Great yellow gentian	-	-	-	Literature
Convolvulaceae	<i>Convolvulus arvensis</i> L.	Bindweed	-	-	-	Observation
Fabaceae	<i>Ononis adenotricha</i> Boiss.	Ononis	D.Akd	-	-	Observation
Fabaceae	<i>Trifolium campestre</i> Schreb.	Hare's-foot clover	-	-	-	Observation
Malvaceae	<i>Alcea heldreichii</i> (Boiss.) Boiss.	Alcea	D.Akd	-	-	Observation
Malvaceae	<i>Malva neglecta</i> Wallr.	Malva neglecta	-	-	-	Observation
Moraceae	<i>Morus alba</i> L.	White mulberry	-	-	-	Observation
Papaveraceae	<i>Papaver rhoeas</i> L.	Poppy	-	-	-	Observation
Poaceae	<i>Arundo donax</i> L.	Kargı	-	-	-	Observation
Poaceae	<i>Hordeum distichon</i> L.	Hordeum	-	-	-	Observation
Primulaceae	<i>Anagallis arvensis</i> var. <i>caerulea</i> (L.) Gouan	-	-	-	-	Observation
Primulaceae	<i>Anagallis arvensis</i> var. <i>arvensis</i> L.	Pimpernel	-	-	-	Observation

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Family	Species	Name	Element	Endemis m	Bern, CITES	Detection Method
Ranunculaceae	<i>Consolida orientalis</i> (J.Gay) Schrödinger	Morçişek	-	-	-	Literature
Ranunculaceae	<i>Adonis flammea</i> Jacq.	Adonis flammea	-	-	-	Literature

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19 taxa belonging to 12 families were identified within the project area and impact area. Within the project area and impact area; Apocynaceae is represented by 1 taxon, Asteraceae by 2 taxons, Boraginaceae by 1 taxon, Brassicaceae by 2 taxons, Convolvulaceae by 1 taxon, Fabaceae by 2 taxons, Malvaceae by 2 taxons, Moraceae by 1 taxon, Papaveraceae by 1 taxon, Poaceae by 2 taxons, Primulacea by 2 taxons.

While 2 of the identified plant species are in the Mediterranean and 2 in the Eastern Mediterranean phytogeographic region, the remaining species are cosmopolitan, the phytogeographic region is not fully known or widely distributed.

No endemic / rare / sensitive species were identified in the project area.

Images for the detected species are given below.



Figure V-7: *Alcea heldreichii* (Boiss.) Boiss. (Alakurtaran)



Figure V-8: *Anagallis arvensis* var. *caerulea* (L.) Gouan (blue-flowered) - *Anagallis arvensis* var. *arvensis* L. (Pimpernel) (Orange-flowered)





Figure V-9: *Convolvulus arvensis* L. (Tarlasmışı) )



Figure V-10: *Crepis foetida* L. (Kohum)



Figure V-11: *Echium plantagineum* L. (Kırkbatıran)



Figure V-12: *Hirschfeldia incana* (L.) Lagr.-Foss. (Nadasturpu)



Figure V-13: *Hordeum distichon* L. (ikiliarpa)



Figure V-14: *Malva neglecta* Wallr. (Çobançöreği)



Figure V-15: *Morus alba* L. (Akdut)



Figure V-16: *Ononis adenotricha* Boiss. (Karayandırak)





Figure V-17: *Papaver rhoeas* L. (Gelincik)



Figure V-18: *Tolpis virgata* (Desf.) Bertol. (Hoşkısı)



Figure V-19: *Trifolium campestre* Schreb. (Üçgül)



### 3. Fauna

#### Mammals

As a result of habitat-based studies, 9 mammal species belonging to 6 families were identified in the project area. These species, systematic information and protection status are given in Table V-31.

Table V-34. Mammal species in the project area and its surroundings

Scientific Name	Name	Endemism	IUCN	CITES	BERN	MAKK
<b>Suidae</b>						
(L) <i>Sus scrofa</i>	Wild boar	-	LC	-	III	II
<b>Rhinolophidae</b>						
(L) <i>Rhinolophus euryale</i>	Mediterranean horseshoe bat	-	NT	-	-	-
(L) <i>Rhinolophus ferrumequinum</i>	Greater horseshoe bat	-	LC	-	-	-
<b>Vespertilionidae</b>						
(L) <i>Pipistrellus pipistrellus</i>	Common pipistrelle	-	LC	-	-	-
<b>Erinaceidae</b>						
(G) <i>Erinaceus concolor</i>	Hedgehog	-	LC	-	-	-
<b>Cricetidae</b>						

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Scientific Name	Name	Endemism	IUCN	CITES	BERN	MAKK
(L) <i>Microtus arvalis</i>	Common vole	-	LC	-	-	-
(L) <i>Microtus guentheri</i>	Guenther's Vole	-	LC	-	-	-
<b>Muridae</b>						
(G) <i>Mus musculus</i>	House mouse	-	LC	-	-	-
(G) <i>Rattus rattus</i>	Rat	-	LC	-	-	-

(L): Literature

(G): Observation

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1 of 9 mammal species in the project area and impact area, which is likely to be due to its habitat feature, is included in the Bern Annex-III list. According to the IUCN Red List, there is 1 species in "NT" category and 8 in "LC" category. According to the Central Hunting Commission Decisions (MAK); 1 species are included in ANNEX-II list. There is no endemic species in the mammalian fauna detected in the project area and its immediate surroundings.

#### Target Species

As a result of the literature and field studies, the target type has not been determined within the scope of the project.

#### Birds

As a result of field studies based on habitat, 35 bird species belonging to 14 families were observed in the project area. These species, their systematic information and conservation status are presented below.

Table V-35. Bird species in the project area and its surroundings

Scientific Name	Name	Status	RDB	IUCN	CITES	BERN	MAKK
<b>Accipitridae</b>							
(L) <i>Aquila chrysaetos</i>	Golden eagle	Y	A.1.2	LC	II	II	-
(G) <i>Buteo buteo</i>	Hawk	Y	A.3	LC	II	II	-
(L) <i>Buteo rufinus</i>	Red Falcon	Y	A.3	LC	II	II	-
<b>Upupidae</b>							
(L) <i>Upupa epops</i>	Hoopoe	YZ	A.2	LC	-	II	-
<b>Apodidae</b>							
(G) <i>Apus apus</i>	Common Swift	T	A.3.1	LC	-	III	-
<b>Ciconiidae</b>							
(L) <i>Ciconia ciconia</i>	White Stork	YZ	A.3.1	LC	-	II	-
<b>Columbidae</b>							
(G) <i>Columba livia</i>	Rock dove	Y	A.5	LC	-	III	II
(G) <i>Columba palumbus</i>	Common Wood Pigeon	KZ	A.4	LC	-	-	II
(G) <i>Streptopelia decaocto</i>	Eurasian Collared Dove	Y	A.5	LC	-	III	I
<b>Falconidae</b>							
(L) <i>Falco naumanni</i>	Lesser Kestrel	T	A.2	LC	II	II	-
(L) <i>Falco tinnunculus</i>	Kestrel	Y	A.2	LC	II	II	-
<b>Alaudidae</b>							
(G) <i>Galerida cristata</i>	Crested Lark	Y	A.3	LC	-	III	I
(L) <i>Lullula arborea</i>	Forest Lark	KZ	A.3	LC	-	III	I
(G) <i>Melanocorypha calandra</i>	Calandra Lark	Y	A.5	LC	-	II	-
<b>Corvidae</b>							
(L) <i>Corvus corax</i>	Raven	Y	A.5	LC	-	III	I
(L) <i>Corvus frugilegus</i>	Rook	Y	A.5	LC	-	-	II
(L) <i>Corvus monedula</i>	Western Jackdaw	Y	A.5	LC	-	-	II
(L) <i>Garrulus glandarius</i>	Jay	Y	A.3.1	LC	-	-	II
(G) <i>Pica pica</i>	Magpie	Y	A.5	LC	-	-	II
<b>Emberizidae</b>							
(L) <i>Calcarius lapponicus</i>	Lapland Longspur	R	A.6	LC	-	II	-
(L) <i>Emberiza hortulana</i>	Ortolan Bunting	YZ	A.3	LC	-	III	I
(L) <i>Miliaria calandra</i>	Corn Bunting	Y	A.4	LC	-	III	I



Scientific Name	Name	Status	RDB	IUCN	CITES	BERN	MAKK
<b>Hirundinidae</b>							
(G) <i>Delichon urbicum</i>	Common House Martin	YZ	A.3	LC	-	II	-
(L) <i>Hirundo rupestris</i>	Eurasian Crag Martin	KZ	A.5	LC	-	II	-
(G) <i>Hirundo rustica</i>	Barn Swallow	YZ	A.5	LC	-	II	-
<b>Motacillidae</b>							
(L) <i>Anthus campestris</i>	Tawny Pipit	YZ	A.2	LC	-	II	-
(G) <i>Motacilla alba</i>	White Wagtail	Y	A.3.1	LC	-	II	-
(L) <i>Motacilla cinerea</i>	Grey Wagtail	KZ	A.2	LC	-	II	-
<b>Passeridae</b>							
(G) <i>Passer domesticus</i>	Sparrow	Y	A.5	LC	-	-	II
(L) <i>Passer hispaniolensis</i>	Spanish Sparrow	Y	A.3	LC	-	III	I
(L) <i>Passer moabiticus</i>	Lesser Sparrow	Y	A.2	LC	-	III	I
(L) <i>Petronia petronia</i>	Rock Sparrow	Y	A.3	LC	-	II	-
<b>Sturnidae</b>							
(L) <i>Sturnus vulgaris</i>	Common Starling	KZ	A.5	LC	-	-	I
<b>Turdidae</b>							
(L) <i>Turdus pilaris</i>	Fieldfare	KZ	B.2	LC	-	III	I
(L) <i>Turdus viscivorus</i>	Mistle Thrush	Y	A.2	LC	-	III	I

(L): Literature

(G): Observation

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As a result of the studies, 35 bird species have been identified in the project area and its vicinity. According to the Bern Convention, 16 species are included in the Annex-II list and 12 species are in the Annex-III list. 7 species are not included in the Bern Convention supplement lists. According to the IUCN Red List, all of the species identified in the project area are in the “LC” category. According to the Central Hunting Commission Decisions (MAK); there are 11 types in the list of Annex-I and 7 types in the list of Annex-II. There is no endemic species in the ornithofauna identified in the project area and its immediate surroundings.

### Target Species

As a result of the literature and field studies, the target type has not been determined within the scope of the project.

### Reptiles

As a result of field studies based on habitat, 10 reptile species belonging to 7 families were identified in and around the Project area. Species identified, their systematic information and conservation status are presented below.

Table V-36. Reptile species in the project area and its surroundings

Scientific Name	Name	IUCN	CITES	BERN
<b>Testudinidae</b>				
(G) <i>Testudo graeca</i>	Tortoise	VU	II	II
<b>Agamidae</b>				
(G) <i>Stellagama stellio</i>	Stellagama	LC	-	II
<b>Gekkonidae</b>				
(G) <i>Hemidactylus turcicus</i>	Mediterranean House Gecko	LC	-	III
<b>Lacertidae</b>				
(G) <i>Lacerta trilineata</i>	Balkan Green Lizard	LC	-	II
(G) <i>Ophisops elegans</i>	Field Lizard	-	-	II
<b>Colubridae</b>				
(L) <i>Platyceps najadum</i>	Dahl's Whip Snake	LC	-	II
(L) <i>Zamenis situla</i>	House Snake	LC	-	II
<b>Natricidae</b>				
(L) <i>Natrix natrix</i>	Grass Snake, Ringed Snake	LC	-	III
(L) <i>Natrix tessellata</i>	Water Snake	LC	-	II
<b>Typhlopidae</b>				
(L) <i>Xerotyphlops vermicularis</i>	Blind Snake	-	-	III

(L): Literature

(G): Observation

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As a result of the studies, it has been determined that 10 reptile species can show distribution in the project area and its immediate surroundings. According to the Bern Convention; 7 species are in Annex-II list and 3 species are in Annex-III list. According to the IUCN Red List, there is 1 species in "VU" category and 7 in "LC" category. 2 species have not been evaluated in the "NE" category, that is, according to the IUCN categories. There is no endemic species among the reptile species identified in the project area and its immediate surroundings.



### Target Species

As a result of the literature and field studies, the target type has not been determined within the scope of the project.

### Amphibians

As a result of habitat-based studies, 7 amphibian species belonging to 4 families were observed in and around the project area. These species, their systematic information and conservation status are presented below.



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**Table V-37. Amphibian species in the project area and its surroundings**

Scientific Name	Name	IUCN	CITES	BERN
<b>Bufonidae (Real Land Frogs)</b>				
(G) Bufo bufo	Common Toad	LC	-	III
(L) Bufotes variabilis	Variable Toad	DD	-	III
<b>Hylidae (Main Tree Frogs)</b>				
(L) Hyla savignyi	Levantine Tree Frog	LC	-	III
<b>Ranidae (Real Water Frogs)</b>				
(L) Pelophylax bedriagae	Levant Water Frog	LC	-	III

(L): Literature

(G): Observation

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9. Mulder, J. (1995). Herpetological Observations in Turkey (1987-1995). Deinsea 2, Pp. 51-66
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As a result of the studies, it has been determined that 4 amphibian species are distributed in the project area and its vicinity. There are no endemic species among the amphibians identified in the project area and its immediate surroundings. According to the Bern Convention; It is included in the Annex-III list of 4 types of distribution in the area. According to the IUCN Red List, 1 species is in "DD" and 3 species are in "LC" category.

#### Target Species

As a result of the literature and field studies, the target type has not been determined within the scope of the project.

When the project is evaluated in general, it is not anticipated that a negative situation will occur on biological diversity. It will be appropriate to monitor the analysis of the water, which will be discharged to the receiving environment only after the treatment process to be carried out within the scope of the project. The waters collected through the canal are then poured into the marine environment. These areas are important as a feeding, sheltering and breeding area for many living species. For this reason, the discharge criteria of the Water Pollution Control Regulation and the Urban Wastewater Treatment Regulation must be complied with.

If the discharge criteria specified in section V.3.6 are met, no adverse impact on the ecological environment is expected within the scope of the project.



Figure V-20: Existing discharge point



Figure V-21: Existing collection channels





Figure V-22: Discharge to Marine Environment

The project area is located in Fethiye Göcek Special Environmental Protection Area. With a general assessment, the existing settlement and its surroundings are located within the Special Environmental Protection Area. Within the scope of the project to be performed within the existing facility, the treatment discharge to be made should be made in accordance with the “Water Pollution Control Regulation” and the “Urban Wastewater Treatment Regulation” in order not to have any impact on the Special Environmental Protection Area and monitored seasonally.

## V.5. Impacts on Socio-Economic Environment

### V.5.1. Transportation Network

There is no need for the construction of new roads or improvement on the roads within the scope of the project. The existing transportation infrastructure is also sufficient for the realization of the rehabilitation project.

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Land preparation and construction phase of the Project will take approximately 24 months. In this context, no significant increase is expected on the vehicle load on the highways in the vicinity. However, the impact on the existing traffic load on the highways during the construction phase will only occur during the transportation of the excavation that will occur as a result of the equipment to the site and excavation activities.

### **Mitigation Measures**

If it is necessary to carry out the necessary applications for the control of the asphalt road situation at the border of the treatment plant area, MUSKI will be the first step in the negotiations and applications that should be made to the relevant authorities.

In cooperation with the relevant administration, MUSKI will ensure that necessary measures are taken and implemented in terms of the entrance-exit of the treatment plant and the safety of road traffic.

#### **V.5.2.Tourism**

Since the project will be constructed in a touristic region, it is important to evaluate the impacts on tourism.

The fact that the wastewater treatment capacity is constantly high is the primary requirement of the region as it is a touristic area. In addition, the summer houses in the region solve this problem in a primitive way such as septic tanks. During discharge of these tanks with sewage trucks, wastewater odor and leakage are very common.

While this method creates environmental problems among the residents of the region, it also causes financial and administrative burdens. It is anticipated that the realization of the project will contribute positively to the residents and investors.

#### **V.5.3.Local Supply**

If possible and feasible, priority will be given to local procurement at all stages of the Project, thereby creating a positive impact on the regional economy.



#### **V.5.4.Labor and Working Conditions**

As explained in the previous sections, it is planned that 80 people will work in the land preparation and construction phase of the Project, and 25 people will work together with the existing personnel during the operation phase. In recruitment, MUSKI will give priority to local people.

### **V.6. Labor and Working Conditions**

#### **V.6.1.Protection of the Workforce**

MUSKI will take the necessary measures against child labor and forced labor. In this context, persons under 18 years of age will not be employed at any stage of the Project.

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### V.6.2. Occupational and Community Health and Safety

The construction phase of the project includes the erection of the equipment and the use of the machines within this scope.

As explained in the Sectoral Guidelines for Water and Sanitation, working in sanitation facilities is often physically demanding and can involve hazards such as open water, trenches, slippery walkways, working at high altitude, powered circuits, and heavy equipment.



The nature of the work can also include entering limited areas, including manholes, sewer pipelines, storage tanks, wells, digesters and pumping stations.

Before the start of land preparation and construction works, MUSKI will prepare a site-specific OHS Management Plan for the Project based on construction site OHS risk assessment in line with Turkish Legislation listed below and international standards:

- Occupational Health and Safety Regulation (Official Gazette Date: 09.12.2003, Number: 25311)
- Regulation on Occupational Health and Safety in Construction Works (Official Gazette Date: 05.10.2013, Number: 28786)
- Implementing Regulation on Use of Personal Protective Equipment at Workplaces (Official Gazette Date: 02.07.2013, Number: 28695)
- Implementing Regulation on the Procedures and Principles of Employee Occupational Health and Safety Training (Official Gazette Date: 15.05.2013, Number: 28648)
- WBG EHS General Guidelines

The measures to be taken during the all phases are listed below:

- Entrance of the personnel and third persons to the plant will be controlled.
- Special security practices within the scope of the project will comply with the provisions of the Private Security Services Law and the Law on the Execution of Private Security Services.
- Personal Protective Equipment will be provided to the employees according to the nature of the job. Necessary trainings will be given.
- Smoking will be prohibited in areas where the risk of fire is high. All workers will be informed about the action plan on fire.
- All equipment will be operated in an appropriate working order.
- The procedures approved by MUSKI and the requirements of the technical specifications of the supplier companies will be followed for the maintenance and repair activities.
- An adequate OHS organisational structure will be defined, as defined by the local legislation and for 80 workers 2 OHS officers should be assigned to be at the site during working hours.

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- A risk assessment will be done before commencing the works and personnel will be trained regarding the risks.
- OHS Personnel will daily inspect the site and if any additional risk is observed. Relevant plans and trainings will be renewed.

## **V.7. Community Health and Safety**

### **V.7.1.Land Preparation and Construction Phase**

The construction phase of the project includes the usage of the equipment and the use of the machines within this scope. Before the start of land preparation and construction work, Contractor will prepare a site-specific Emergency Preparedness and Response Plan (EPRP) for the Project in accordance with Turkish Legislation and international standards:

- Occupational Health and Safety Regulation (Official Gazette Date: 09.12.2003, Number: 25311)
- Regulation on Occupational Health and Safety in Construction Works (Official Gazette Date: 05.10.2013, Number: 28786)
- Regulation on the Use of Personal Protective Equipment in Workplaces (Official Gazette Date: 02.07.2013, Number: 28695)
- Regulation on the Procedures and Principles of the Occupational Health and Safety Training of the Employees (Official Gazette Date: 15.05.2013, Number: 28648)

An Emergency Preparedness and Response Plan (EPRP) will be created against any emergency. The measures to be taken will be determined, and the employees will be provided to comply with the EPRP by providing the necessary trainings on these issues and to act in accordance with this plan.

The elements that should be included in the Emergency Response Plan are listed below:

- Determining the Emergency Response Team
- Making job descriptions
- Creating subordinate levels (rescue, first aid, intervention etc.)
- Identification of relevant institutions / organizations and coordination issues within itself
- Determination of the service (transportation, supplies, supply, maintenance etc.), allocation protocols that will need
- Determining the daily working principles of the personnel to work ,

The emergency response plan at the facility will also include the following topics;

- Occupational safety and first aid plans,
- Protection-safety and security plan for the facility and its surroundings against sabotage and attacks,

AME will receive the necessary training and training on emergency response; vehicle and equipment maintenance and controls will be done periodically. Emergency Response Plan general coordination scheme is given.

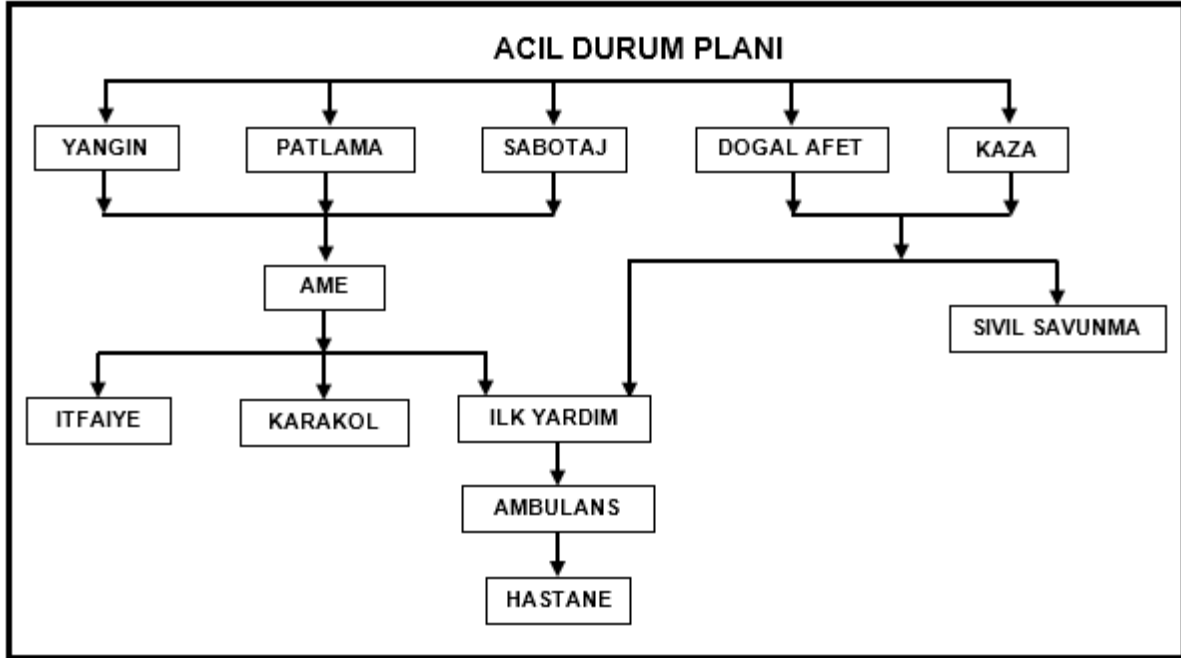


Figure V-23 Emergency Response Plan Coordination Chart

In general, the emergency plan content is summarized below. In line with the suggestions of the company that will install the facility, it will be ensured that the necessary precautions are taken by detailing at the application stage.

## EMERGENCY PLANS



**EMERGENCY PLANS** for earthquake, fire, flood and flood, chemical spillage or leakage/explosion and evacuation of the facility are summarized below.

### 1 - EARTHQUAKE EMERGENCY PLAN

#### 1.1 - GENERAL MEASURES TO BE TAKEN BEFORE EARTHQUAKE

-File cabinets and shelves will be securely fixed to each other and to the wall.



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- Tables and similar items hanging on the corridor walls will be fixed securely and without falling.
- Irregular stacking will not be made in areas where chemical substances are stored, and no gaping chemicals will be left in any way.
- Glass broken in the whole business will be replaced immediately, especially if it is at risk.
- Fire extinguishing devices will be periodically checked.
- Material stocks shall not be made in front of emergency escape routes and places where emergency exit gates are located.
- Emergency exit doors and direction signs will be placed on the roads to emergency assembly centers.
- Pipeline, machinery and equipment connection points of the facility will be determined and regular maintenance will be carried out.
- The list of machinery and equipment that must be de-energized during the earthquake will be prepared and kept up to date.
- Any flammable and falling material will not be left against the risk of fire on the roofs .

## 1.2 - ACTION PLAN DURING THE EARTHQUAKE

At the time of the earthquake, staff working anywhere will wait for the earthquake to end calmly in a place that will ensure its own safety. With the end of the earthquake, it will turn off the device / machine (currently disconnecting electricity, gas, fuel), exit the emergency exit doors without panicking and go to the nearest emergency assembly center.

With the end of the earthquake, the Emergency Committee will be organized immediately.

### 1.3 - POST-EARTHQUAKE ACTION PLAN

#### TEAMS

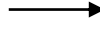
#### WHAT TO DO



Communication, Security and Evacuation



Ensure that all personnel are gathered in a safe place.



If there are injured people, they apply first aid and send the injured to the nearest



Search and Rescue



If there are personnel under the wreckage, they start search and rescue works.

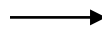
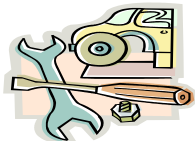


Damage Detection



First of all, they quickly check for broken parts, damage or leaks starting from the most risky points.

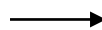
They control all medium and high voltage lines



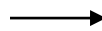
First of all, they quickly repair the leaks, broken parts, parts falling from the overturned chimneys, ruptures and damages in pipelines and other risk zone damages, determined by the Damage Detection Team.



Fire



In case of a fire during earthquake, they firstly cut off the energy of the fire section and start the cooling works. If the lines are broken or damaged, they quickly eliminate these.



If there is any chemical leakage on the floor, they ensure that they are cleaned quickly with inert material.



Plant's Personnel



In order for Emergency Teams to act quickly;

THEY KEEP CALM AND DO NOT INTERVENT THE OPERATIONS OF THE EMERGENCY TEAMS.

## 2 - FIRE EMERGENCY PLAN

### 2.1 - FIRE



Fires:

- By destroying one of the flammable material, oxygen and heat trio,
- By removing fuel,
- Removing oxygen (air) or oxygen source,
- The chemical reaction resulting from fuel, oxygen and sufficient heat can be stopped and extinguished.

### 2.2 - CLASSIFICATION OF FIRE

Table V-38 General Information About Fire Classes

<u>FIRE CLASS</u>	<u>EXAMPLES</u>	<u>EXTINGUISHERS</u>
A- Corny Burning Solid Materials	Wood, coal, paper, textile, rubber, leather, latex etc.	Water, foam, multi-purpose dry chemical powder (ABC) fire extinguishers
B- Flammable Liquids or Solid becoming Liquids	Alcohols, paints, solvents, thinners, machine oils, petroleum products (gasoline kerosene) oils, etc.	Foam, Multi-purpose dry chemical powder (BC) fire extinguishers, carbon dioxide gas fire extinguishers
C- Flammable Gases	Hydrogen, methane, LPG, propane, butane, ethylene, (ABC) natural gas, acetylene etc.	Multipurpose dry chemical powder fire extinguishers, carbon dioxide gas fire extinguishers, water and foam
D- Flammable Metals	Magnesium, sodium, aluminum powders, peroxides	Specially prepared calcium or sodium chloride and/or anhydrous sodium carbonate-based dry chemical powder can be applied by a special technique.
E- Electric Fires	Transformers, coils, motors, their isolations	Multipurpose dry chemical powder (ABC) fire extinguishers, carbon dioxide gas fire extinguishers. General dry chemical powder (BC) fire extinguishers.

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### 2.3 - MEASURES TO BE TAKEN TO PREVENT FIRE

Flammable substances will only be found in the amount required by the job in the work area and will be transported to previously prepared safe places at the end of the working day.

With flammable substances, flammable and combustible liquids will only be kept in pre-determined special places and their covers will never be left open. This place will be away from heat sources and will be taken under separate protection.

Persons who have spilled flammable liquids or smeared on them will not be allowed to work without changing their tops.

Emergency exit doors will always be clean and operable and will not be closed by an obstacle.

Controls of the fire tubes will be made in accordance with the specified period, and a new fire tube will be used.



Anything that will make it difficult to reach fire extinguishers, valves and other extinguishing devices in front and next to them will be removed.

The locations of fire extinguishers, valves and other fire extinguishers will be determined so that they can be seen from distance with the warning signs and red stripes on the upper parts of the place where the devices are located.

In order to protect from electrical system fires, damaged material will not be used in the installation, the materials used will be clean and rust-free, the connection of the elements of the installation elements will be taken into consideration for the suitability of the insulation materials and care will be taken in accordance with the conditions of the place where the installation is located.

The electrical wiring plan fed from that panel will be visible in the electrical panels, and the suitability of the buttons and covers of the panels will be checked periodically.

Cigarette butts will not be thrown into paper and waste baskets. At the end of the work, the bins will be checked.

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Fire extinguishers will be kept in places where sparks may occur for technical reasons and where chemical materials, fuel and archives are located, and these will never be approached with cigarettes and fire.

Warning signs regarding “Smoking” and "approaching with fire" will be put in the dangerous areas.

Electrical appliances such as electric stoves and irons will not be used in units with high risk of fire.

In car parking lots, cars will be parked in such manner that they will be capable of going out in case of an emergency.

Measures will be taken against fire in the environment during electric arc welding, oxygen welding, oxygen cutting works or spiral cutting and grinding works that produce flames or sparks. For this purpose, all materials that can easily catch flame near the places where these works are performed will be taken to another place, and if not, the work will be started after the fire extinguishers are available.

Attention should be paid to gas leaks that may occur from the furnace or stoves in the cafeteria, when the smell of gas is felt, all heat sources should be closed and the windows should be ventilated and the causes of gas leakage will be investigated with gas detectors.

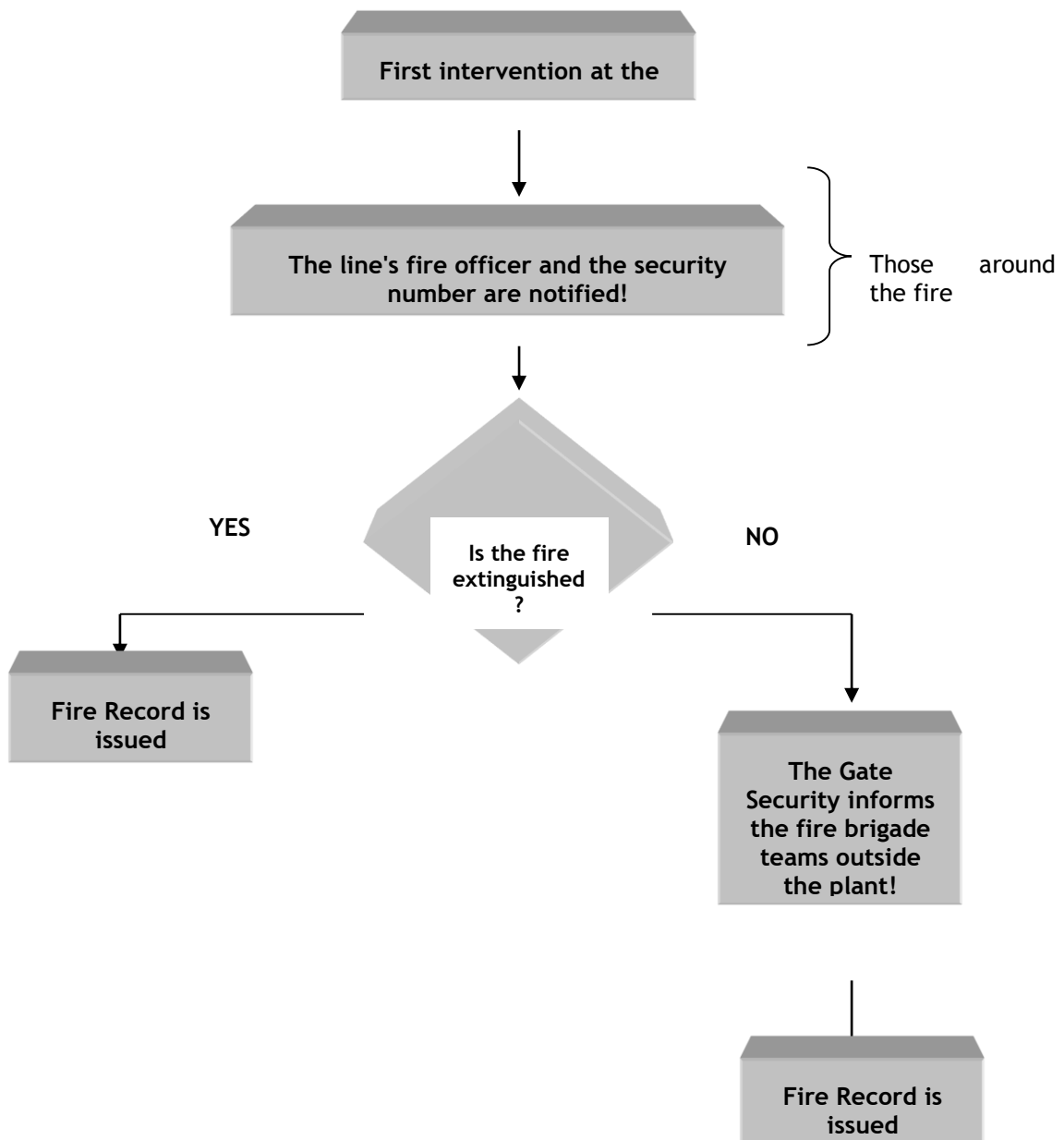
Oil will not be poured on pans that are pre-heated against shining in the cafeteria.



Periodic maintenance and controls of surge arresters in transformers will be reported.

## 2.4 - FIRE RESPONSE ACTION PLAN

### 2.4.1 - FIRE NOTICE

The first person to see the fire starting will extinguish the fire by intervening with the nearest fire extinguishing device if the fire is too small and can be extinguished with personal effort (fire tubes, fire cabinets). In parallel with this process, the security number to be created within the facility will be called and the fire team of the scene will be informed immediately. The fire team will prepare a **Fire Report** by examining the causes of the fire.



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## 2.4.2 - FIRE INTERVENTION

Firefighting rules, fire brigade numbers and security duties must be hung in a place that can be seen at the entrance of the facility.

Electrical maintainers cut the electricity of the unit, where there is a fire, by the instruction of the fire supervisor, and enable the fight against fire to be more active.

The personnel of the facility conducts partial or complete closure of liquid and gaseous flammable substances in the pipelines to the fire zone by the instructions of the fire supervisor.

In open air or ventilated areas, it should not be left in the smoke and gas more than the time required for fire extinguishing. Special mask should be used in areas which are closed and difficult to ventilate. Those who take part in firefighting will first save those who are trapped due to the fire, and then try to recover goods and materials such as documents, files and machines according to the situation. Clothes that have been ignited should be rolled to the floor or covered by wet cloth or laundry by those close to the event.

## 2.4.3 - FIRE-FIGHTING METHODS

The fire extinguishing system consists of fire pumps, piping, hydrants, water spray system (automatic), water sprinkler system (automatic), portable extinguishers (dry), high pressure CO<sub>2</sub>, fire alarm and automatic detector system, ventilation of required areas, air conditioners and fire stairs.

In addition, the fire system will be installed in the entire facility (piping) and the hydrants will be equipped at intervals of 30/60/80 meters. Belt conveyor lines will be equipped with automatic sprinkler system. Automatic water spray and sprinkler system will be created in transformers. In addition, the necessary places will be equipped with external fire stairs, indoor spaces, especially the battery room with automatic ventilation and fire equipment, hot equipment, all glass or rock wool insulated cables mounted on the ceilings and all control rooms equipped with air conditioning system (central air conditioning system).

## 2.5 - WHAT TO DO AFTER FIRE

After the fire, the fire team makes the damage determinations and a detailed Fire Minutes including the location of the incident, the reason for the occurrence, the time, the amount of the damage and what is extinguished. One copy of the report is kept in the Fire file and the other copy is sent to the Accounting Directorate for compensation of the damage from the insurance. If fire sabotage has occurred as a result of terrorism and malicious acts, the situation is reported to the Gendarmerie.

### 3 - FLOOD EMERGENCY PLAN

- ❖ Materials that can react with exposed water will be stored in places higher than the ground, such as pallets or racks.
- ❖ In order not to be exposed to flooding, all manholes in the open area and within the facility will be cleaned periodically every 3 months.
- ❖ The water channels on the roof and the pipes giving the water down will be cleaned at least 2 times a year.
- ❖ In the event of flooding or flooding, employees will wait in a reliable, high position.
- ❖ The energies of electrical equipment and panels on the ground will be cut off.
- ❖ The Communication, Security and Evacuation team and Search and Rescue Teams will save the stranded personnel and take them to a safe place.
- ❖ First aid team will make first response to injured personnel immediately.
- ❖ Maintenance-Repair Team will ensure the discharge of water organized.
- ❖ When the facility is completely emptied, Damage Assessment Teams will make the necessary minutes by making examinations.



### 4 - CHEMICAL LEAK/SPILL EMERGENCY PLAN

Some chemicals used in the facility and the method to be applied for leaking or spillage of these chemicals are given below.

#### 4.1 - CLEANING PLAN

- 1) The closest employees at the scene spread the inert material such as perlite, sand, soil in certain areas throughout the facility on the spilled chemical and call chemical leak cleaning teams. The list of chemical leak cleaning teams and phone numbers are shown on the plant's boards.
- 2) Chemical leak teams arriving at the scene collect the chemical leakage impregnated with inert material with shovel and leave them in hazardous waste bins. The wastes collected in these trash bins will be given to disposal companies licensed for transportation.
- 3) Protective materials (protective glasses and face mask, etc.) are used in the procedures to be applied for spills.
- 4) No water is used in cleaning of chemical substances.
- 5) If there is flow towards the channel, flow is prevented by making a set with inert materials.
- 6) If the chemical flowing material has escaped into the water channel, the channel is blocked in the direction of travel and placed in a container with the pump.
- 7) Chemicals that have been spilled and then properly collected cannot be thrown into the water in any way.



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8) In case of fire , it will be quenched with dry chemical powder or carbon dioxide and water will never be used.

9) In case of leakage, chemical leakage and maintenance and repair teams will be informed.

10) Leaks will be prevented and the main gas outlets will be closed.

#### **V.7.2.Operation Phase**



Events can occur at any time, and in any combination, that may require an immediate emergency response. MUSKİ has already have a Emergeny Preparedness and Response Plan, nevertheless, it will be reviewed and revised considering possible incidents such as:

- Power failures
- Natural disasters such as flooding, snow/ice storms, freezing, hurricanes, high winds, tornadoes, earthquakes
- Fires
- Explosions
- Chemical spills
- Hydraulic overloading, ruptures and sewer blockages
- Sewer overflows
- Intentional or accidental release of chemical or flammable substances into the collection system
- Security threats, vandalism, terrorism
- Loss of SCADA system or alarm functions
- Construction accidents
- Equipment failure
- Process upsets
- Personnel injury
- Pandemics
- Labor strikes



Content of the emergency preparedness response plan will be prepared, not limited to: system specific information; partnerships; a vulnerability assessment; chain of command structure; communication procedures; detailed emergency response procedures; an event follow-up evaluation; training, exercises and drills.

Mitigation measures to maintain a sustainable community healt and safety management are:

- The area around the facility is already fenced. Local people and animals' access to the area will be kept under control. The entrance of the staff and third parties to the facility will be carried out in a controlled manner.

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- Private security officers is already employed to ensure the security of the work area. Private security practices within the scope of the project will comply with the provisions of the Private Security Services Law and the Law on the Execution of Private Security Services.
- Personal Protective Equipment will be provided to the employees according to the nature of the job. Necessary trainings will be made for their use.
- Smoking will be prohibited in areas where the risk of fire is high. All workers will be informed about the action plan on fire
- All equipment will be operated in an appropriate working order.
- Procedures approved by MUSKI for the maintenance and repair activities and the requirements of the suppliers' technical specifications will be followed.
- Necessary health and safety signs and traffic signs will be located at the project site. Employees will be informed and warned about signs.
- Within the scope of the Regulation on the Procedures and Principles of Occupational Health and Safety Trainings, trainings will be given to operation and maintenance personnel, and measurement and evaluation will be made after the trainings.
- Entrance of the operation personnel, maintenance personnel and third parties to the facility will be provided in a controlled way through the doors where security personnel are located.
- Equipment meeting the international standards will be used in the facility in terms of electrical performance and safety.
- Before the facility is put into operation, necessary electrical tests will be carried out to check that the electrical connections and other related equipment are working properly.
- An Emergency Preparedness and Response Plan will be prepared before the facility is operational.
- Grids with an automatic cleaning system will be used to prevent cleaning workers from entering the ducts.
- Suitable ventilation systems will be installed where methane deposition is expected.
- Guardrails will be built to hold around all tanks and pits.
- MUSKI will prepare an Indoor Entry Procedure in accordance with its standards, national requirements and internationally accepted standards.
- MUSKI will organize relevant training on safe use and emergency response procedure for operating personnel working with disinfectant.
- MUSKI will ensure that the Emergency Preparedness and Response Plan covers escape plans in case of chlorine emission.
- MUSKI will provide its employees with a sufficient number of gas measuring instruments.
- MUSKI will advise individuals with asthma, diabetes or immune system disorders not to work in treatment facilities due to the risk of infection.

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- MUSKI will ensure that all activities at the treatment plant and pumping stations comply with national standards and WBG SHE Guidelines.



Before the start of the operation phase, a Community Health Management Plan will be prepared by MUSKI and submitted to the approval of İlbank.

### V.8. Environmental Benefit Cost Analysis

Environmental cost-benefit analysis in the project is the construction and operation phases were examined separately, these evaluations are listed in Table V-39.

Table V-39 Potential Environmental Impacts Matrix at the Construction and Operation Phases of the Project



ENVIRONMENTAL COMPONENTS AFFECTED	ACTIVITIES OF THE BIOLOGICAL WASTEWATER TREATMENT PLANT	
	LAND PREPARATION AND CONSTRUCTION PHASE	OPERATION PERIOD
<b>Geology and Ground</b>	Excavation will be carried out at the Project Site.	There is no impact.
<b>Hydrology and Water Quality</b>	There is no impact.	Water quality will increase
<b>Terrestrial Ecology</b>	Since the vegetative area on the soil surface will be stripped, it has an impact on the plants, but the reason for the construction activity will be limited in a limited area.	There is no effect.
<b>Marine Ecology</b>	No impact is expected during the construction phase.	Discharge will have an impact, but providing discharge limits will reduce the impact.
<b>Socio-Economic Status</b>	It has a positive impact.	It has a positive impact.
<b>Human Health and Safety</b>	There is a possibility of work accidents.	There is a possibility of work accidents.
<b>Air pollution</b>	Dust emission will occur.	Odor is expected.
<b>Noise</b>	There will be a temporary noise increase below the CBDYY limits.	Noise will occur below the limits of the CGDYY.
<b>Soil</b>	There will be no significant impact.	There will be no significant impact.

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As a result, when a general assessment is made for the project, Fethiye district has a great importance due to its current use and especially its tourism-based development as mentioned before. In case of realization of the project, the area where Fethiye Wastewater Collection Basin wastewater will be treated and the region will be protected. Therefore, the implementation of the project is important in the balance of protection and use. As a matter of fact, in the table below, general environmental benefit-cost analysis is examined.

**Table V-40 Environmental Benefit/Cost Analysis**

ASSESSMENT ELEMENTS	CURRENT STATUS	SUGGESTED PROJECT	DESCRIPTIONS
			+: ADVANTAGEOUS COMPARED TO OTHERS - : INSUFFICIENT/DISADVANTAGEOUS COMPARED TO OTHERS X: THE SAME WITH THE OTHERS
Energy	X	X	Energy will be used within the scope of the proposed project.
Economy	X	X	Energy will be used within the scope of the said project. However, necessary measures will be taken in terms of energy efficiency.
National Contribution	-	+	Fethiye district, which covers Turkey's most important tourism regions, will be protected.
Operational Expenses	X	X	Operational energy consumption of the proposed project will be in question. However, necessary measures will be taken in terms of energy efficiency.
Technology	-	+	Worldwide-accepted A <sub>2</sub> O Technology will be used.
Environmental Factors		+	Thanks to the project, the wastewater of Fethiye Wastewater Collection Basin will be treated and water quality will increase.

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## VI. PROCESS ALTERNATIVES

### VI.1. No Action Alternative

No action alternative is the assessment of the positive or adverse results that will arise if the project does not become operational.

As explained earlier, in the current situation, the wastewater generated is discharged into the Aegean Sea after being treated in the existing Fethiye WWTP. Within the scope of the mentioned project, the capacity of the existing facility will be increased due to the future population growth and wastewater collection basin expanded.

If the project is not realized, the situation will continue and the Aegean Sea will be at risk due to the population increase in Fethiye District in the following years. Therefore, adverse impacts will begin to occur and discharges will cause marine pollution.

The healthy and sustainable utilization of the wastewater service of the settlements in the service area of the project will be at risk. This situation will have adverse impacts on public health.

Since there is currently a treatment plant within the project area, a new area for the said investment will not be used. Therefore, the project will not lead to a significant change in land use.

If the project is not realized, short-term impacts due to the construction phase such as noise and dust formation will not be seen. However, in the event of the project, these impacts will be kept within the boundaries of the regulation and will not have significant impacts on the local people.

For the above reasons, the no action alternative is not considered a reasonable alternative. The benefits of the positive impacts of the project are important for the environmental population.

### VI.2. Location Alternatives

The existing wastewater treatment plant was commissioned on 12.12.2003. As the land which covers the said wastewater treatment plant will be sufficient for the 2nd Stage, no land expropriation costs will occur. Since the sewerage infrastructure of the city was built in such a way that it can be directed to this land, the existing place was determined as the most suitable place considering the costs.

The fact that the project area is the wastewater treatment plant currently in the districts, the wastewater collection system is ending here, is the reason for choosing the project area. Therefore, no alternative places have been considered.

### VI.3. Technology Alternatives

#### VI.3.1. Process Alternatives

Fethite WWTP, which is the subject of the said capacity increase, has A<sup>2</sup>O technology in conventional wastewater treatment systems.

A<sup>2</sup>O process is a modification of the AO process, since it contains both the anaerobic section for phosphorus removal and the anoxic section for denitrification, both phosphorus and nitrogen removal. The time of water to remain in the anaerobic section is approximately one hour. Dissolved oxygen in the anoxic section is low, but chemically bound oxygen in the form of nitrite and nitrate is fed back to the system through the air section. There may be less than 2 mg/lt of phosphorus concentration at the outlet without filtration. Phosphorus concentration may decrease to less than 1.5 mg/lt by filtration of leaving water. In Figure VI-1 general flow diagram of A<sup>2</sup>O process is given.

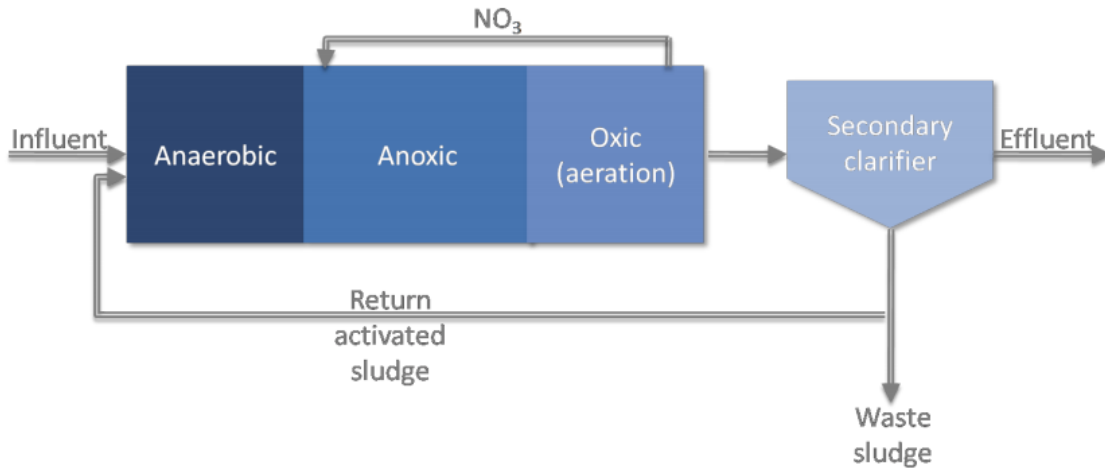




Figure VI-1 A<sup>2</sup>O Process General Flow Diagram

Treatment technology will remain the same within the scope of the project and A<sup>2</sup>O technology is suitable for further treatment modifications that can be realized later.

#### VI.3.2. Waste Sludge Management

Sludge treatment is one of the most difficult operations in terms of operation and planning in wastewater treatment plants. Although the amount of sludge produced corresponds to a low percentage of 1% to 6% by volume of wastewater, the investment and operating costs of sludge treatment units have a higher share within the total cost of the facility. Therefore, choosing the most suitable sludge treatment system is of great importance.

In general, in waste management; firstly, it is essential not to create waste or to minimize waste generation, then to ensure that it is recycled if possible, and if it cannot be recovered, it should be disposed in accordance with the environment.



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Considering the waste sludge management and disposal alternatives, project area, site selection and other relevant conditions of the Wastewater Treatment Plants, legal standards, operating and maintenance costs, ease of operation, initial investment costs and the land requirement of the selected site should be considered.

Waste sludge will be dried and stored by licensed companies. In this context, waste sludge analysis should be carried out in line with the parameters specified in Annex 2 of the “Regulation on Regular Storage of Waste” published in the Official Gazette dated 26.03.2010 and numbered 27533, and the final disposal method should be determined according to the results of the relevant analysis. Attention should be paid to the provisions of the Provisional Article 4 of the “Regulation on the Amendment to the Regulation on the Regular Storage of Waste”, which was published in the Official Gazette dated 11.03.2015 and numbered 29292.

### **VI.3.3. Discharge Alternatives**

Within the scope of the mentioned project, the wastewater treated with the currently used discharge structure will continue to be sent to the Aegean Sea via the channel.

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## VII. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The ESMP will be implemented with an adaptive management approach to respond to changes occurring at different stages of the Project and, as a living document, will be updated to reflect the current status of the Project and site features and management requirements when necessary.

MUSKİ is obliged to implement the ESMP with adequate and qualified personnel working under an appropriate organizational structure, in line with Project standards, in line with stakeholder participation and information sharing requirements, and to ensure that contractors / subcontractors adopt management controls.

To have an adequate environmental and social management of the project MUSKİ have the Contractor to prepare relevant sub-management plans during the construction phase and MUSKİ will prepare and implement the necessary sub-management plans. İlbank will review and approve these plans. The sub-management plans to be prepared durinh each phase of the project is given below:

**Table VII-1. Sub-management plans to be prepared**

Construction Phase	Responsibility	Operation Phase	Responsibility
Pollution Prevention Plan	Contractor	Pollution Prevention Plan	MUSKİ
Greviance Mechanism	Contractor	Greviance Mechanism	MUSKİ
Emergency Preparedness and Response Plan	Contractor	Emergency Preparedness and Response Plan	MUSKİ
Community Health and Safety Plan	Contractor	Community Health and Safety Plan	MUSKİ
Dust Management Plan	Contractor	Waste Management Plan	MUSKİ
Traffic Safety Management Plan	Contractor	Occupational Health and Safety Management Plan	MUSKİ
Noise and Vibration Management Plan	Contractor	Sludge Management Plan	MUSKİ
Soil and Groundwater Management Plan	Contractor	Security Plan	MUSKİ
Waste Management Plan (Hazardous and non-Hazardous Waste)	Contractor		
Oil and Chemical Spill Contingency Management Plan	Contractor		
Occupational Health and Safety Management Plan	Contractor		
Environmental Monitoring Plan	Contractor		
Contractor Management Plan	MUSKİ		
Security Plan	Contractor		



## VII.1. Mitigation Management Plan

Table VII-2. Land Preparation and Construction Phase Environmental and Social Management Plan

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
Air Environment	<ul style="list-style-type: none"> <li>• Preparing a specific Dust Management plan</li> <li>• Sufficient application of dust suppression methods (irrigation, sweeping etc.)</li> <li>• Coating of interior roads with materials to prevent dust and keeping roads clean</li> <li>• Speed limit application in the project area</li> <li>• Keeping trees as wind barriers and planting new ones</li> <li>• Loading / unloading without skidding</li> <li>• Covering the stored excavation materials</li> <li>• Checking the exhausts of the vehicles regularly</li> <li>• Minimizing unnecessary vehicle idling</li> <li>• All engines will be turned off when not in use</li> </ul>	Contractor	MUSKi Field Management	Within the project cost
Noise	<ul style="list-style-type: none"> <li>• Preparing a Noise Management plan</li> <li>• Machinery and equipment used during land preparation and construction activities will not be operated at the same point/location but they will be distributed homogeneously within the area.</li> <li>• Use of construction noise barriers around the receptors closest to the WWTP area.</li> <li>• Regular maintenance of construction machinery and equipment and definition of speed limits for construction vehicles and this should be included in the transport management plan to be prepared by the contractor.</li> </ul>	Contractor	MUSKi Field Management	Within the project cost

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"> <li>MUSKI will designate a liaison officer under the complaints procedure to evaluate noise-related complaints and, where necessary, to plan and implement confirmatory actions. Grievance mechanism should cover this measure</li> </ul>			
Water Resources	<ul style="list-style-type: none"> <li>Durable concrete will be used in order to ensure the leak-proofness of the units of the project that are in contact with water, wastewater and chemicals by taking into account the appropriate cement ratio.</li> </ul>	Contractor	MUSKI Field Management	Within the project cost
Soil	<ul style="list-style-type: none"> <li>A soil management plan will be prepared by the contractor</li> <li>During the construction phase, the fuel needs of the construction machinery and vehicles to be used in the area will be supplied from the nearest station; if deemed necessary, the fuels storage in the construction site will be organised in the special reservoirs with adequate containment.</li> <li>In the land preparation and construction phase of the project, the provisions of "Regulation on Control of Excavation Soil, Construction and Demolition Waste" will be complied with.</li> <li>The scope of the project will be in line with the provisions of "Regulation on Soil Pollution Control and Point-Sourced Contaminated Sites".</li> </ul>	Contractor	MUSKI Field Management	Within the project cost

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"> <li>Waste and wastewater to be generated during the land preparation and construction phases of the project will be stored and disposed in a controlled manner in accordance with the appropriate regulations and management practices specified in this report. Thus, it will not be possible for wastes and wastewater to occur in the Project area to interact with the soil environment and cause any impact.</li> <li>In the event that a damage caused by construction machinery and trucks is detected on the property access roads, highways and the immovables of the residents during land preparation and construction phases, this damage will be covered by the construction contractor under the supervision of MUSKI.</li> <li>By installing an appropriate drainage system in the area, the potential impacts of surface runoff will be minimized. In this context, drainage channels will be constructed in accordance with the topographic conditions of the area.</li> <li>Following the completion of construction and installation works, topsoil will be reused at the areas within the WWTP reserved for landscaping in order to provide restoration of these areas.</li> </ul>			

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"> <li>After the completion of the construction. Soil samples from the areas that could reflect the status of the WWTP (inside &amp; outside of WWTP) must be taken and if a drastic increase in any of the baseline parameter is seen or if the site is suspected to be contaminated, Provincial Directorate must be informed.</li> </ul>			
Wastes	<ul style="list-style-type: none"> <li>A waste management plan will be prepared</li> <li>Wastes to be generated within the scope of the project will be managed in accordance with the waste management hierarchy.</li> <li>Wastes will be stored only temporarily on site, and final disposal will take place outside the facility.</li> <li>Recycling, transportation and disposal of waste will be carried out through licensed companies and/or relevant municipalities.</li> <li>Throughout the project, all practices that would put personnel or public health at risk will be avoided in all activities related to the collection, temporary storage, transportation and disposal of waste.</li> <li>Wastes that will be stored temporarily in the field will be delivered to licensed and suitable type of transportation vehicles to be removed from the site. Information regarding the transactions within this scope will be recorded and the records will be kept in the administrative building.</li> </ul>	Contractor	MUSKi Field Management	Within the project cost

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"> <li>Hazardous and special wastes likely to occur within the scope of the project (for example, waste electronic devices/parts, cables, filters, chemicals or packaging contaminated with oils or oils such as paint and solvents, rags, protective clothing etc.) will be stored in the Temporary Storage Area in special sections in containers separated from non-hazardous wastes. This area will have an impermeable base, be protected against surface runoff water and rain, and be drained as required.</li> <li>Hazardous or non-hazardous waste phrase, waste code, amount of stored waste, storage date and amount will be displayed on the wastes that are classified according to their characteristics. With the measures to be taken in the Temporary Storage Area, the wastes will be prevented from reacting with each other.</li> <li>Temporary storage permit will be obtained from Muğla Provincial Directorate of Environment and Urbanization for the storage of waste other than municipal waste and packaging waste.</li> </ul>			
Biological Environment	<ul style="list-style-type: none"> <li>EPC during construction will be responsible to pre-treat all volume of waste water before treatment of the 1st phase WWTP. so in essence EPC shall not be in position to discharge any waste water to the environment..</li> </ul>	Contractor	MUSKi Field Management	Within the project cost

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
Occupational Health and safety	<ul style="list-style-type: none"> <li>• EPC should establish at the site EHS organisational structure that will include OHS officers</li> <li>• Before the start of land preparation and construction works, MUSKI will prepare a site-specific OHS Management Plan for the Project in line with Turkish Legislation and international standards.</li> <li>• Entrance of the personnel and third persons to the plant will be controlled.</li> <li>• Special security practices within the scope of the project will comply with the provisions of the Private Security Services Law and the Law on the Execution of Private Security Services.</li> <li>• Personal Protective Equipment will be provided to the employees according to the nature of the job. Necessary trainings will be given.</li> <li>• Smoking will be prohibited in areas where the risk of fire is high. All workers will be informed about the action plan on fire.</li> </ul> <p>All equipment will be operated in an appropriate working order.</p>	Contractor	MUSKI Field Management	Within the project cost
Handling Complaints	<ul style="list-style-type: none"> <li>• Impacts on the community will be reduced through public participation.</li> <li>• Grievance mechanism will be established.</li> </ul>	Contractor	MUSKI Field Management	Within the project cost

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
Transportation Network	<ul style="list-style-type: none"> <li>If it is necessary to carry out the necessary applications for the control of the asphalt road situation at the border of the treatment plant area, MUSKI will be the first step in the negotiations and applications that should be made to the relevant authorities.</li> <li>In cooperation with the relevant administration, MUSKI will ensure that necessary measures are taken and implemented in terms of the entrance-exit of the treatment plant and the safety of road traffic.</li> </ul>	Contractor	MUSKI Field Management	Within the project cost
Local Supply	<ul style="list-style-type: none"> <li>If possible and feasible, priority will be given to local procurement.</li> </ul>	Contractor	MUSKI Field Management	Within the project cost
Labor and Working Conditions	<ul style="list-style-type: none"> <li>MUSKI will take the necessary measures against child labor and forced labor.</li> <li>Persons under 18 years of age will not be employed.</li> <li>In recruitment, MUSKI will give priority to local people.</li> <li>Employee grievance mechanism will be established.</li> <li>Illerbank and the WB will be reported in case of fatalities and incidents</li> </ul>	Contractor	MUSKI Field Management	Within the project cost
Community health and safety	<ul style="list-style-type: none"> <li>A community health and safety plan will be prepared</li> <li>Determining the Emergency Response Team</li> <li>Making job descriptions</li> <li>Creating subordinate levels (rescue, first aid, intervention etc.)</li> <li>Identification of relevant institutions / organizations and coordination issues within itself</li> </ul>	Contractor	MUSKI Field Management	Within the project cost



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Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"><li>• Determination of the service (transportation, supplies, supply, maintenance etc.), allocation protocols that will need</li><li>• Determining the daily working principles of the personnel to work</li></ul>			



**Table VII-3. Operation Phase Environmental and Social Management Plan**

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
Air Environment (Odor)	<p>Primary Level Measures: A pollution prevention plan covering the odor risk will be established.</p> <ul style="list-style-type: none"> <li>• Prevention of wastewater exceeding the treatment plant capacity</li> <li>• Reducing solid waste and activated sludge amounts</li> <li>• Increasing the frequency of cleaning of the screens</li> <li>• Proper and timely disposal of sludge to prevent problems with flies and odors</li> <li>• Increasing the aeration rate in biological treatment processes</li> <li>• Adding chlorinated water to the sludge thickeners if the activated sludge unit is in the open area</li> <li>• Adding lime to activated sludge</li> <li>• Covering of the preliminary treatment unit</li> </ul> <p>In case that the disturbing impact of the odor continues following the first level measures, secondary level measures will be taken:</p> <ul style="list-style-type: none"> <li>• Addition of oxidizing agent (hydrogen peroxide, sodium hypochlorite) (oxidizing agents, prevent the formation of odor, in particular hydrogen sulfide). Addition of sodium hydroxide may also be considered. Sodium hydroxide will dissolve hydrogen sulfide gas in water</li> <li>• Control of pH levels of anaerobic bacteria formation or prevention by disinfection</li> <li>• Oxidation of fragrant compounds with the help of chemicals</li> </ul> <p>In case that the disturbing impact of the odor continues following the first and second level measures, final level measures will be taken:</p> <ul style="list-style-type: none"> <li>• Covering of aeration ponds and biophosphorus tanks</li> </ul> <p>As a general precaution: Implementation of a complaint procedure to manage odor-related complaints.</p>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs
Noise	<ul style="list-style-type: none"> <li>• During equipment and machinery purchase, the sound levels given in the technical specifications section will be taken into account.</li> <li>• The provisions and limit values of RAMEN and the World Bank Group General HSE Guidelines will be met during operation.</li> </ul>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs
Water Resources	<ul style="list-style-type: none"> <li>• MUSKI will aim to minimize bypass.</li> </ul>	MUSKI	Field personnel,	Included in the operating costs

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"> <li>The wastewater quality of the wastewater treatment plant will comply with applicable national requirements or internationally accepted standards and will be monitored continuously.</li> <li>System overflows will be avoided as much as possible using level measurement devices.</li> </ul>		Related Branch Office	
Wastes	<ul style="list-style-type: none"> <li>Wastes will be stored only temporarily on site, and final disposal will take place outside the facility.</li> <li>Recycling, transportation and disposal of waste will be carried out through licensed companies and / or relevant municipalities.</li> <li>It will definitely not be possible to burn or bury waste in the field, and to dispose of waste on nearby roads or water resources.</li> <li>Throughout the project, all practices that would put personnel or public health at risk will be avoided in all activities related to the collection, temporary storage, transportation and disposal of waste.</li> <li>Wastes that will be stored temporarily in the field will be delivered to licensed and suitable type of transportation vehicles to be removed from the site. Information regarding the transactions within this scope will be recorded and the records will be kept in the administrative building.</li> </ul>	MUSKİ	Field personnel, Related Branch Office	Included in the operating costs
Waste Sludge	<ul style="list-style-type: none"> <li>Waste Management Plan will be prepared and implemented</li> <li>Waste sludge will be dried and stored by licensed companies. In this context, waste sludge analysis should be carried out in line with the parameters specified in Annex 2 of the "Regulation on Regular Storage of Waste" published in the Official Gazette dated 26.03.2010 and numbered 27533, and the final disposal method should be determined according to the results of the relevant analysis.</li> <li>Mud transfer systems, such as conveyors, screw pumps and channels, will be kept clean to avoid odor.</li> <li>In addition, the drying process in the dry season will be processed and dried properly.</li> </ul>	MUSKİ	Field personnel, Related Branch Office	Included in the operating costs

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"> <li>The trucks will be covered to prevent odor during transportation.</li> </ul>			
Biological Environment	<ul style="list-style-type: none"> <li>Effluent quality should be monitored.</li> </ul>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs
Handling Complaints	<ul style="list-style-type: none"> <li>Grievance Mechanism will be followed</li> <li>Potentially affected people living in the vicinity will be informed about the start of works</li> </ul>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs
Health and Safety	<ul style="list-style-type: none"> <li>A transport management plan will be established</li> <li>An Emergency Preparedness Response Plan covering occupational safety and first aid plans, and protection-safety and security plan for the plant and its surroundings against sabotage and attacks will be prepared and implemented.</li> <li>Entrance of the personnel and third persons to the plant will be controlled.</li> <li>Special security practices within the scope of the project will comply with the provisions of the Private Security Services Law and the Law on the Execution of Private Security Services.</li> <li>Personal Protective Equipment will be provided to the employees according to the nature of the job. Necessary trainings will be given.</li> <li>Smoking will be prohibited in areas where the risk of fire is high. All workers will be informed about the action plan on fire.</li> <li>All equipment will be operated in an appropriate working order.</li> <li>The procedures approved by MUSKI and the requirements of the technical specifications of the supplier companies will be followed for the maintenance and repair activities.</li> </ul>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs
Local Supply	<ul style="list-style-type: none"> <li>If possible and feasible, priority will be given to local procurement</li> </ul>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs
Labor and Working Conditions	<ul style="list-style-type: none"> <li>MUSKI will take the necessary measures against child labor and forced labor.</li> <li>Persons under 18 years of age will not be employed.</li> <li>In recruitment, MUSKI will give priority to local people.</li> </ul>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs

Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"> <li>• A Community health and safety plan which elaborates issues in line with the WBG EHS guidelines will be prepared</li> <li>• Illerbank and the WB will be reported in case of fatalities and incidents</li> </ul>			
Community Health and safety	<ul style="list-style-type: none"> <li>• The area around the facility is already fenced. Local people and animals' access to the area will be kept under control. The entrance of the staff and third parties to the facility will be carried out in a controlled manner.</li> <li>• Private security officers is already employed to ensure the security of the work area. Private security practices within the scope of the project will comply with the provisions of the Private Security Services Law and the Law on the Execution of Private Security Services.</li> <li>• Personal Protective Equipment will be provided to the employees according to the nature of the job. Necessary trainings will be made for their use.</li> <li>• Smoking will be prohibited in areas where the risk of fire is high. All workers will be informed about the action plan on fire</li> <li>• All equipment will be operated in an appropriate working order.</li> <li>• Procedures approved by MUSKI for the maintenance and repair activities and the requirements of the suppliers' technical specifications will be followed.</li> <li>• Necessary health and safety signs and traffic signs will be located at the project site. Employees will be informed and warned about signs.</li> <li>• Within the scope of the Regulation on the Procedures and Principles of Occupational Health and Safety Trainings, trainings will be given to operation and maintenance personnel, and measurement and evaluation will be made after the trainings.</li> <li>• Entrance of the operation personnel, maintenance personnel and third parties to the facility will be provided in a controlled way through the doors where security personnel are located.</li> </ul>	MUSKI	Field personnel, Related Branch Office	Included in the operating costs



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Receptor/ Issue	Mitigation Measure	Responsibility	Authority	Cost
	<ul style="list-style-type: none"><li>• Equipment meeting the international standards will be used in the facility in terms of electrical performance and safety.</li><li>• Before the facility is put into operation, necessary electrical tests will be carried out to check that the electrical connections and other related equipment are working properly.</li><li>• An Emergency Preparedness and Response Plan will be prepared before the facility is operational.</li><li>• Grids with an automatic cleaning system will be used to prevent cleaning workers from entering the ducts.</li><li>• Suitable ventilation systems will be installed where methane deposition is expected.</li><li>• Guardrails will be built to hold around all tanks and pits.</li><li>• MUSKI will prepare an Indoor Entry Procedure in accordance with its standards, national requirements and internationally accepted standards.</li><li>• MUSKI will organize relevant training on safe use and emergency response procedure for operating personnel working with disinfectant.</li><li>• MUSKI will ensure that the Emergency Preparedness and Response Plan covers escape plans in case of chlorine emission.</li><li>• MUSKI will provide its employees with a sufficient number of gas measuring instruments.</li><li>• MUSKI will advise individuals with asthma, diabetes or immune system disorders not to work in treatment facilities due to the risk of infection.</li><li>• MUSKI will ensure that all activities at the treatment plant and pumping stations comply with national standards and WBG SHE Guidelines.</li></ul>			

## VII.2. Monitoring Plan

Table VII-4. Land Preparation and Construction Phase Environmental and Social Monitoring Plan

Parameter	Area/Location	Technical/Method	Time/Frequency	Cost	Responsibility
Environmental Noise Level	Nearest Residential	Noise level measurement with calibrated sound level meter  Noise complaints records	Quarterly and during activities where noise level increases (can be done more frequently based on public complaints)  Once, if there is a change in the activities that causes an increase in noise level  In case of complaints	Included in construction costs	Contractor, Supervisory Authority
Dust (PM10 and PM2.5)	Nearest Residential	Visual Investigation  Dust sampler (PM10 and PM2.5)  Dust complaints records	Weekly field observation  Quarterly and during activities where dust level increases  Once, if there is a change in activities causing the dust level to increase  In case of complaints	Included in construction costs	Contractor, Supervisory Authority
Wastes	Temporary Storage Area and Construction Site	Visual Investigation  Records (forms, declarations, etc.)	Daily field observation based on the course of construction works	Included in construction costs	Contractor, Supervisory Authority  EHS Officer
Health and Safety	Construction Site	Visual Investigation  OHS Audit  H&S Training Records  H&S Documents (OHS Management Plan)	Daily or weekly field observation based on the course of construction works  Monthly/Quarterly Audits	Included in construction costs	Contractor, Supervisory Authority
Labor and Working Conditions	Construction Site	Site Visits and Audits  Grievance records	Weekly field observations  Monthly/Quarterly Site Visits/Audits	Included in construction costs	Contractor, Supervisory Authority
Topsoil and erosion	Construction Site	Visual Investigation	Daily or weekly field observation based on the course of construction works	Included in construction costs	Contractor, Supervisory Authority



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Parameter	Area/Location	Technical/Method	Time/Frequency	Cost	Responsibility
Grievance Mechanism	Construction Site and Impact Area	Site Visits and Audits Grievance records	Weekly field observations Monthly/Quarterly Site Visits/Audits	Included in construction costs	Contractor, Supervisory Authority

**Table VII-5. Operation Phase Environmental and Social Monitoring Plan**

Parameter	Area/Location	Technical/Method	Time/Frequency	Cost	Responsibility
Maintenance and repair	In the plant area	Failure records reports	Regular preparation of fault and repair record reports, monthly check of records	Included in the operating costs	MUSKI Supervisory Authority
Water Resources (Effluent Quality)	Discharge Location	Measurement / Analysis	Weekly	Included in the operating costs	MUSKI Supervisory Authority
Leakege	WWTP Area	Maintenance Records	Regular preparation of fault and repair record reports, monthly check of records	Included in the operating costs	MUSKI Supervisory Authority
Environmental Noise Level	Nearest Residential	Noise level measurement with calibrated sound level meter	Once during commissioning  In case of complaints	Included in the operating costs	MUSKI Supervisory Authority
Wastes	Maintenance and operation areas	Visual Investigation  Records (forms, declarations, etc.)  Internal and/or External Audits	Daily/Weekly operating personnel  Quarterly/Biannual Internal/External Audits	Included in the operating costs	MUSKI
Waste Sludge	Sludge Disposal Unit	Observation in the area, environmental audits (Personnel), Records on sludge amounts, licenses of the companies, audit results	During the operation phase, documents related to the sludge amounts sent to the licensed disposal company will be prepared and related documents will be recorded within the scope of monitoring.	Included in the operating costs	MUSKI
Odor	Nearest Residential	Environmental Control	Daily/Weekly by the operating personnel  In case of complaints	Included in the operating costs	MUSKI Supervisory Authority
Labor and Working Conditions	Maintenance and operation areas	Site Visits and Audits	Weekly field observations  Monthly/Quarterly Site Visits/Audits	Included in the operating costs	MUSKI Supervisory Authority
Health and Safety (including disasters and accidents)	Maintenance and operation areas	Visual Investigation  OHS Audit  H&S Training Records	Daily/weekly field observation  Monthly/Quarterly Audits	Included in the operating costs	MUSKI Supervisory Authority







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Parameter	Area/Location	Technical/Method	Time/Frequency	Cost	Responsibility
		H&S Documents (OHS Management Plan)			
Grievance Mechanism	Settlements near the Project Area	6 Months Social Monitoring (under MUSKI control) Monthly Complaint Record Control (Public) Public Participation and Information Meeting Records	Daily/weekly field observation Monthly/Biannual Site Visits/Audits	Included in the operating costs	MUSKI

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### VII.3. Institutional Arrangements, Necessary Approvals and Permissions

The main actors in the implementation of this ESMP are İller Bankası Project Management Unit (PMU) and the project owner MUSKI. Overall, a summary of the roles and responsibilities of the project stakeholders is provided in Table VII-5.

#### VII.3.1. Main Beneficiary Organization and its Responsibilities

The municipality has responsibilities including:

- Providing health and social assistance, including general hygiene.
- To realize land expropriations for public services and construction works, including the construction of urban roads, bridges and similar infrastructure specified in the development plan.
- To carry out cultural and educational activities.
- To ensure the level of welfare, including agriculture and economy, as well as public health and sanitary system inspection practices.



#### VII.3.2. The Main Responsibilities of the Water and Sewerage Administrations

The main responsibilities of Water and Sewerage Administration are as follows:

- In principle, they are responsible for the construction and operation of the required environmental infrastructure (drinking water and urban wastewater).
- It can apply to the General Directorate of State Hydraulic Works or İller Bank for financial, technical and construction assistance.
- It is responsible for the construction, operation and maintenance of water supply facilities and urban wastewater infrastructure within its service limits.

**Table VII-6. Roles and Responsibilities**

	Municipality- MUSKI	İller Bankası	The World Bank
<b>Financial Roles</b>	Borrower	Financial Intermediary	Main funding source
<b>Application Process</b>	Submission of Demand Based Applications	Examining/analyzing applications to inform the World Bank	Acceptance of the final decision on eight participating municipalities
<b>Preparation Process</b>	Implementation of the laws and regulations and other related policies that are requested by the World Bank through İller Bankası	Coordination between selected municipalities to ensure compliance with all relevant rules and regulations throughout the project. Arrangement of an internal working structure for investment options.	Assisting İller Bankası in developing the performance and progress database system during the preparatory phase Providing technical guidance to İller Bankası

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	Municipality- MUSKI	İller Bankası	The World Bank
<b>Number of Staff</b>	Assigning a Social Expert and an Environmental Expert	Determining the team's structure	Assisting İller Bankası in forming the monitoring team
<b>Project Roles</b>	Preparation of ESMP and establishment of grievance mechanism. Tendering of all project construction works and consultancy services within the framework of predefined rules	The main responsible for monitoring of the ESMP and grievance mechanism . Supervision and monitoring of the entire process to ensure that the World Bank's environmental and social protection measures are properly implemented.	General review of project development stages. Examination of incoming reports to determine whether bank standards are complied with or not.

### VII.3.3. Responsibilities of Other Stakeholders



#### İller Bankası

İller Bankası is the relevant institution of the Ministry of Environment and Urbanization. 'İller Bankası' has two main functions:

- a) Support infrastructure development at the local level through technical assistance, grants and loans,
- b) Transferring central tax revenues to local administrations,

Municipalities are the Bank's stakeholders. 'İller Bankası' plans the water supply, sewerage networks, water and wastewater treatment plants, solid waste management system, sea discharge, geothermal applications and building constructions (municipal building, cold storage, station buildings and landscape architecture, etc.) required by the municipalities, It carries out its construction and financing. Specifically, İller Bankası will ensure that the following are fulfilled:

- Providing guidance on the preparation of project documents of MUSKI in accordance with the requirements of the World Bank and the public participation and announcement requirements,
- Providing guidance to MUSKI officials and consultants on World Bank's protection measures (documents and procedures) on cultural assets, natural habitats, forests and international waterways,
- To examine the documents related to the environmental and social assessment of the project, to provide written opinions to the consultants of MUSKI and to give official approval to these documents and procedures in accordance with the requirements of the World Bank protection measures,
- To ensure that agreements on the implementation of the ESMP and other environmental and social protection measures are included,

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- MUSKI will regularly monitor the ESMP practices and the necessary information and practices about the project will be included in the project monitoring report to be submitted to the World Bank regularly every 6 months,
- To have an idea about the opinions of the relevant groups and local environmental/social experts about the environmental and social aspects of the project implementation and to meet with these groups during field visits when necessary,
- To provide coordination and communication with the World Bank supervision missions regarding the environmental and social protection measures of the project implementation,



### **The World Bank**

The task of the World Bank is to ensure that the loan obtained from the Bank is spent within the scope of the relevant work and to check and approve the compliance of the tenders and contracts executed regarding this work with the World Bank tender and contract documents and procedures. The transactions will be checked periodically by the Bank.

### **Contractor**

MUSKI General Directorate is responsible for the environmental and social impacts of the project during the construction and operation phases. MUSKI will include the ESMP to the tender documents before the tender for the construction phase and the contractor will be informed about the environmental and social commitments. The activities to be carried out by the contractor and to be supervised by the consultant are as follows:

- All conditions and rules included in the ESMP document, which is part of the contract document, are implemented on the field and in the technical office and revised with MUSKI, if necessary,
- Providing the necessary trainings to the personnel who will work at the construction stage,
- Providing necessary information to MUSKI, managing the grievance mechanism and reporting complaints to MUSKI regularly at the information meeting of the environmental community and NGOs about the ESMP within the scope of the Project,
- Regular monitoring of project activities and preparation of 3-month Environmental and Social Monitoring Reports within the scope of ESMP and submitting to MUSKI General Directorate.

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## VIII. STAKEHOLDERS AND PUBLIC PARTICIPATION

### VIII.1. Identifying Stakeholders

In order to realize stakeholder engagement equally and fairly, stakeholders must be identified in the first phase of the project. With this determination, it will ensure that all stakeholders of the project are analyzed correctly, including directly and indirectly affected people and groups interested / interested in the project.



Stakeholders expected to be directly or indirectly affected by the project are listed below:

- National state institutions and organizations (Ministry of Forestry and Water Affairs, Ministry of Environment and Urbanization, Ministry of Culture and Tourism etc.);
- Local government institutions and organizations (Muğla Governorship, Fethiye Municipality, Fethiye District Governorship etc.);
- People directly or indirectly affected (those living in the Project impact area, landowners, common land users, seasonal workers, etc.)
- NGOs
- Universities, local businesses, cooperatives, chambers of commerce, etc. interest groups
- Project employees

The issue of how to share information with the stakeholders to be communicated during the project is important and these details regarding the information process are summarized below.

**Table VIII-1. Stakeholder Engagement Matrix**

Stakeholder Groups	Information to Share	Communication Method
Government institutions and organizations	<ul style="list-style-type: none"> <li>• Non-technical summary of the project and Stakeholder Engagement Plan</li> <li>• Current developments about the project</li> <li>• Complaint mechanism procedure</li> </ul>	<ul style="list-style-type: none"> <li>• Opinion/feedback meetings</li> <li>• Non-technical summary of the project and printed copies of the stakeholder engagement plan in municipal buildings</li> </ul>
People directly or indirectly affected (those living in the Project impact area, landowners, common land users, seasonal workers, etc.)	<ul style="list-style-type: none"> <li>• Complaint mechanism procedure</li> <li>• Current developments about the project</li> <li>• Non-technical summary of the project</li> </ul>	<ul style="list-style-type: none"> <li>• Public participation meeting</li> <li>• Announcements in the local press</li> <li>• Regular information meetings</li> <li>• Announcements and posters to be hung in public places (coffeehouse, headman's building, village mansion etc.)</li> <li>• Materials such as introduction brochure, booklet to be distributed</li> </ul>
NGOs	<ul style="list-style-type: none"> <li>• Non-technical summary of the project and Stakeholder Engagement Plan</li> <li>• Complaint mechanism procedure</li> <li>• Current developments about the project</li> </ul>	<ul style="list-style-type: none"> <li>• Public participation meeting</li> <li>• Opinion/feedback meetings</li> <li>• Announcements in the local press</li> <li>• Materials such as project introduction brochure, booklet to be distributed</li> </ul>
Universities, local businesses, cooperatives, chambers of commerce, etc. interest groups	<ul style="list-style-type: none"> <li>• Non-technical summary of the project</li> <li>• Complaint mechanism procedure</li> <li>• Current developments about the project</li> </ul>	<ul style="list-style-type: none"> <li>• Public participation meeting</li> <li>• Opinion/feedback meetings</li> <li>• Materials such as project introduction brochure, booklet to be distributed</li> </ul>
Project employees	<ul style="list-style-type: none"> <li>• Complaint procedure for employees</li> <li>• Current developments about the project</li> </ul>	<ul style="list-style-type: none"> <li>• Regular meetings and negotiations</li> <li>• Announcements and posters on the boards in the work areas</li> </ul>

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## VIII.2. Public Participation Meeting-I

People who are likely to be affected by the project are residents living around the project area and living or working within the boundaries of the Fethiye wastewater collection basin. In order to announce the project, to give information about the project and to get the opinions of the public, a Public Participation Meeting was held on 12.07.2019 at 10.30 in Fethiye MUSKİ Service Building.

Before the meeting date, meeting announcements were made in 2 different newspapers published locally and across the country, informative correspondence was made to the Municipality of Fethiye and all neighborhood headmen and the announcement texts were sent. Apart from the participation of the people of the region;

- Headmen of the Neighborhood,
- Fethiye Municipality Employees and Assembly Members,
- Officials of Fethiye District Agriculture and Forestry Directorate,
- Chamber of City Planners, Muğla Branch Officials
- MUSKİ Officials,
- Officials from ÇINAR Mühendislik Müşavirlik A.Ş.

participated to the meeting.

In the meeting, information about the project was given and the questions asked were answered.

Views of the Public Participation Meeting regarding Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Project's are given in Figure VIII-1- to Figure VIII-4.



Figure VIII-1 Image from the Public Participation Meeting-1



Figure VIII-2 Image from the Public Participation Meeting-2







Figure VIII-3 Image from the Public Participation Meeting-3



Figure VIII-4 Image from the Public Participation Meeting-4

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During the Public Participation Meeting, both the local people and people coming from outside the region and interested in the project expressed their opinions and suggestions. The highlights of the meeting are briefly discussed below;

- The question of whether there will be expropriation for the project or not is given the answer that the planned facility will be established in the empty area next to the existing facility and that no extra expropriation will be made.
- It was stated by a participant, who is a hotel operator, that the population of Günbaşıbaşı district increased to 700,000 people in the summer months, as many other hotel owners stated, the tourists found Çalış beach very dirty, there were accidents due to jellyfish, they were uncomfortable with the smell and were afraid to swim.
- It was stated by other participants that the capacity of the existing treatment plant is sufficient, that the reason why Çalış beach's swimming water quality class will fall from C to D is not that the existing lines are not rehabilitated. Because it is thought that the pollution in Çalış Beach is caused by leaks at the discharge points in the bay. Raw wastewater leakage to the treatment plant of the priority by MUSKI officials, etc. It is stated that it will be brought without any help, but rehabilitation of all lines will be done soon. In addition, the results of the discharge point analysis of the plant were shared by MUSKI and it was stated that the values met the standards but there were those who discharged illegally and they should be prevented. First of all, illegal uses and existing leaks were detected, and then information was shared about rehabilitation.
- The President of Çalış Aquaculture Cooperative, who attended the meeting, stated that the reason for the pollution in the sea is not the sewage treatment, but the introduction of chemicals such as meteorite, acid, chlorine, detergent used in the pools by the touristic enterprises and preventing the breeding of fish species in the sea, causing fish death and pollution. In order to solve this, it has been stated that work should be done about how the water of swimming pools should be discharged and it should be brought under control by regulation. These opinions were also supported by many other people attending the meeting and a solution was requested for this issue.

Proje Adı	Fethiye İleri Biyolojik Atıksu Arıtma Tesisi 2. Kademe Üniteleri Uygulama Projesi Muğla İli Muhtelif Kanalizasyon Rehabilitasyon Ve Yapım İşi
Toplantı Yeri	Fethiye MUSKİ Hizmet Binası Toplantı Salonu
Toplantı Tarihi	11.07.2019
Toplantı Saati	10:30
Katılımcı Sayısı	

	Ad / Soyad	Kurum / Mahalle	İmza
1	Ao. Alparslan KULLUKÇU	CHP Fethiye İler. Beled.	
2	İhsan ÇAKIR	Foca Mhl.	
3	ÖĞÜR TRULLU	FETHİYE BELEDİYESİ	
4	MURMET DADHOŞ	FETHİYE BELEDİYESİ	
5	N. Mehmet SÖĞÜT	Fethiye Belediyesi	
6	Veli PARUSAN	Belediye Meclis Üyesi	
7	Ercan GELİK	Kerapazeler Mah. Muht.	
8	Süzen TAZAR	Kesikkapı mah. muht.	
9	Tufan OKSAR	Taşyaka mah. muht.	
10	Bekir SAHİP	Tuzla mah. muht.	
11	İlker CANI	Foca mah. muht.	
12	Hasan SİMSİLİ	Foca Mh.	
13	Alihan E. dener ÖRMAN	S.S. Fethiye ÇALIŞ Su Üniteleri Kaap Dsk	
14	Wajir KAVCAK	Camhane Mah. Muht.	
15	Nurhan GÖZTEPE	Karacay Mah. Muhtarı	
16	Cevdet KÖSE	Akarca Mah. Muhtarı	
17	Şahel KURTULUS	MUSKİ-İGME Şu. D. Bile 3. Bölge 26. Mh.	
18	Emre YATIM	Babatlas. mh - Muhtarı.	
19	Uğur GÜBÜZ	Babatlas. mh. Aşağı	
20	Sükrü KÖSE	Tarım ve Orman İlçe Müd.	

Figure VIII-5 Minutes of Public Participation Meeting 1/2

Proje Adı	Fethiye İleri Biyolojik Atıksu Arıtma Tesisi 2. Kademe Üniteleri Uygulama Projesi Muğla İli Muhtelif Kanalizasyon Rehabilitasyon Ve Yapım İşi
Toplantı Yeri	Fethiye MUSKI Hizmet Binası Toplantı Salonu
Toplantı Tarihi	11.07.2019
Toplantı Saati	10:30
Katılımcı Sayısı	

	Ad / Soyad	Kurum / Mahalle	İmza
1	Soner ALP	Fethiye İlçe Tarım ve Orman Müd.	Alp
2	Tahir BAŞARAK	Fethiye Belediyesi Fen İş. Müd.	Başarak
3	M. Serhat KARAGÖZ	Fethiye Belediyesi İnce İşletme Müd.	Karagöz
4	Hazin Hıyran	Fethiye Beld. Fen İş. Müd.	Hıyran
5	Güziye ÖLKAYA	Fethiye Beld. Bel. İş. Müd.	Ölkaya
6	Serim BOZ	MUSKI Kon. ve Atıksu Arıtma Üniteleri Servis Müh.	Boz
7	Yahya KABAĞ	Fethiye Beld. Çevre Koruma ve Kontrol Müd.	Kabağ
8	İsmail Yarıbaşı	Fethiye Bld. Çevre Koruma ve Kontrol Müd.	Yarıbaşı
9	Ayşe Devrim ÖZTÜRK	Fethiye Belediyesi İnce İşletme Müd.	Öztürk
10	Bağcı AKIN	MUSKI	Akin
11	MUSTAFA DURAN	MUSKI	Duran
12	Murat ÖZTEK	MUSKI	Öztek
13	Doğan AYAN	MUSKI	Ayan
14	KORAY ŞARLAK	MUSKI	Şarlak
15	Tasime SAHİN	MUSKI	Sahin
16	Doğukan VAYIĞ	MUSKI	Vayığ
17	Göknel SEKİ	"	Seği
18	BİROL KEŞKİ	ŞEHİR PLANÇILARI ODASI MUĞLA ŞUBESİ	Keşki
19	Ramazan K. Balık	0332 611 06 94 Muhtelif 1. Menteşe Sevgi Müh.	Balık
20			



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Figure VIII-6 Minutes of Public Participation Meeting 2/2




**DUYURU**  
**(Çevresel ve Sosyal Etki Değerlendirmesi) ÇSED ve**  
**(Çevresel ve Sosyal Yönetim Planı) ÇSYP Süreci**  
**Halkın Katılımı Toplantısı**

Muğla Büyükşehir Belediyesi Su ve Kanalizasyon İdaresi Genel Müdürlüğü (MUSKİ) tarafından; Muğla İli, Fethiye İlçesi Cumhuriyet, Tuzla, Foça, Babataşı, Mentешеoğlu, Taşkaya, Akarca, Kesikkapı Mahalleleri sınırları içerisinde, “Dünya Bankası'nın Çevresel Değerlendirme İle İlgili İşletim Politikası (O.P. 4.01) Kapsamında, Yönetim Planlarının, Eylem Planlarının Ve Etki Değerlendirme Raporlarının Hazırlanması” nin yapılması kapsamında halkı bilgilendirmek, görüş ve önerilerini almak için “Halkın Katılımı Toplantısı” yapılacaktır.

Halkımıza saygı ile duyurulur.

<b>Toplantı Yeri</b>	: Fethiye MUSKİ Hizmet Binası Toplantı Salonu
<b>Toplantı Yerinin Adresi</b>	: Tuzla Mahallesi, Adnan Menderes Bulvarı Fethiye /Muğla
<b>Toplantı Tarih ve Saati</b>	: 12.07.2019 10:30



**Proje Sahibi:** Muğla Büyükşehir Belediyesi Su ve Kanalizasyon İdaresi Genel Müdürlüğü (MUSKİ)

<b>Tel</b>	: (0 252) 214 48 80
<b>Faks</b>	: (0 252) 212 48 80

**ÇED Raporunu Hazırlayan Kuruluş:** Çınar Müh. Müş. A.Ş.

<b>Tel</b>	: (0 312) 472 38 39
<b>Faks</b>	: (0 312) 472 39 33

Figure VIII-7 Public Participation Meeting Announcement

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### VIII.3. Public Participation Meeting-II

People who are likely to be affected by the project are residents living around the project area and living or working within the boundaries of the Fethiye wastewater collection basin. In order to announce the project, to give information about the project and to get the opinions of the public, a Public Participation Meeting was held on 18.12.2019 at 10.30 in Fethiye MUSKİ Service Building.

Before the meeting date, meeting announcements were made in 2 different newspapers published locally and across the country, informative correspondence was made to the Municipality of Fethiye and all neighborhood headmen and the announcement texts were sent. Apart from the participation of the people of the region;

- ❖ Headmen of the Neighborhood,
- ❖ Fethiye Municipality Employees and Assembly Members,
- ❖ Officials of Fethiye District Agriculture and Forestry Directorate,
- ❖ Chamber of City Planners, Muğla Branch Officials
- ❖ MUSKİ Officials,
- ❖ Officials from ÇINAR Mühendislik Müşavirlik A.Ş.

participated to the meeting.

In the meeting, information about the project was given and the questions asked were answered.

Views of the Public Participation Meeting regarding the Fethiye Advanced Biological Wastewater Treatment Plant 2nd Stage Project are given below.

Possible adverse impacts of the construction phase of the project on tourism were asked, information was given that the construction activity would be realized in the closed season and the measures were explained.



Figure VIII-8 View of the 2nd Public Participation Meeting-1



Figure VIII-9 Image from the 2nd Public Participation Meeting-1

Within the scope of the second Public Participation Meeting, information was given about the project, the ESIA process was explained and the Environmental and Social Management System was explained. During the meeting, both the people living in the region and people coming from outside the region and interested in the project expressed their opinions and suggestions. The highlights of the meeting are briefly discussed below.

The question of whether there will be extra expropriation for the project or not is given the answer that the planned facility will be established in the empty space next to the existing facility and that no extra expropriation will be made.



Proje Adı	FETHİYE İLERİ BİYOLOJİK ATIK SU ARITMA TESİSİ 2. KADEME ÜNİTELERİ UYGULAMA PROJESİ
Toplantı Yeri	Fethiye MUSKI Hizmet Binası – Toplantı Salonu
Toplantı Tarihi	18.12.2019
Toplantı Saati	10:30
Katılımcı Sayısı	

No	Ad / Soyad	Kurum / Mahalle	İmza
1	MURUVET DAŞHOS	FETHİYE BELEDİYESİ	
2	Metin AY	Fethiye Kent Konseyi Çalış. - Der	
3	BİROL KESKİ	ŞEHİR PLANICILARI ORAN Fethiye Kent Konseyi	
4	Sevinç BOZ	Muski-	
5	MUSTAFA DURAN	MUSKI	
6	NİZAMETTİN İSKİ	Muski	
7	ŞEPA TÜRKMEN	MUSKI	
8	Tahir BAŞARAN	Fethiye Belediyesi	
9	Buket KIZIL	Fethiye Belediyesi	
10	DURMUŞ ARICI	MUSKI	
11	SERKAN TOSUN	Atıkların nakil ve depolama Şube Mh. (MUSKI)	
12	Mehmet KÖKÇÜ	MUSKI	
13	Goran KOCAYARDAĞI	MUSKI	
14	CAHT CAHT	MUSKI	
15	Hasan Volkan ÖZTUNIL	Muski	
16	Senil Başaran	Ev hanım.	
17	Adnan Başaran	Emekli	
18	Emine BARKAN TAMER	Genç Mh. (MUSKI)	
19	Öğüt Kaan YILMAZ	İst. İb. md.	
20	Öğüt CANATAN	Mh. Mh.	

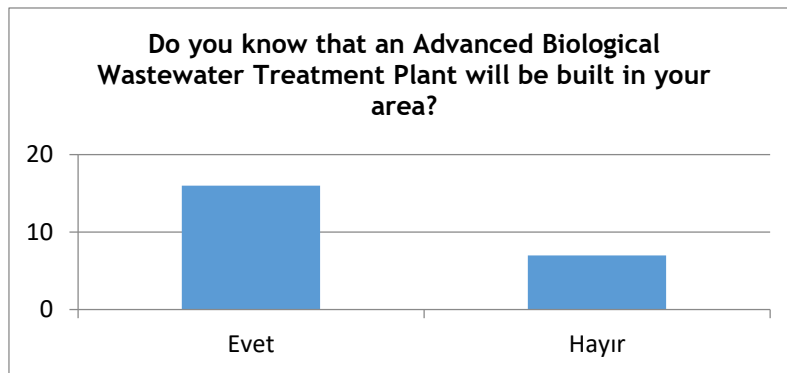
21	Aklat Arsel KUŞ	Çınar Mh. (Genç Mh.)	
22	Sinan Yıldırım	Çınar Mh.	

Figure VIII-10 2. Minutes of Public Participation Meeting

#### VIII.4. Survey Study Results

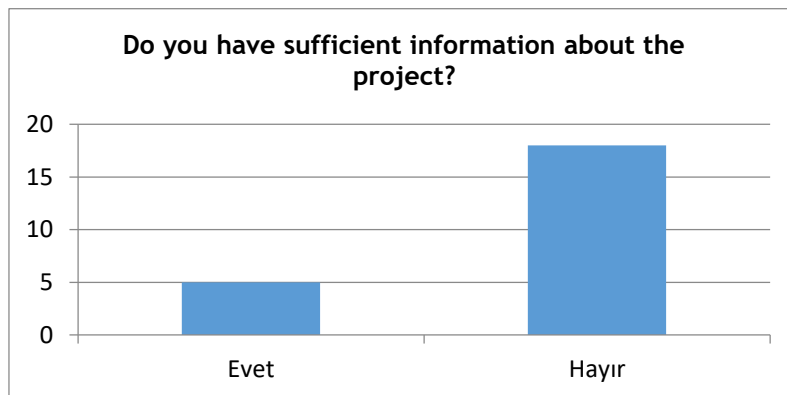
Within the scope of the project, surveys were conducted simultaneously with the Public Participation Meeting to determine the views and suggestions of stakeholders. Approximately 23 people participated in the survey study. Participants were asked about their level of knowledge, support status, expectations and suggestions for the project. The data obtained in the survey study were analyzed using the SPSS (Statistical Package for Social Sciences) program and interpreted below.

Participants were first asked whether they were aware of the Advanced Biological Wastewater Treatment Plant project to be built in their region. Approximately 70% of the participants stated that they knew that the project would be carried out.



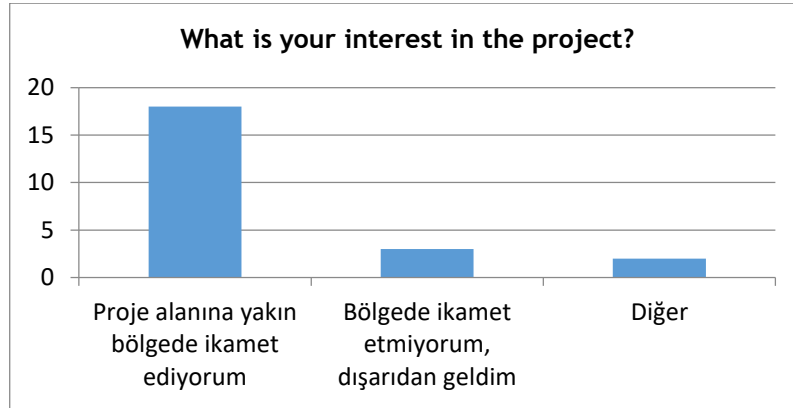
Graphic VIII-1: Being aware of the project

Although the number of people who know the project will be quite high, the number of participants who think that they have sufficient information about the project is low. 78% of the participants think that they do not have enough information about the project.



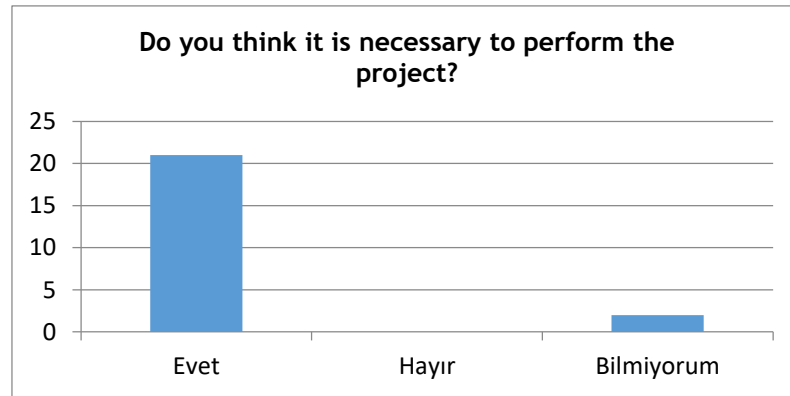
Graphic VIII-2: Knowledge Level regarding the Project

About 78% of the participants' interest in the project stated that they reside in the region close to the project area, 13% stated that they did not reside in the region, came from the outside but were interested in the project.



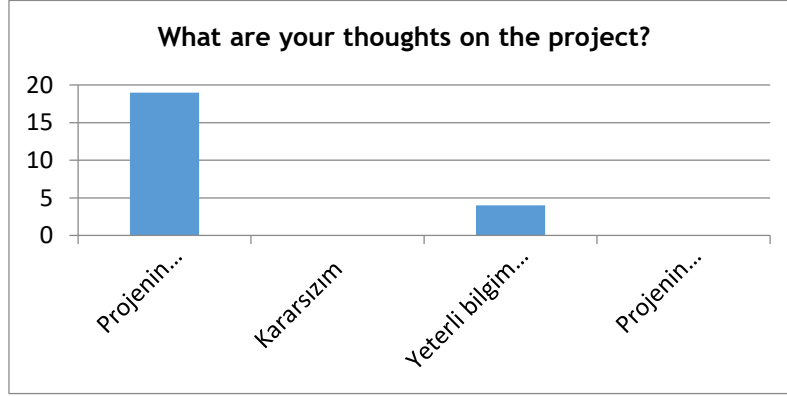
Graphic VIII-3: Reason of Interest with the Project

During the survey, the participants were asked whether they thought it was necessary to do the project or not. The majority of the participants (91%) require the project to be carried out. Only 9% replied “I don't know” on the grounds that they did not have sufficient information about the project.



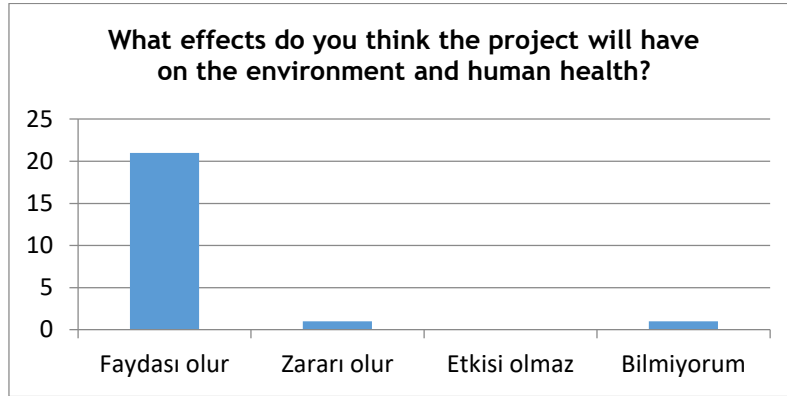
Graphic VIII-4: Views on the Project

In order to better understand the opinions of the participants about the project, what they think about the project was asked. While 83% stated that they supported the implementation of the project, 17% did not comment because they did not have enough information.



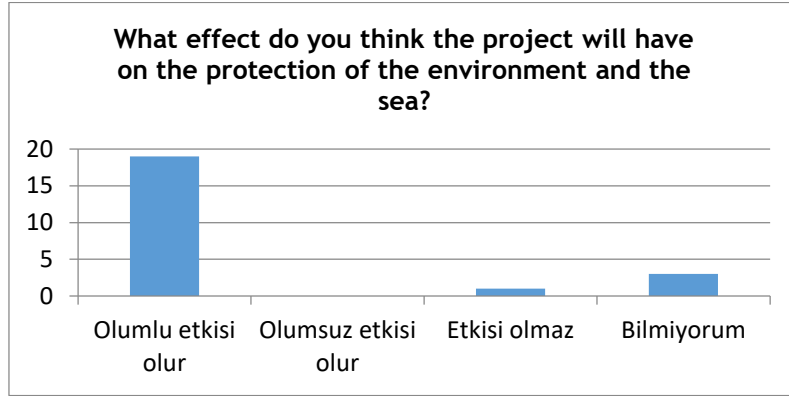
Graphic VIII-5: Views on the Project

While responding to the question of what effects the project will have on the environment and human health, 91% of the respondents said that it would be beneficial, 1 person stated that there would be harm and 1 person did not know. It is seen that those who stated that they did not have enough information about the project in the previous question also expressed positive opinions about the environment and human health.



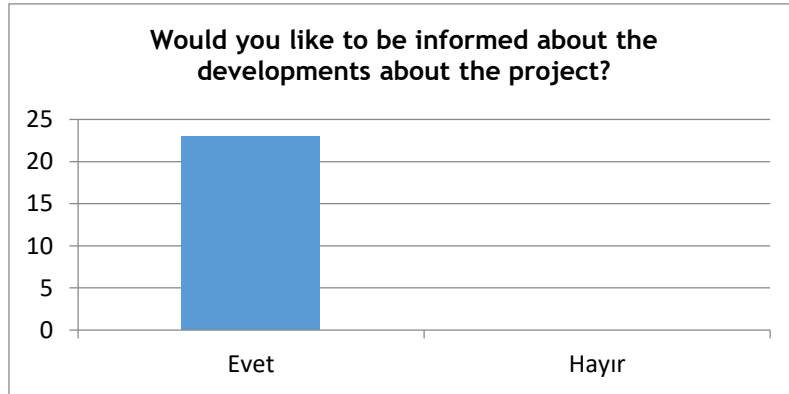
Graphic VIII-6: Views on the Impacts of the Project on Environment and Human Health

On the question of how the project will have an impact on the protection of the environment and the sea, 83% of the participants responded that they would have a positive impact, while 3 people did not know what impact it would have, and 1 person stated that it would not have an impact.



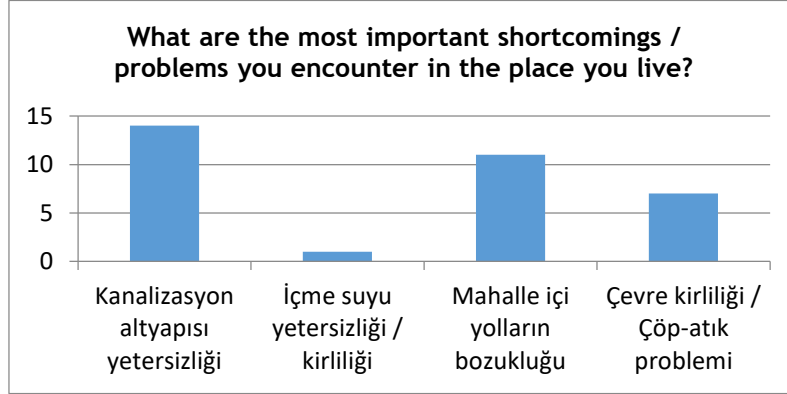
Graphic VIII-7: Views on the Impacts of the Project on the Protection of the Environment and the Sea

The participants were asked if they would like to receive information about the developments on the Project. All of the participants stated that they want to be informed about the developments related to the project.



Graphic VIII-8: Opinions on Being Informed about the Developments Related to the Project

Finally, the participants were asked what the most important deficiencies / problems they encountered in their place of residence. Participants answered this question by selecting more than one answer option. The two most important problems stated by the participants are the insufficient sewerage infrastructure and the disturbance of the roads in the neighborhood. At the same time, environmental pollution / garbage-waste problem was also mentioned as an important problem.



Graphic VIII-9: The most important deficiencies/problems encountered in the region

At the end of the survey, it is seen that the participants complain about the smell they think is caused by the existing marine pollution and treatment in the section of specifying the opinions and suggestions about the project. In this regard, although there are many people who think that the realization of the project is essential, some participants have made additional suggestions and evaluations.



There are concerns about the urgent construction of the treatment plant of the Ovacık-Hisarönü region, which is considered as one of the factors causing the Fethiye Bay's pollution, how much of the total district population of the settling tanks to be constructed within the scope of the project will be resolved. In addition, there are those who state that the existing sewerage line is sufficient but that the lines must be rehabilitated to prevent infiltration because they are too old and neglected. Some participants stated that the water purified immediately to save the inner gulf of Fethiye should be given to the sea with deep discharge instead of Mut stream. Especially, the negative effects of Çalış Beach swimming water criteria cause a lot of concern. If the existing lines are not rehabilitated, there is a concern that Çalış beach will have a swimming water quality class of D in 2018, and that the beach will not be swimmable. Although the priority of the purification plant was increased by the MUSKI officials during the HKT regarding these concerns, it was stated that deficiencies and infiltrations in the existing lines, illegal discharges will be detected and rehabilitation will be carried out.

### VIII.5. Grievance Mechanism

#### VIII.5.1. Land Preparation and Construction Phase

Public participation and public disclosure meetings were held with the people in the settlement close to the project area and with the direct or indirect stakeholders of the project.

An accessible grievance mechanism has been established for all project stakeholders to create a healthier grievance management. Metropolitan Municipality and Construction Contractor will be responsible for the management of complaints.

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In the public participation meeting held on 12.07.2019, the following information was conveyed to the project stakeholders;

- With the disclosure of the project information, stakeholders were helped to understand the project's risks, impacts and opportunities. The people living in the project area and its surroundings have been explained to the stakeholders affected by the adverse environmental or social impacts of the project.
  - The purpose, nature, scale and duration of the project activities
  - Potential impacts and mitigation plans
  - The foreseen stakeholder engagement process and opportunities and methods that the public can participate in
  - The time and place of any envisaged public participation meeting and the reporting, summarizing and reporting process of the meetings
  - The process in which any complaints will be managed



The main features that a grievance mechanism should have are;

- A good explanation of how complaints are filed and handled after submission of applications,
- Having minimum time to get answers
- Alternative tools for submitting the complaint to a person personally, if the written application bothers the complainant

It is important to establish a Grievance Redress Mechanism (GRM) at the project level at the municipal level and within the Construction Contractor. An example mechanism that can be used by the Construction Contractor is presented in the table below;

Table VIII-2. Complaint/Grievance Redress Mechanism

Stage	Related Authority	Application Tool	Parameters to be defined	Activities	Time
1	<b>Muğla Metropolitan Municipality</b> Related unit: Project Plan For Investment And Construction Department Phone: 444 4 801 Address: Orhaniye, Uğur Mumcu Blv. No:41, 48000 Menteşe/Muğla Email: <a href="https://www.muski.gov.tr/bizeulasin.aspx">https://www.muski.gov.tr/bizeulasin.aspx</a>	<ul style="list-style-type: none"> <li>➤ Face to face meeting,</li> <li>➤ Phone call, correspondences</li> <li>➤ Email,</li> <li>➤ Online application,</li> <li>➤ Correspondence</li> </ul>	<ul style="list-style-type: none"> <li>• Name and Surname of the Complainant;</li> <li>• Subject of Complaint;</li> </ul>	Questions or complaints are evaluated. Feedback is given to the person. If	15-30 days

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2	<b>Construction Contractor Office</b> Related person: Phone: Address: Email:  (To be indicated when known)	➤ Face to face meeting, ➤ Phone call,	<ul style="list-style-type: none"> <li>• Location of the Complaint;</li> <li>• Contact information (phone/cell phone number, address, e-mail etc.);</li> <li>• Institution name (if any)</li> <li>• Date and time</li> </ul>	it is not resolved, it is directed to legal means.	30 days
---	--	--	--	--	---------

Muğla Metropolitan Municipality and Construction Contractor must have separate free telephone lines to receive complaints.

Anonymous grievances can be addressed to CİMER, İllerBank or Muğla Metropolitan Municipality directly.

The main steps in a grievance mechanism are described below;



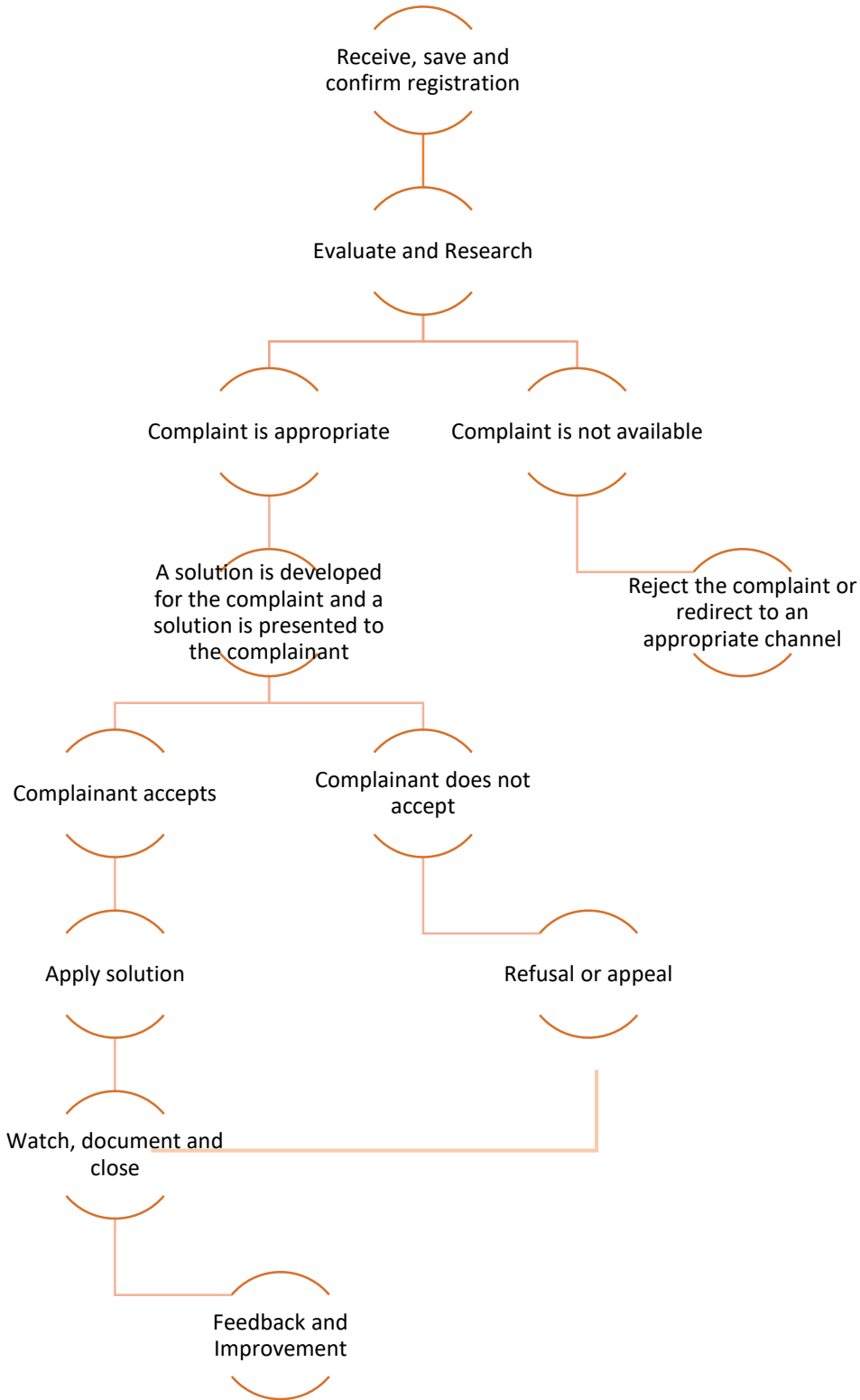




Figure VIII-11: Example Complaint Mechanism

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### ***Employee Grievance Mechanism***

Muğla Metropolitan Municipality should aim to provide a mechanism for dealing with complaints from Construction Contractor employees. The following objectives must be met;

- Establish a mechanism for all construction contractors for their workers to share their thoughts and complaints about the working conditions of their working environment
- Preventing recurring complaints about employment issues and working conditions.
- Having an active and transparent relationship with employees who aim to resolve concerns in the first stage of the dispute

#### **VIII.5.2. Operation Phase**

The project GRM will be available throughout project life, including operation phase. The Contractor and Muğla Metropolitan Municipality are responsible for taking measures to reduce possible environmental and social impacts in order to fulfill the laws and regulations stipulated in national legislation and other relevant international policies that apply to the project. They must take into account the new regulations that may come into force during the operation phase and comply with the changing conditions in the regulations. The municipality is also responsible for the training of staff on environmental awareness. Checks whether the rules specified in the monitoring plans are followed by a series of internal audits.

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## X. PUBLIC PARTICIPATION SURVEYS





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XI. PROJECT AREA PROPERTY DEED AND LAND USE COMMITMENT

Resim Tarifi Saati: 2.24.20 15:24

**TAŞINMAZA AIT TAPU KAYDI**

Araç Tipi : Araç Tipi  
Zemin No : 1603432  
Sıra : MÜĞLA / FETHİYE  
Kullanıcı : FETHİYE  
Mülkiyet Adı : GÜNLERBAŞI M  
Mevki : ERENBELLENİ  
Çalışma No : 89 / 8776  
Kayıt Durum : AŞİF

Adı/Parcel : 2087 / 1  
Yüzölçümü : 2087 m<sup>2</sup>  
Alan Tak. Nolu : ARSA

**TAŞINMAZ SERH / BEYAN / İRTİFAK**

Sistem No	Tip	Tanım	Kisi
0			

**TEFERRUAT BİLGİLERİ**

Sistem No	Açıklama	Miktar	Değer
0		0	0

**MÜLKİYET BİLGİLERİ**

Sistem No	TC- Mülk	Elherliği No	Hisse Pay/Paydaş	Edinme Sebabi - Tarihi - Yev.	Terhiz Sebabi - Tarihi - Yev.	Mülkiyet Zedeler	Tarih - Yevmiye	Terhiz Sebabi - Tarihi - Yev.
0383554	0 - MÜĞLA İLİ VE KANALİZASYON İDARESİ GENEL MÜDÜRLÜĞÜ	1 / 1	1 / 1	Konu Kurumcaın İbrazatı Devri 2024/20/003				

**SBI**

Diğer Notlar: Bu taşınmazın mülkiyeti Muğla Büyükşehir Belediyesi tarafından 2018 sayılı Kanun Hükmünde Kararname ile devredilmiştir. Bu taşınmaz devir sonucu doğrudan kullanılmaya ve aynı amaçla kullanılmaya elverişlidir. Devir amacına uygun olarak kullanılmadıkça hiçbir şekilde devredilmez. Ayrıca, taşınmazın mülkiyeti devredilen kamu idaresi adına resmî işler için kullanılmaktadır.

1/1

**ŞLİ GİBİDİR.**

*Şahin*  
M.Ş. Müd. A.



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## TAAHHÜTNAME

Muğla İli, Fethiye İlçesi, Günlükbaşı Mahallesi'nde, 2907 ada, 1 parsel üzerinde, Muğla Su ve Kanalizasyon İdaresi (MUSKİ) Genel Müdürlüğü tarafından gerçekleştirilmesi planlanan **"Fethiye İleri Biyolojik Atık Su Arıtma Tesisi 2. Kademe Üniteleri Uygulama Projesi"** ile ilgili olarak; "Dünya Bankası'nın Çevresel Değerlendirme İle İlgili İşletim Politikası (O.P. 4.01) Kapsamında, Yönetim Planlarının, Eylem Planlarının Ve Etki Değerlendirme Raporlarının Hazırlanması İşi" kapsamında inşaat aşamasında ilave olarak arazi kullanımının yapılmayacağına dair tüm hususlara uyacağımızı taahhüt ederiz. 20/12/2019

  
Veys Rıza YÜCEL  
Planlama ve Yatırım  
Şb.M.d.V.



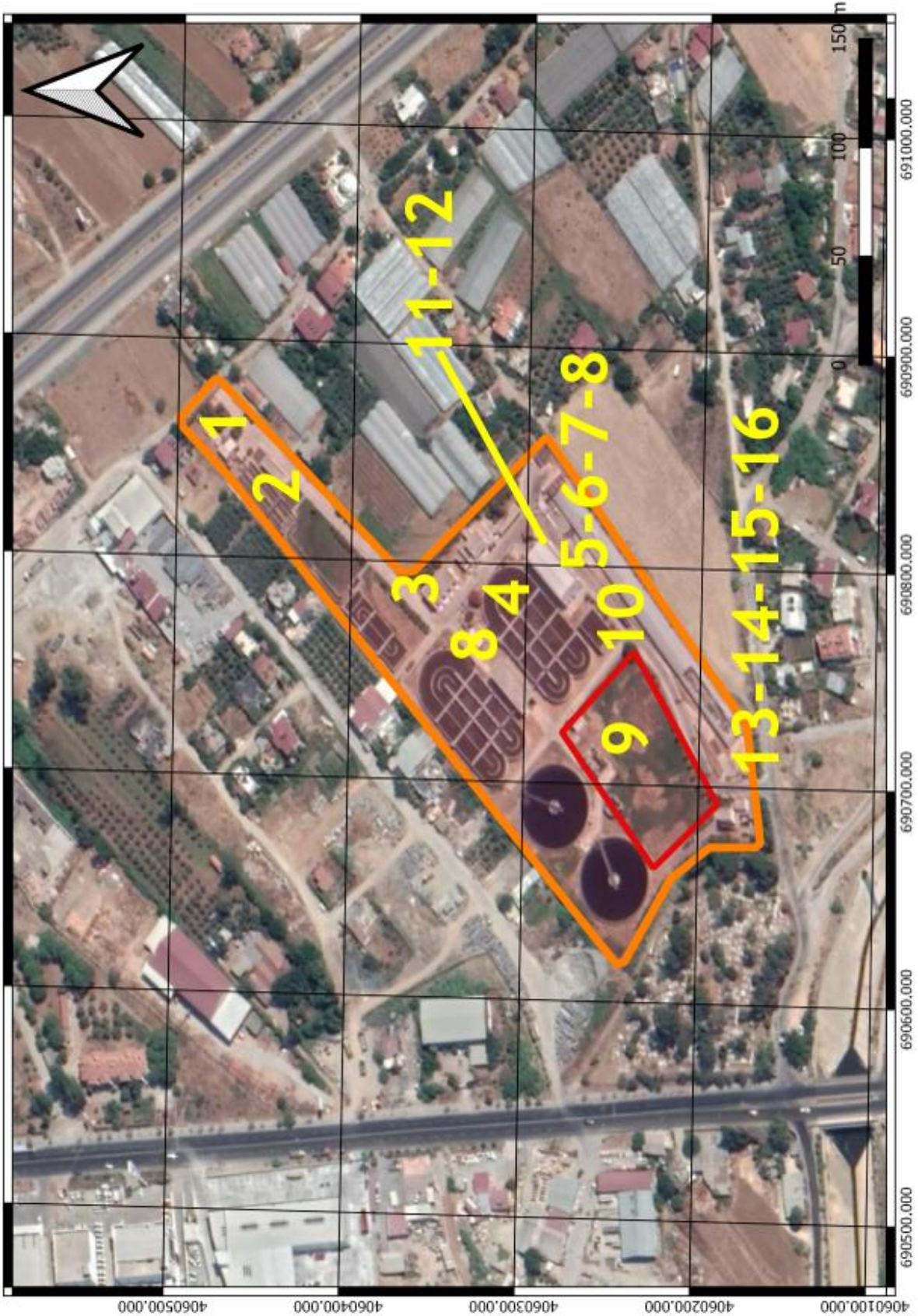
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## XII. PROJECT COMPONENTS MAP



No	Current Plant	To be renewed	To be built
1	TM4 Pump Station	All pumps will be renewed and be operated as 4 + 1.	-
2	Pre-Treatment	Coarse and Fine Screens will be replaced. Sand pumps will be renewed. Sand trap blowers will be added.	Screens and sand traps will be covered. In addition, 1 Screen channel will be built. 1 coarse grill, 2 + 1 fine grill, 2 + 1 tank reserve sand pump, 1 sand trap blower will be built.
3	Selector Tank	-	1 more tank will be built and a submersible mixer will be placed inside it. The existing and new selector tanks will be covered.
4	Anaerobic (Biop) Ponds	-	1 Biop Tank will be built. 2 submersible mixers will be placed. The existing and new Biop tanks will be covered.
5	Distribution Structure and Aeration Ponds	FeCl3 pumps will be replaced.	The distribution structure will be covered. 4 + 1 FeCl3 pumps will be placed.
6	Blower Building	Blowers will be replaced.	4 + 1 ventilation blowers will be placed.
7	Final Sedimentation Tanks Flow Distribution Structure	2 covers will be placed on the line going to the new pools.	-
8	Foam Chamber	1 + 1 foam pump will be placed in the existing foam chamber.	A new foam chamber will be constructed for the final sedimentation pools. 1 + 1 foam pump will be placed inside.
9	Final Sedimentation Tank	-	2 Final Sedimentation Tanks will be built.
10	Sludge Feeding Tank	The current situation will be preserved.	The foam collected in the new Foam Chamber will be pressed here with the pump.
11	Sludge Dewatering Building	Decanters will be put instead of belt presses. Decanter Feeding Pumps and Polyelectrolyte Unit-Dosing Pumps will be replaced.	Decanter Feeding Pumps will be changed to 2 + 2 and Polyelectrolyte Unit-Dosing Pumps to 2 + 2.
12	Reverse Cycle and Excess Sludge Pump Building	The Reverse Cycle Pumps will be provided to operate as 4 + 1. Excess Mud Pumps will be replaced.	2 pumps will be taken to the Reverse Cycle Pumps. Excess Mud Pumps 2 + 1 will be installed.
13	Filtrate Water Pump Station	Filtrate Water Pumps will be replaced.	Filtrate Water pumps will be placed as 2 + 1.
14	Disc-Type Filtration	More efficient operation will be provided by putting a filter system in front of the new UV system.	



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No	Current Plant	To be renewed	To be built
15	UV Disinfection System	It will be demolished.	The new UV system will be rebuilt due to the replacement of filter system in front of it.
16	Hydrophore Building	Hydrophore Unit will be replaced as a package.	-