SAKARYA GAS FIELD DEVELOPMENT PROJECT - ESIA

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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT

Non-Technical Summary

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DEFINITIONS

COMPANY	Turkish Petroleum - Offshore Technology Center (TP-OTC)
CONSULTANT	WSP Golder Associates Turkey Ltd. Şti. (GOLDER)
PROJECT	Sakarya Gas Field Development (SGFD) Project
PROJECT OWNER	TPAO
PROJECT EXECUTOR	TP-OTC

ABBREVIATIONS

Abbreviation	Definition
AoI	Area of Influence
BOTAŞ	Turkish Petroleum Pipeline Corporation
CFC	Chlorofluorocarbon
CH_4	Methane
CLC	Coastal Logistics Center
CO	Carbon Monoxide
CO_2	Carbon Dioxide
dB	Decibel
ECA	Export Credit Agency
E&S	Environmental and Social
EIA	Environmental Impact Assessment
EP	Equator Principles
EPCI	Engineering, Procurement, Construction and Installation
ETL	Energy Transmission Line
E&S	Environmental and Social
EHS	Environment, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System

Abbreviation	Definition
ETP-A	Effluent Treatment Package
EU	European Union
FCG-H	Flooding, Cleaning, Gauging and Hydrotesting
FMS	Fiscal Metering Station
g	Grams
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GLC	Ground Level Concentration
GN	Guidance Note
Golder	Golder Associates Turkey Ltd.
GTG	Gas Turbine Generator
HAZOP	Hazard and Operability
H_2S	Hydrogen Sulphide
HC	Hydrocarbon
HR	Human Resources
HSE	Health and Safety and Environment
IBA	Important Bird Area
IMO	International Maritime Organisation
KBA	Key Biodiversity Area
Kg	Kilogram
kHz	Kilohertz
KM	Kilometre
KP	Kilometer Point
KPI	Key Performance Indicator
kt	Kilo tonne
$ktCO_{2e}$	Kilo tonnes of carbon dioxide equivalent
kV	Kilovolt

Abbreviation	Definition
kW	Kilowatt
kW(e)	Kilowatt electric
KWh	Kilowatt hour
LRP	Livelihood Restoration Plan
M	Meter
m^3	Cubic meter
MEG	Mono-Ethylene Glycol
$MMSm^3$	Million metic standard cubic meter
mmBTU	Million British Thermal Unit
MmBTU/h	Million British Thermal Unit per hour
Mt CO_2e	megatonnes of carbon dioxide equivalent
MARPOL	The International Convention for the Prevention of Pollution from Ships
SCMD	Standard cubic meter per day
MoEUCC	Ministry of Environment, Urbanisation and Climate Change
MWt	Megawatt Thermal
N_2O	Nitrous Oxide
N/A	Not Applicable
NH_4	Ammonium
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
O_3	Ozone
ODS	Ozone Depleting Substance
OECD	The Organization for Economic Cooperation and Development
OHS	Occupational Health and Safety
OHSAS	Occupational Health and Safety Assessment Series
OPF	Onshore Production Facility

Abbreviation	Definition
PAP	Project Affected Person
PIG	Pipeline Inspection Gauge
PLET	Pipeline End Termination
PLR	Pig Launcher Receiver
PM	Particulate Matter
PPM	Public Participation Meeting
ppm	Parts per million
PS	Performance Standard
SEP	Stakeholder Engagement Plan
SGFD	Sakarya Gas Field Development (Unless otherwise stated, SGFD Project refers to the Phase 1 of the investment. SGFD Phase 1 is the topic of this ESIA)
SIA	Social Impact Assessment
SO_2	Sulphur Dioxide
SPS	Subsea Production System
SURF	Subsea Umbilical, Risers and Flow Lines
T	Temperature
t	tonnes
TANAP	Trans-Anatolian Natural Gas Pipeline Project
$tCO_2e/tLNG$	tonnes carbon dioxide equivalent per tonnes of liquefied natural gas
TCFD	Task Force on Climate-related Financial Disclosures
TPAO	Turkish Petroleum Corporation
TP-OTC	Turkish Petroleum Offshore Technology Center A.S.
TTK	Turkish Hard Coal
WB	World Bank
WB ESF	World Bank Environmental and Social Framework
WD	Water Depth
WWTP	Wastewater Treatment Plant
XT	Xmas Tree

1.0 INTRODUCTION

Turkish Petroleum Corporation (TPAO or Project Owner) has been established in order to perform hydrocarbon exploration, drilling, production, refinery and marketing activities on behalf of the Turkish Republic with the Law no 6327, in 1954.

On 12th March 2019, Turkish Petroleum Offshore Technology Centre (TP-OTC or Project Executor) was founded upon a Resolution of the Board of Directors of the main company TPAO, which conducts and supports petroleum and natural gas exploration and production activities at the seas of Turkey. The name TP-OTC was registered on 2 April 2019 following this resolution, and the company was structured specifically for the conducting of maritime operations.

TP-OTC, 100% owned by TPAO will be conducting Project Management and Engineering, Procurement, Construction and Installation (EPCI) for the Sakarya Gas Field Development Project (SGFD Project or the Project).

This Non-Technical Summary (NTS) briefly explains the outcomes of the Project Environmental and Social Impact Assessment (ESIA) and reflects TP-OTC's ongoing commitment to provide stakeholders with clear, relevant and sufficient information to enable a proper understanding of the Project.

Based on the Project ESIA outcomes, an Environmental and Social Management Plan (ESMP) has been defined and will be implemented during the Project construction and the operation stages. The ESMP defines the processes and resources put in place as part of TP-OTC's commitment to avoid, mitigate and effectively manage environmental, health & safety and social risks and impacts.

This commitment complies with the national requirements of the Project's host country (Turkey), and the following key international standards for managing project environmental, social, health and safety risk.

Applicable Environmental and Social Requirements of the Project are defined based on the IFC Performance Standards (PS), Guidance Documents, World Bank Sectoral and General EHS Guidelines, Equator Principles (EP), World Bank Environmental and Social Framework (WB ESF), the World Bank Environmental and Social Standards (WB ESS) and the National Turkish legislation.

Every effort has been made to ensure that the information contained in this NTS is correct at the time of its release. Further information on the Project and the ESIA process can be accessed as follows:

https://tp-otc.com/en/sustainability/

2.0 INTRODUCING THE SAKARYA GAS FIELD DEVELOPMENT PROJECT

With its developing economy, Turkey is among the world's major energy consumers. When the sectoral distribution of natural consumption in 2020 is calculated as a percentage; residential consumption is 32.35%, consumption for electricity generation is 28.27%, and industrial consumption is 26.31%.[1]

Turkey is a country that is heavily dependent on imports of natural gas. The rate of foreign dependency in natural gas consumption is higher than oil, and approximately 98.9% of Turkey's natural gas consumption is

[1] TR. Energy Market Regulatory Authority (EPDK), Natural Gas Market 2020 Sector Report, 2021

met by imports. While approximately 44.8 billion m^3 of natural gas was consumed in Turkey in 2020, only 1.1% of this amount (441 million m^3) was met by domestic production.

The Blue Stream Natural Gas Pipeline and TurkStream Gas Pipeline between Russia and Turkey, the natural gas pipeline between Iran and Turkey, Trans-Anatolian Natural Gas Pipeline Project (TANAP) between Azerbaijan and Turkey were built and put into operation for supply through pipeline. TANAP and TurkStream Gas Pipelines also reach Europe over Turkey and contribute to meet Europe's natural gas demand.

Natural gas import has become mandatory for Turkey due to the fact that domestic reserves and production amounts remain at very limited levels in order to meet the current and potential use of natural gas, whose usage rate and areas are increasing due to the advantages it has in parallel with the increase in energy demand.

However, a shortage of supply is encountered frequently due to political issues or technical problems. Due to these reasons arising from suppliers and transit countries and technical reasons, Turkey has faced with difficulties in maintaining the daily supply-demand, especially in winter.[2]

Offshore exploration activities, which were accelerated in order to increase the rate of meeting Turkey's increasing oil and natural gas demand with domestic production, gave its first results with the natural gas reserve detected in the Sakarya Gas Field in 2020.

The SGFD Project is the first deepwater gas field discovery and the biggest natural gas reserve in the country. Within the scope of the Project, an annual production of 3.5 billion m^3 will be achieved in Phase 1, followed by an annual production of 14 billion m^3 in Phase 2, and 30% of Turkey's total consumption will be met. It is estimated that the project will start production in 2023 and the natural gas needs of approximately 2.5 million households will be met in Phase 1. With the realization of the Project, Turkey will be able to use its own resources in the near future, and thus, will decrease the share of energy in total importation significantly and make great contributions to the country's economy.

2.1 Project Location

The SGFD Project aims to extract, transport onshore and process the natural gas discovered in the Sakarya Gas Field based in the exclusive economic zone of Turkey, off the Western Black Sea Region, to make it available for use by consumers.

Sakarya Gas Field is located within the Sakarya Gas Field Block C26 in the western Black Sea, 165 km offshore fro Filyos, Zonguldak, at a depth of approximately 2,200 m, within the Turkey exclusive economic zone. The natural gas discovery was initiated with the Tuna-1 deepwater exploration well, set at a depth of 2,115 m to reach a depth of 4,525 m.

The Project consists of three main units, including the Subsea Production System (SPS) in Sakarya Gas Field, the Onshore Production Facility (OPF) in Çaycuma district of Zonguldak province and two offshore pipelines for gas transportation from field to OPF and MEG transportation from OPF to field, and an umbilical, all including shore crossings (SURF). Illustration of the main Project units is presented below. For further details, please refer to Section 2.2.

[2] TR. Energy Market Regulatory Authority, 2021, Natural Gas Market 2020 Sector Report

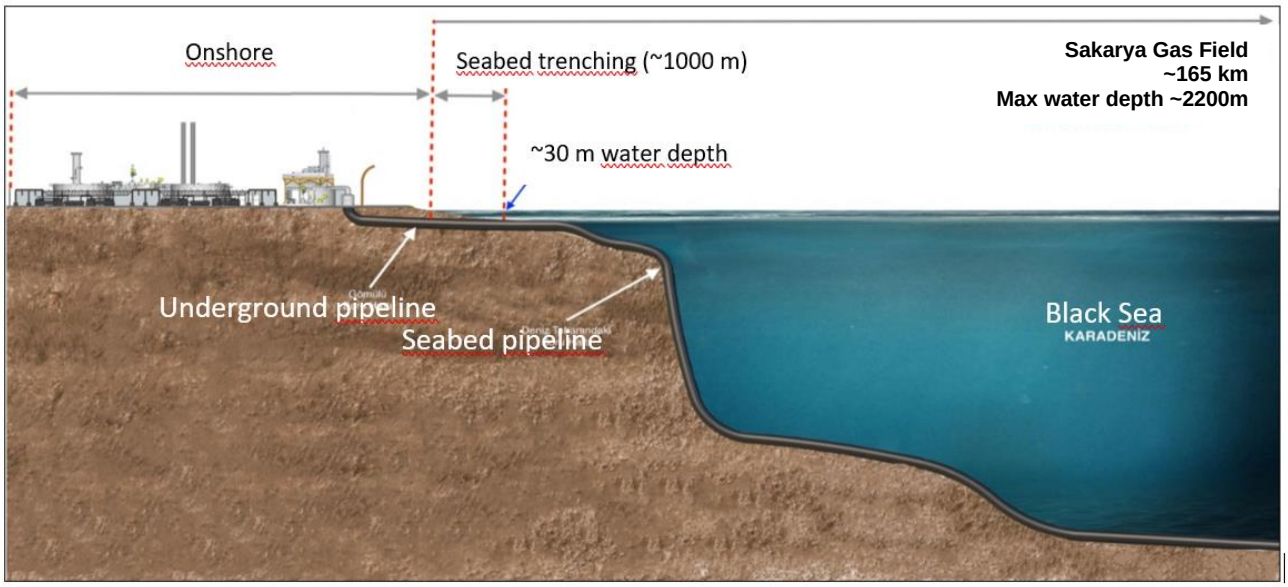

Figure 1: Illustration of Main Project Units

Once processed at the onshore production facility, the gas produced by the Sakarya Gas Field will be measured at a Fiscal Metering Station (FMS) and offloaded to the national grid via a ~36 km onshore pipeline. Both the FMS and the pipeline will be designed, constructed, and operated by Petroleum Pipeline Corporation ("BOTAŞ") and, in line with the OECD and IFC Performance Standards definition, will be considered as Associated facilities to the main Project.

Layout showing Sakarya Gas Field Development Project and BOTAŞ FMS and Pipeline is presented below.

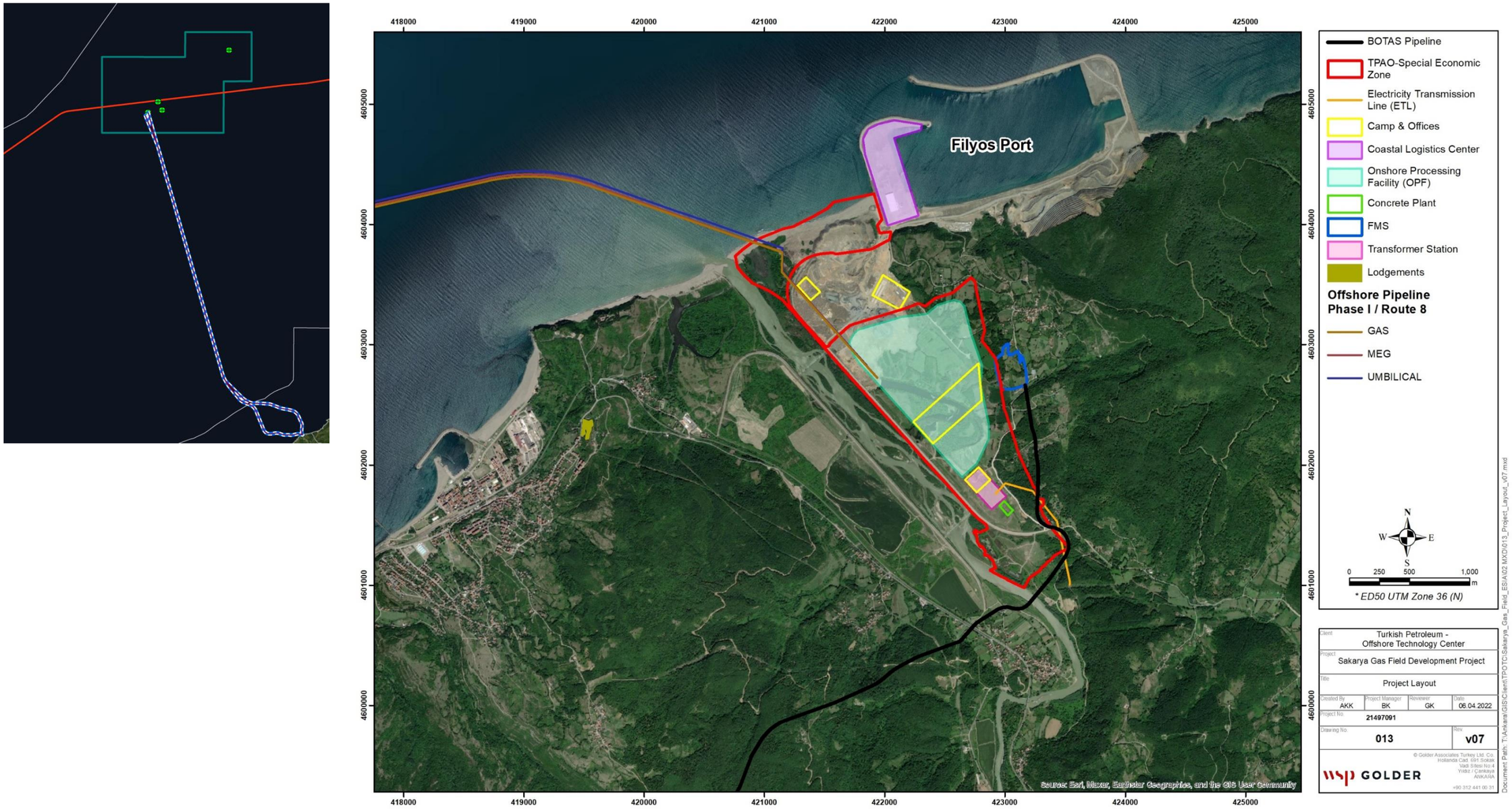

Figure 2: Sakarya Gas Field Development Project, BOTAŞ FMS and Pipeline Layout

The Project will be realized in two phases, Phase 1 and Phase 2:

- Under **Phase 1**, natural gas to be produced with the subsea production system from 10 wells in Sakarya Gas Field will be transported onshore through a 16-inch (40.64 cm) diameter carbon steel pipeline, processed at the onshore production facility. In Phase 1, the daily production capacity will reach a maximum of 10 million standard m^3.
- Under **Phase 2**, the natural gas whose production will continue in Sakarya Gas Field will be connected to the subsea production system with up to 30 additional wells reaching a total of up to 40 wells under Phase 2. A 24 inches pipeline (60.96 cm) or above will be needed to transport the additional gas produced in Phase 2.

The present document only deals with the Phase 1 of the Project since the details and schedule of the Phase 2 components have not been finalized yet.

Other facilities related to the Project are the Coastal Logistic Centre (CLC) and the Filyos Port. The CLC will be used for the coordination of supply and logistics on sea drilling operations in the Black Sea Region, as well as the berthing of drilling support vessels and the loading of drilling equipment on these vessels.

Figure 3: Aerial View of the CLC

The Filyos Port will primarily serve the Filyos Industrial Zone, which is planned to be established across the Filyos River. Filyos Port/Industrial Zone Connections Project is planned to carry out transportation and distribution of goods arriving at Filyos Port. In the scope of the Project, Filyos Port will also be used for marine vessel berthing and Subsea Production System (SPS) equipment maintenance, site receival and pre-deployment tests before installation.

In Phase 1, it is planned to employ 1,900 people as a maximum for the construction of the offshore section of the Project. A maximum of 6,500 people will work during the construction of the Project's onshore section. It is planned to employ 120 people for Phase 1 operation. No personnel will work in the offshore section during the operation phase.

2.2 Project Components

As discussed in the previous section, the Project during Phase 1 consists of three main components, including:

- The Subsea Production System (SPS) in Sakarya Gas Field;
- The Onshore Production Facility (OPF);
- Two offshore pipelines for gas transportation from field to OPF and MEG transportation from OPF to field, and an umbilical, all including shore crossings (SURF).

In addition to the abovementioned components, 2 more will be present, namely:

- The Transformer Station and Energy Transmission Line (ETL);
- The Construction Camp Sites & Permanent Lodgings.

2.2.1 Offshore Components

Subsea Production System (SPS)

The production system will be a subsea network that connects 10 production wells (at the end of Phase 1) throughout a 2,173-km^2 region and transfers them to the gas pipelines. The figure below illustrates the SPS and the components that form it.

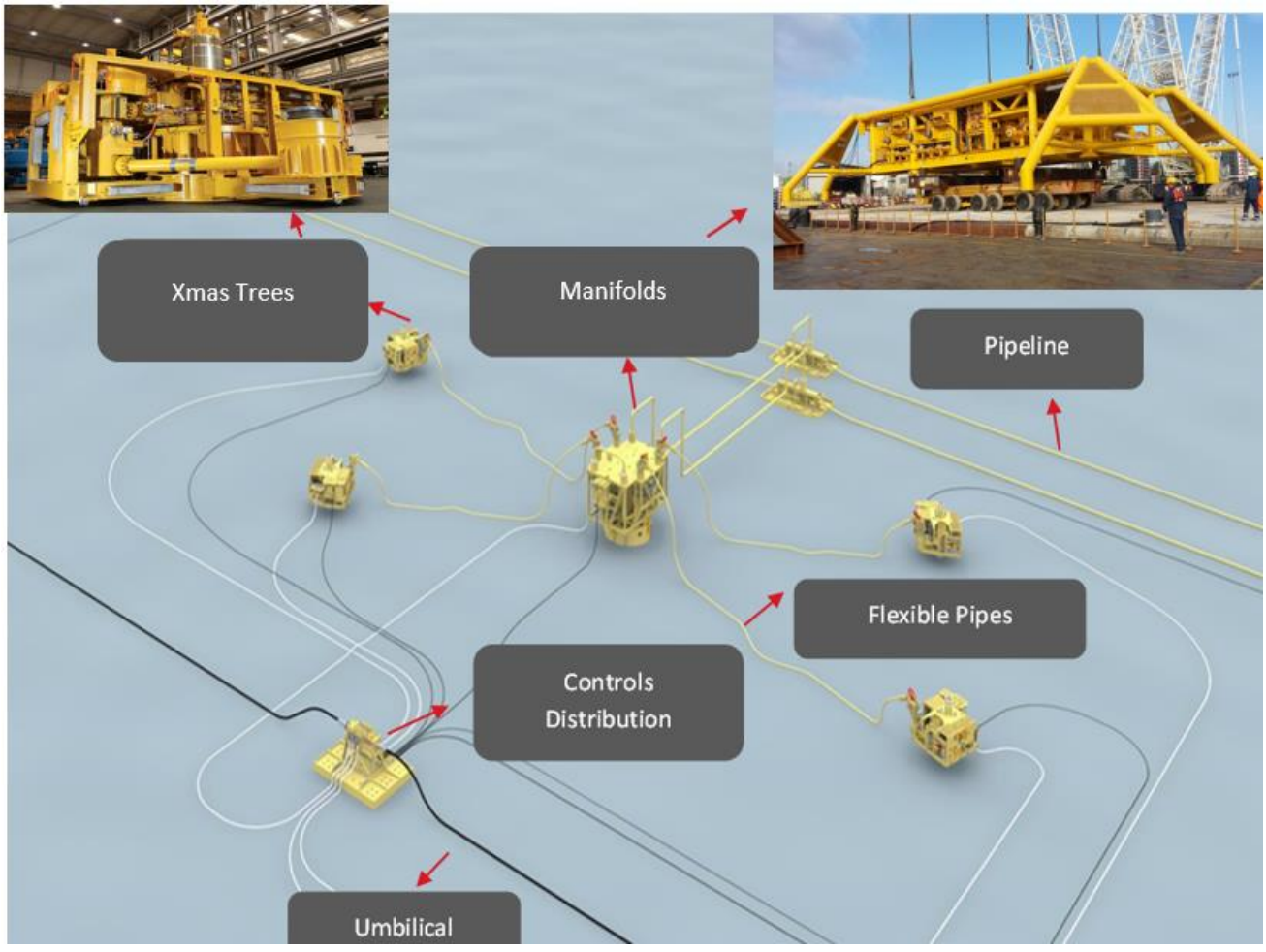

Figure 4: Illustration of Subsea Production System

In the region where the gas production and MEG distribution manifolds will be installed, a foundation for these units will be installed by erecting suction piles within the gas production field due to weak bearing capacity. After the construction of the foundation has been completed, the subsea distribution components will be lowered onto the foundation, installed, connected to the XTs and subsequently checked. To allow the flow of gas, and MEG between the distribution manifold and the OPF, steel pipes will be installed between the main head of the distribution manifold and the pipeline termination units. The gas produced will be transferred from the XTs to the distribution chambers by means of flexible pipes. The flexible pipe interface consists of standard flanged end joints, pre-connected flexible pipes, externally inserted vertical connectors as well as hoisting interface and gooseneck assemblies. During assembly, they will be connected to the flexible ends in the piping tower of the assembly ship.

The umbilical will be utilized to supply hydraulic fluid and necessary chemicals to the XT. Additionally, cables inside the umbilical will ensure the electrical and fiber optic connection between the land and the sea section of the Project as well as the management of the production system from land. The installation of the main umbilical begins with the umbilical pulling activities on the shore. The umbilical will be connected to the wellhead valves and seabed distribution manifolds following the completion of the installations.

Prior to commissioning, the structural integrity of the pipelines will be determined by flooding, cleaning and gauging activities in which the pig train will be launched and propelled with filtered and treated seawater. After the gauge plate acceptance, the flooding, cleaning and gauging (FCG) operation will be completed. For hydrotesting (H), subsea hydrotest pump will be engaged and the pipeline will be pressurized. After stabilization and hold periods, the pipeline will be depressurised and subsea leak test which is similar to hydrotesting will follow afterwards.

During operation phase, MEG will be comingled with the gas during the transportation of the produced gas to land through gas pipeline in order to prevent the formation of hydrate, which may clog the pipe due to pressure and temperature fluctuations. The MEG will be transported to the production site through a pipeline (about 10 inches - 25.4 cm - in diameter) from land and infused into the gas by injecting it into the well heads. Thereafter, it will turn back to land mixed with gas through the gas pipeline. Below figure provides the flow process chart of the production system

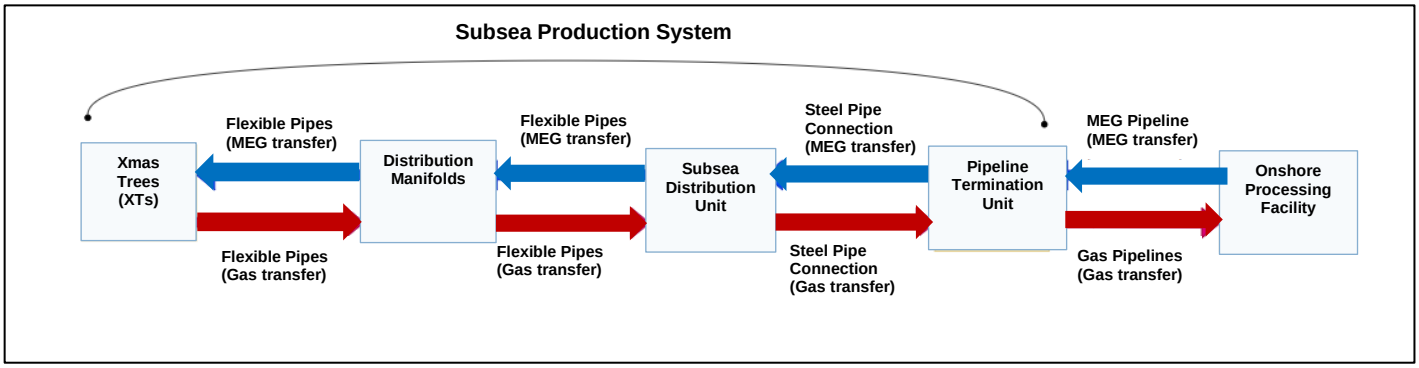

Figure 5: The Flow Process Chart of The Subsea Production System

SURF

Within the Phase 1 of the Project the SURF will include:

- A seabed umbilical, approximately 6 inches (15.24 cm) in diameter that bundles together small pipes containing fluids, chemicals, and electrical and fibre optic lines;

- Gas pipeline, 16 inches (40.64 cm);
- The MEG line approximately 10 inches (25.4 cm) in diameter.

For laying of the pipeline in the shallow water section, a 3 m trench will be excavated in the planned pipeline corridor for an overall length of 1.4 km from the shore till approximately 20 m depth. Umbilical will be buried under seabed by post lay trenching method at approximately 30 m east of the gas pipeline. The sediments excavated will be temporary deposited on a dumping site, covering a surface of 0.26 km^2, located close to the port having minimum 5 m and maximum 14 m depth. Once the pipelines which will be previously coated in concrete have been laid, the trench will be backfilled with the excavated sediments, covering the pipeline by a minimum of 2 m.

The dredging technique in the shore crossing section will vary depending on the water depth, soil conditions and the embedding depth of the umbilical and pipelines. The vessel with backhoe mechanism will be utilized during the ditching activities in the shore crossing section up to a water depth of 5 m

Gas and MEG pipelines will be laid by similar methods from shore to offshore. The pipeline will be transported by offshore piping barge from where it was temporarily positioned by the shallow water piping barge. Priority temporary piping heads will be removed on the barge. As the pipe welding and coating is completed, the piping will be resumed. The offshore piping barge will engage the dynamic positioning system to fix itself. It will undertake piping activities in parallel with welding and coating works. After the completion of the piping activities, a pipeline termination unit will be inserted on the pipe end, extending to the subsea production system. This will connect the pipeline to the production distribution chamber once the construction operations of the sea section are completed.

Before the construction of the shore crossing section begins, the access routes and passageways will be prepared, the site will be arranged and levelled, piping equipment and temporary field facilities will be installed.

The umbilical will be pulled from the installation vessel located in approximately 15m water depth to the OPF an overall distance of approximately 2.7 km. The umbilical will be floated, using small buoyancy modules, and pulled up to the beach where the divers will remove the floats. Following the pulling activities of the umbilical and pipelines at the coastal crossing section have been completed, the shore base pulling spread will be removed, the cofferdam will be backfilled and removed, the ditches trenches will be closed with the stored sediment excavated during the construction operations.

Following the completion of the construction stage, a number of procedures will be followed to verify that the lines operate smoothly in the expected circumstances. Prior to commissioning, the structural integrity of the subsea system is determined by FCG-H activities which involves free flooding of trunklines, initial cleaning with cleaning pigs, gauge plate acceptance and hydrotesting. After FCG-H activities, nitrogen is injected before the last pig until reception of dewatering pig train at receiving side (PLET). Trunkline will be left packed with Nitrogen at the operating dewatering pressure. After all leakage testing on the MEG pipeline has been accomplished, the treated and filtered seawater will be replaced with MEG and Cl mixture.

After all installation and pre-commissioning activities have been completed, surveys will be undertaken to assess the condition of the seabed components at the end of the installation.

The maintenance operations to be conducted during the operating phase of the Project aim to investigate all possible impacts on the pipeline, ensure the safety of personnel, goods and the environment, determine the situations that may obstruct safe and regular natural gas flow, minimize repairs, monitor all incidents based on the cause-and-effect relationship principle for the operations to be conducted during the operating phase.

2.2.2 Onshore Components

Onshore Production Facility (OPF)

The Onshore Production Facility (OPF), which will be built on the onshore section of the Project, mainly intends to process the raw gas from the Sakarya Gas Field. At the facility to be established on the land side; water and liquids will be separated from the gas flowing from the reservoir, particles will be filtered, the humidity will be absorbed, and gas will be compressed and transported to the network.

The OPF is planned to be built in two phases. Phase 1 will begin operations in 2023, while Phase 2 will be operational at a later period after 2023. Phase 1 will be capable of processing natural gas of a maximum of 10 million standard m^3 per day (with the addition of Phase 2, OPF will have a total processing capacity of 40 million standard m^3).

During construction, the OPF will be divided into 3 processing blocks. Block 2 is designated as temporary storage of excavation waste and Block 3 is designated as construction camp area for one of the EPCI Contractor.

There is no topsoil present at the OPF area due to industrial zone construction activities and ongoing soil improvement works. There will be a concrete batching plant having 90 m^3/day capacity in order to supply concrete required for construction of the onshore facilities.

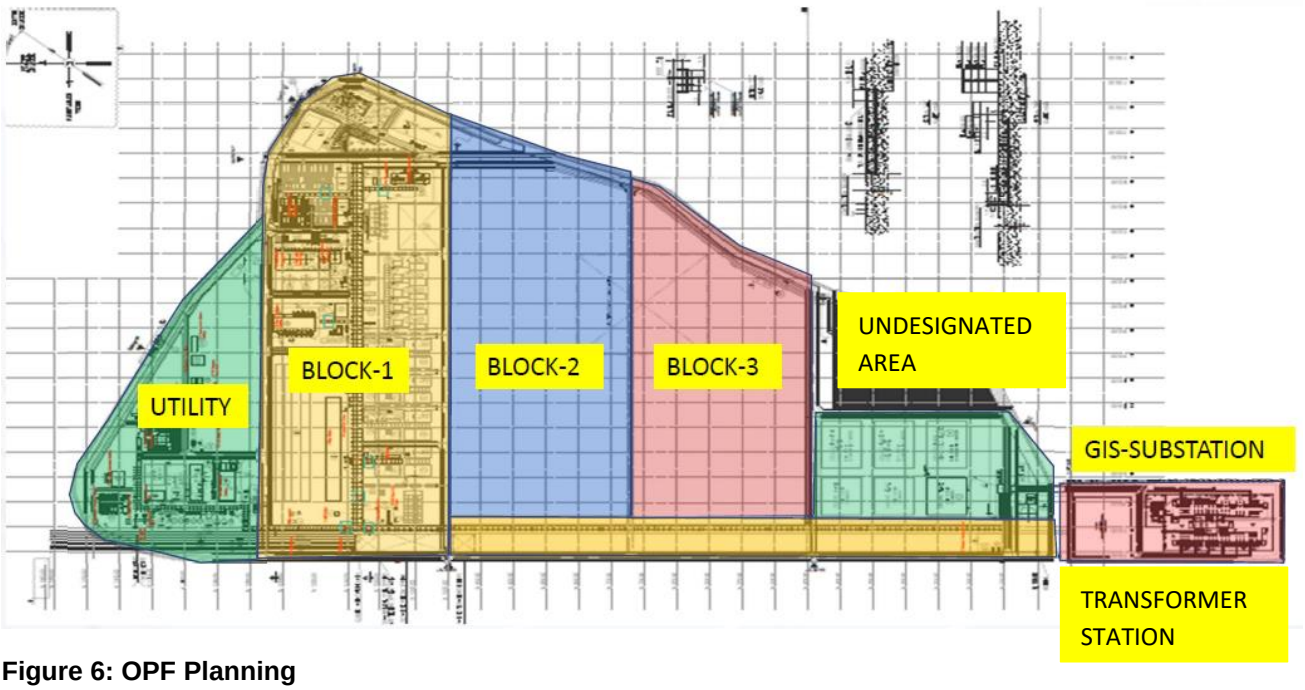

Figure 6: OPF Planning

Transformer station and Energy Transmission Line

The amount of electrical energy required for the Project was calculated as 9,000 kW(e) in Phase 1. There will be 15kV 3 gas engines (2 in operation and 1 spare) each having a capacity of 4,500 kW(e) will be used inside the facility to generate the necessary energy in Phase 1. These engines will burn natural gas to generate electricity. The total thermal power of the 2 gas engines (operational ones) is 18.9 MW(t). Furthermore, the Project will be connected to the national electrical grid through a substation (with 400 kV Overhead transmission line with a maximum of 1.3 km and GIS Switchyard that will be utilized as a backup power supply when the gas engines are not in use during a maintenance repair. Construction activities of the overhead transmission lines

will require the excavation of the areas where the pole feet will be placed. After the pole feet are placed in the pits, galvanized steel pylons will be mounted to each other with bolts and electricity poles will be constructed. The line will be put into operation after the quality control tests are carried out. Access roads are required for access of construction vehicles and machinery during construction and for maintenance activities during operation. In this context, existing access roads will be used to reach the route.

2.3 Associated Facilities

According to the OECD definition and IFC Performance Standards, Associated Facilities are defined as:

- OECD - "Associated facilities are those facilities that are not a component of the project but that would not be constructed or expanded if the project did not exist and on whose existence the viability of the project depends; such facilities may be funded, owned, managed, constructed and operated by the buyer and/or project sponsor or separately from the project."
- IFC – PS1 par. 8 – "Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable"

As previously stated in this document, following the processing at the onshore production facility, the gas produced by the Sakarya Gas Field will be measured at a Fiscal Metering Station (FMS) and offloaded to the national grid via a ~36 km onshore pipeline, which according to the OECD and IFC definitions will be considered as Associated Facilities to the main Project.

It was considered not feasible to apply in this ESIA the same approach used for the main Project components (e.g., SPS, SURF, OPF, etc.) for the FMS and pipeline due to lack of i) basic information to assess the impact of the components with the same level of detail as the Project components; ii) difficulty in obtaining baseline information as construction work has already begun; and iii). temporal gap for applying mitigation measures on BOTAŞ project actions already implemented. Therefore, it has been agreed among all parties involved in the SGFD Project to address the FMS and the onshore pipeline section through a high-level E&S Assessment Report to identify key environmental and social risks and a Management and Corrective Action Plan with a list of site-specific mitigations measures focused on the construction phase of both the pipeline and the FMS. The document addresses the gaps identified and/or indicates if additional specific actions/documents are needed to ensure alignment between the two projects' components and the relevant Lenders' standards. The E&S Assessment Report is included in Appendix A of the ESIA.

2.4 Alternatives Assessment

The methodological approach for the selection of the best-case design included the consideration of alternative in terms of:

- the location of the Sakarya Gas Field Project; *and*
- The technological process

2.4.1 Alternative Locations of Project Components

IFC PS1 requires full and detailed justification for any proposed alternatives through the environmental and social risks and impacts identification and assessment process. In the following paragraphs, alternative locations considered for the onshore facilities and the SURF and the reasons that led to the choice of the designated locations over others are discussed.

Onshore facilities

While determining the site for onshore facilities, several conditions have been considered. To assure the safety of the gas flow, the Project site has been selected to be the shortest distance from the Sakarya Gas Field. The shortest SURF is substantial for minimizing the pressure and conductivity loss inside the lines and therefore assuring the safety of flow and controls.

As can be seen from the figure below, while the distance of Filyos Port to the Sakarya Gas Field Tuna-1 well location is 165 kilometers, the distance of the other land points hosting a port to the said location is at least 45 kilometers longer.

The project area is also significant in terms of its transportation and logistics facilities. In comparison to nearby ports, the Port of Filyos has in fact a significantly wider area of use.

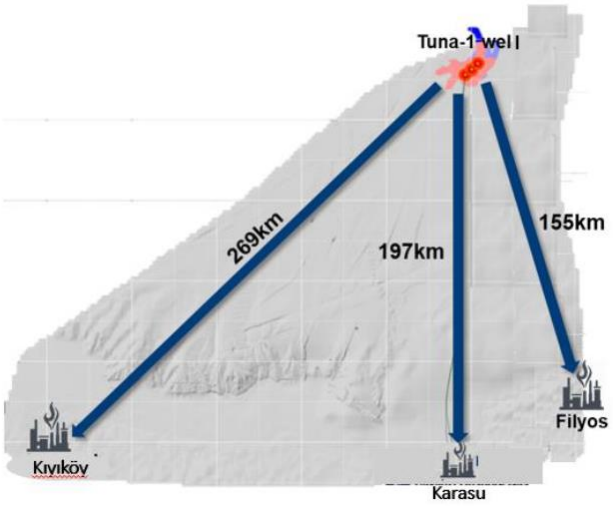

Figure 7: Port Alternatives

Moreover, while Karasu Port area is very close to the city centre and living areas, Filyos port is not surrounded (or limited surrounded) by any private land or forest land, and a limited extension of vegetation clearing within the area will be necessary.

In addition, due to the limited presence of privately owned land, there will be limited need for an expropriation process within the scope of the Project.

Regarding the location of BOTAŞ FMS, it was initially designed as to be inside the OPF boundaries. It was later moved to a new location due to difficulties related with soil improvement and time constraint on the Project. Therefore, BOTAŞ was moved to a new location that does not require much soil improvement for the FMS construction.

Lastly, two routes have been considered for the connection of the transformer station to the existing energy transmission line, and the route has been chosen in a way that does not require new access roads and causes the least number of trees to be cut with minimum expropriation.

SURF

As previously stated in the NTS, the SURF connecting the wells to the coast will include a seabed umbilical, the gas pipeline and the MEG line.

Several options to the landfall siting in Filyos were taken into consideration, and two areas were considered particularly appropriate to the landfall (Figure 8). Since the 1st Area was designated as industrial one and was already subject to environmental impacts due to other projects, it was selected as the landfall siting.

Figure 8: The two possible landfall sites in Filyos area

Furthermore, within the selected area (1st Area) in the Filyos landfall location, the least environmental impacting (as far as technically feasible) routing option was selected. In particular, the direct impact (pipeline footprint) on a wetland (i.e., the pond in Figure 9) was avoided as much as possible. In fact, even if the technical study highlighted the green track shown in Figure 9 as the technically most feasible option, the red one plus the dotted line was chosen. This option was the furthest feasible site from the wetland where the first onshore pipeline curve could be placed. Any further option towards east results technically hardly achievable because the pipeline would require the creation of angles (curve) below the minimum technically possible value.

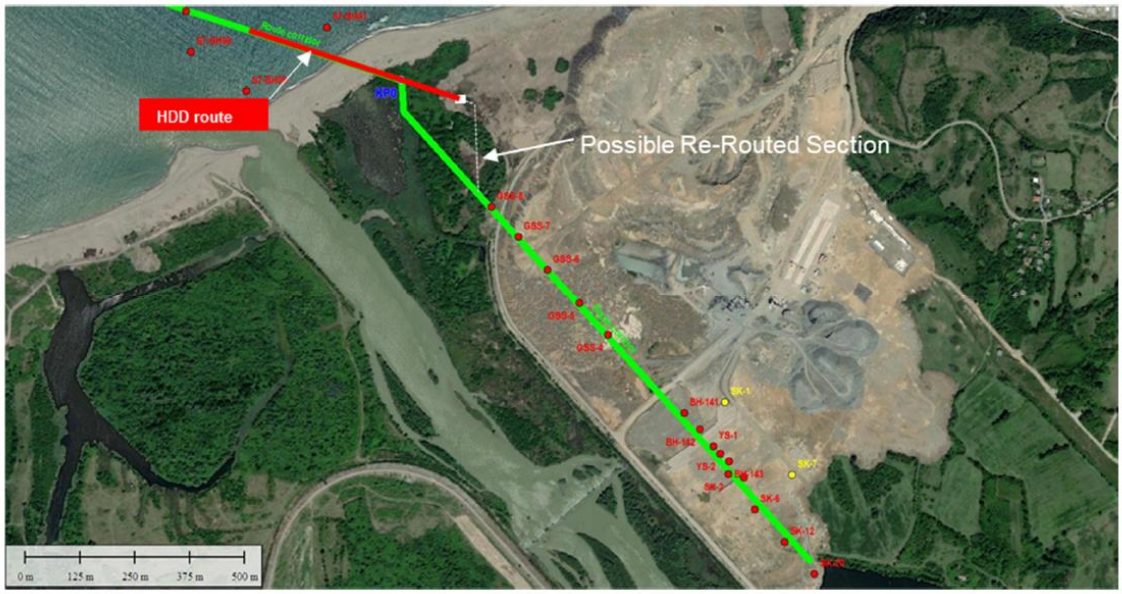

Figure 9: Possible routing options in the 1st Area of Filyos landfall location.

2.4.2 Alternative Technologies Selection Process

The alternative technologies selection process has been carried out for several technologies concerning the OPF, the flares, the disposal of produced water, the disposal of hydrotest water, the power generation, the heating medium, cooling system and the technical operations for the pipeline construction.

For the **OPF**, a software was used to develop the process building blocks for the required onshore facility and to evaluate various scenarios of environmental impacts (such as hydrocarbon recovery from the produced water, minimisation of effluents and by-products, electricity and fuel gas consumptions).

For the **flares**, no continuous production flaring has been adopted as part of the development and flaring will be in place for emergency, safety and operational upsets only. The flare locations are upwind of process units and has been selected considering local meteorological conditions and thermal radiation footprints based on the release rates, composition, tip types, etc. The ground flare system also offers the following environmental advantages: reduced adverse visual and noise impact; makes monitoring of emissions easier; and multiple tips ensures smokeless burning under all flow conditions. Noise and emission modelling studies have been carried out to ensure that selected types of flares do not exceed Project Standards.

For the **disposal of produced water**, several treatment options such as chemical oxidation, electrochemical, biological and filters were assessed and evaluated. The evaluation led to the choice of biological treatment due to, among others, the technology readiness level, operability, maintainability, reliability and costs. Discharge options were also evaluated. In the context of the water being treated, the discharge to either surface waters or land was suitable, as opposed to injection into a dedicated disposal well. Discharge to deep-sea by mixing with the monovalent salts was considered in case disposal option of the monovalent salts through a waste disposal company was not available. From the feasible options considered, discharge to Filyos River was selected as the preferred option because of the high load and environmental and safety risks.

For the **hydrotest process** in the scope of pre-commissioning activities, which requires the use of chemicals and additives, chemicals were chosen based on their ability not to cause bioaccumulation phenomena, to be diluted on a high level and on their effectiveness. Moreover, disposal to deep sea (2,200 m) was selected as injection into a disposal well option was not available. Hydrotest water for the onshore section will be instead

discharged in the Filyos river, since no chemical additives will be used. In case the wastewaters do not comply with discharge standards, the option of transporting it to licensed wastewater treatment plants will be considered.

For the **power generation**, either 2 gas turbine generators (GTG), or 3 reciprocating gas engine generators (2 online and 1 on standby) were considered. Reciprocating engines were selected as power generation solution due to higher fuel efficiencies, the lower fuel consumption and shorter start-up times of the reciprocating engines. Solar power and wind farms were also considered, but they resulted unsuitable due to land availability, the region's climatic parameters and the inherently low availability of power that makes them impractical as sole replacement for onsite power generation.

For the **heating medium**, hot oil heater or steam boiler systems were considered as source for MEG heat requirements. Steam has been selected as heating medium of preference based on economic evaluation and environmental and safety risks.

For the **cooling system,** air cooled system was selected over water cooled system in order to reduce the need for water and impacts on the receiving bodies during discharge.

Lastly, for **technical operations for the pipeline construction** besides the trenching options, a trenchless construction method, was considered. Such technique is known to cause less disturbance to the local environment and therefore it would be preferable. However, based on the feasibility study carried out, it will result in additional cost and time, with environmental impacts still expected, particularly in connection with the release of drill fluids into the environment and the setting up of the drill site on shore. Hence, the environmental benefit of this method appears to be very limited to negligible.

GHG emissions

The Equator Principle 4 (EP4) requires an account of the considerations the Project has taken to attain the best practicable environmental options to mitigate its contribution to climate change through reduction on GHG emissions. The Project is thus required to consider its main sources of GHG emissions, compare them within the context of sector and national and global emissions, summarize the best practicable environmental options and list the alternative options that were considered, justifying the selected processes.

The alternative analysis was discussed in terms of GHG reductions, other environmental benefits, and feasibility of each alternative option. Alternatives for the following source of emissions were considered for the highest emitting Project sources and the justifications for the processes selected.

- Upset and maintenance emissions,
- Power generation,
- Process emissions (natural gas fired steam boiler emissions, fugitive emissions),
- Emergency equipment (diesel generators, fire water pumps).

2.4.3 No Project

The 'No Project' alternative, that is the situation where the Project does not proceed, was also considered. Under this scenario, there would not be any impacts on the environment and the beneficial socio-economic outcomes of the Project would not happen. However, the need for the Project is driven by Turkey's rapidly increasing natural gas demand and shortages due to political and technical reasons. If the Project does not proceed, the goal of reducing dependency on imports of natural gas and meeting the increasing demand without any shortages accordingly would not be realized. Consequently, the economic benefit to local and national

stakeholders, as well as the energy security it would bring, would not be realized. On this basis, the 'No Project' option was thus rejected.

2.5 Project Schedule

Project schedule is given below.

- Project has been handed over to TP-OTC once the wellheads are installed.
- The construction commenced on Dec 2021 after the announcement of EIA positive decision on November 26, 2021.
- First gas feed to the national network is planned in 2023.
- It is foreseen that the Project will remain in operation for 25-40 years. The operating period can extend following new explorations.

The Project lifespan is depicted in the figure below.

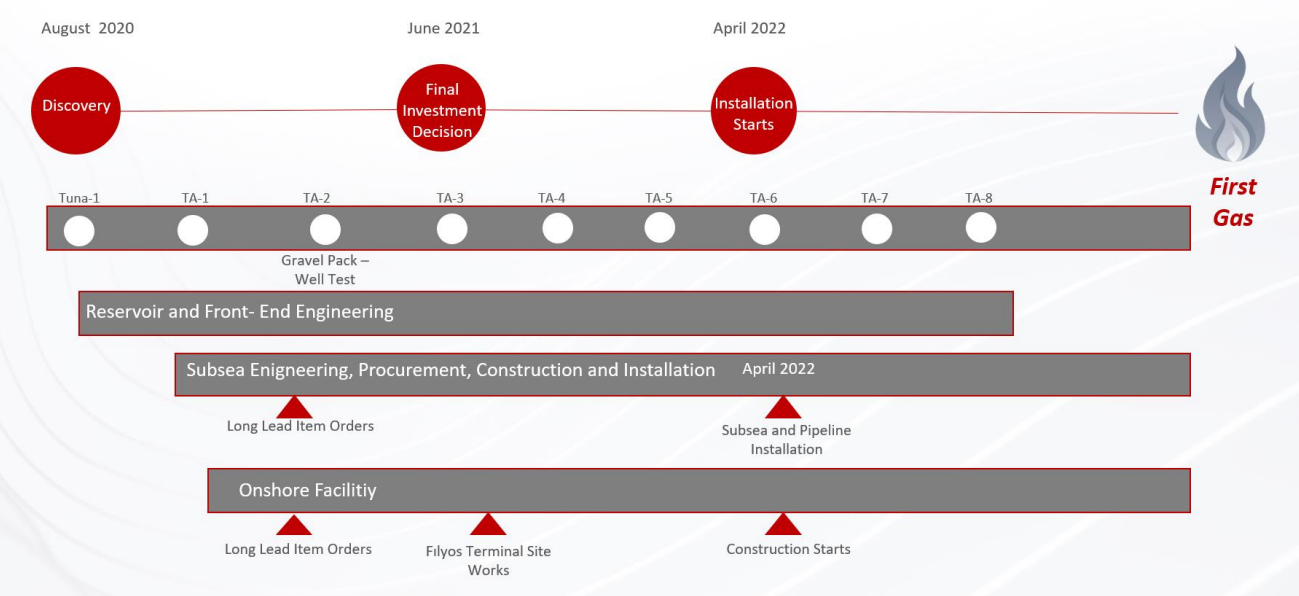

Figure 10: Provisional Project Schedule. *TA: Türkali Well

3.0 IMPACT ASSESSMENT SUMMARY

The main impacts induced by the Sakarya Gas Field Development Project on the offshore environment and onshore environment and local communities are summarized in the following sections. Mitigation measures and management plans addressing negative impacts are also presented to show how TP-OTC will be managing and mitigating the identified impacts.

3.1 Air emissions and ambient air quality

Air quality impacts from offshore Project components

The main offshore sources of emissions during the construction stage of the Project are associated with exhaust emissions from vessels at the various construction phases, including offshore excavation, temporary sediment storage and offshore pipeline laying processes. Impacts on air quality were assessed in the ESIA using a model

of dispersion of pollutants including the estimation of the exhaust emissions from vessels. Modelling results are explained in the following subsection.

Key mitigation measures include the application of air quality management procedures, such as:

- Application of air quality management procedures (including for GHG emissions) for ship operations while in port areas, such as ensuring compliance with combustion emissions specifications (including NOx, SOx, and PM), within the limits established by international regulations (i.e., MARPOL); provisions of "1973 The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Annex VI" amended by 1978 Protocol and the provisions of the "Regulation on Reducing the Sulfur Content in Some Fuel Types" entered into force by being published in the Official Gazette No. 27368 on 06.10.2009.
- Application of air quality management procedures to avoid, minimize, and control combustion emissions, including GHG emissions, related to land-based port activities, such as minimizing travel distances and transfer points and upgrade land vehicle and equipment fleets with low emission vehicles, including use of alternative energy sources, and fuels/fuel mixtures (e.g., vehicle and equipment fleets powered by electricity or compressed natural gas, hybrid locomotives, etc.) where applicable.
    - Prevention, minimization, and control of emissions from Ozone Depleting Substances Ozone depleting substances (ODS) such as CFCs and halons that may be found on board in refrigeration and fire-fighting equipment and systems by avoiding installation of fire-fighting or refrigeration systems containing chlorofluorocarbons (CFCs), in accordance with applicable phase-out requirements and recovery of ODS during maintenance activities and preventing deliberate venting of ODS to the atmosphere.

Air quality impacts from onshore Project components

The main air pollution sources during the onshore construction phase for the Project are dust emissions caused by vegetation clearing, site levelling and grading, material transportation, open area stockpiles, concrete batching plant and exhaust emission from vehicles and construction machinery. Impacts on air quality were assessed in the ESIA using a model of dispersion of pollutants including the estimation of the air emissions from routine operations and from occasional maintenance or emergency situations.

The construction phase modelling results showed, NO_2, SO_2, and PM10 concentrations may exceed Project Standards at some of the sensitive receptors during peak time of construction activities. In order to ensure the compliance with the standards, several mitigation measures will be implemented, including locating activities and rock / earth stockpiles away from sensitive receptors, moisturizing, covering, seeding or fencing stockpiles to prevent wind whipping, ceasing the dust generating work under strong winds, such as reducing work activities or using water spray to reduce dust dispersion, ensuring all vehicles carrying loose or potentially dusty material to or from the site are fully covered, enforcing speed limits and reducing vehicle movements and idling on site, etc. To reduce exhaust emissions vehicle engines and other machinery will be kept turned on only if necessary. Machinery and equipment will be periodically checked and maintained to ensure their good working condition and to ensure the compliance with standards and technical regulations for the protection of the environment. Activities will be conducted trying to use the minimum required number of means at the same time, and electric small-scale mechanization and technical tools will be used when available and feasible.

During operation phase, emissions from the OPF can be categorized as *fugitive, combusted,* and *associated emissions* including several different kinds of air pollutants, such as methane, VOC, CO_2, CO, NO_x, and trace amounts of SO_2 and PM. The operation phase modelling results showed that none of the sensitive receptors

are expected to be significantly impacted during normal or abnormal scenarios as the predicted CO concentration is well within the regulatory limit. During the normal operation, the annual and hourly average NO_2 ground level concentrations (GLCs) are in line with the Project Standards. During abnormal operation, the highest hourly average concentration for NO_2 exceeds the Project Standard at certain locations (within OPF site and on the east of OPF site) which do not correspond to sensitive receptors. At three of the sensitive receptors, the total pollution value approaches to the limit value. During emergency operation, the hourly average NO_2 GLCs and 8-hours average CO GLCs are quite above the limit values and likely to adversely impact most sensitive receptors. However, this operating condition is not expected to persist for a long duration. Emergency flaring mainly happens during the first three months of start-up, approximately 15 times, with an average of 70 minutes. Subsequently, the flaring incidents reduce drastically to about 10 shut-downs with an average time 30 mins in 2 years. Moreover, the flaring usually does not happen at the complete rate, as the wells will be choked and flares are operated with partial opening to maintain pressure in the pipeline.

The reduction of potential atmospheric leaks from components and instruments will be implemented through a series of mitigation measures, including the enforcement of Leak Detection and Repair (LDAR) programs, installation of vapor control units as needed, for hydrocarbon loading and unloading operations / ship tankers and the general implementation of source gas reduction measures to the maximum extent possible. To reduce flaring emissions, flares will be designed to have multiple tips to ensure smokeless burning under all flow conditions, redundant pilots on every stage of the flare, redundant ignition system (high energy ignition/flame front generator) with automatic pilot relight capability, efficient flare tips, and optimization of the size and number of burning nozzles, high integrity instrument pressure protection systems, where appropriate, to reduce over pressure events and avoid or reduce flaring situations, etc. In the event of an emergency or equipment breakdown, or plant upset conditions, excess gas shall not be vented but shall be sent to the flare gas system.

The gas composition did not indicate any significant presence of sulphur and flame-out case has been considered by the HAZOP Analysis to be unlikely because relevant safeguards are in place. Nevertheless, a hydrogen sulfide gas monitoring network has been installed within the OPF site to facilitate early detection and warning. The location of monitoring stations takes into account the location of emissions sources and areas of community use and habitation.

Periodical ambient air quality monitoring at the sensitive receptors will be implemented during the peak time of construction activities and during operation, and also in case of grievance.

3.2 Greenhouse gas emissions

The direct annual GHGs from the stationary combustion and fugitive emissions sources associated with the project are calculated as 146 kt CO_2e for the maximum operating scenario. As stated in previous section of this NTS, the Project alternatives analysis and equipment selection process considered the aspect of GHG emissions to ensure these are minimised.

Also, several mitigation measures will be implemented to ensure that the level of GHG emissions is reduced as much as possible, such as the application of air quality management procedures both for onshore and offshore activities.

3.3 Climate change risk

As a part of this ESIA, a Climate Impact Assessment and Climate Vulnerability Assessment has been prepared in line with the Equator Principles 4. The Climate Impact Assessment and Climate Vulnerability Assessment

approach is designed to be consistent with the approach of the Taskforce for Climate-related Financial Disclosure (TCFD) and considers physical climate change risks to the Project.

According to the qualitative physical risk assessment, the site has in-design adaptation measures in places to reduce the impact of both current climate and projected changes to the future climate. Through the qualitative risk assessment, it is identified that the site is resilient as no unacceptable risks were identified. The majority of the identified risks to the for impacts of climate change on are medium or lower. However, two of the risks have been identified to have a 'severe' risk in the future due to climate change which are associated with impacts of extreme weather events, particularly increasing winds, storms, and associated wave action. Although the mitigation measures have the potential to reduce climate risks, the measures will be monitored for their performance through an ongoing monitoring and surveillance process. Based on the transitional risk assessment, the Project is considered to have no high significant transition risks and have one moderate significant opportunity relating to the continued/increased domestic demand for natural gas as a lower-carbon fuel.

3.4 Wastewater discharge

Wastewater discharge from offshore Project components

Wastewater from offshore Project components such as bilge water, ballast water, domestic wastewater etc. is expected to be mainly generated by the vessels to be operated during construction phase of the Project and the personnel requirements and activities working on the vessels. The key mitigation measure will be the compliance of all vessels with MARPOL and International Maritime Organization (IMO) standards. All ships using ballast water exchange will conduct ballast water exchange at least 50 nautical miles from the nearest land and in water at least 200 m in depth and bilge water and wastewater will be shipped to Zonguldak TTK Waste Receival Facility for disposal. There will be no wastewater discharge from the vessels to sea during the Project lifecycle.

Wastewater resulting from offshore pre-commissioning activities (typically filtered seawater, or filtered seawater with chemical additives including corrosion inhibitor, oxygen scavenger, biocide, and dye to prevent internal corrosion or to identify leaks, MEG or umbilical transportation liquid) will be discharged deep sea, in correspondence to the SPS site (i.e., at a depth of 2,200 m). Chemical additives will be selected in terms of dose concentration, toxicity, biodegradability, bioavailability, and bioaccumulation potential and effluents to be compliant with the relevant Project Standards.

Wastewater discharge from onshore Project components

Unlike offshore activities, onshore water discharge is expected to be generated by several activities, such as pipeline pre-commissioning activities, general OPF construction activities and personnel requirements and activities. Wastewater discharge has the potential to impact several onshore and offshore components, namely hydrological and hydrogeological features, surface and groundwater quality, freshwater and terrestrial fauna, marine habitats and seawater quality. Sources of wastewater to be produced during construction works at the onshore section of the Project are; domestic wastewater due to personnel, wastewater to be produced at the concrete plant due to plant operations and washing of pumps and transmixers, wastewater generated by backwashing of filters in the potable water treatment plants and wastewater resulting from onshore pre-commissioning activities. During construction phase sewage, backwashing water and pre-commissioning water are planned to be discharging into Filyos River. No wastewater will be discharged at the concrete batching plant as the settled wastewater will be recirculated to concrete production process. During the operation phase, five

different sources of wastewater (i.e., demineralization process, open drains, sewage, MEG reclamation unit, and boiler effluent) are planned to be discharged into Filyos River after required treatment operations.

Some of the key mitigation measures to reduce the potential impacts of wastewater discharge are the following:

- The water that has been decomposed by the MEG regeneration and reclamation unit from the MEG will be treated to the Produced Water Treatment Package.
- Wastewater resulting from backwashing and regeneration of activated carbon filter, multimedia filter and ultrafiltration system will be directed to sedimentation package where the residues and trace heavy metals will be settled and processed in sludge thickener and filter press and finally disposed.
- Potentially contaminated surface runoff water from rainfall and/or firewater from hazardous and non-hazardous areas will be treated in Effluent Treatment Plant-A (ETP-A). In case ETP-A does not meet river discharge limits, wastewater will be routed to Produced Water Treatment Package for further processing.
- Boiler blow down will be collected on concrete curbed area and routed towards ETP-A for further treatment before discharge into Filyos River.
- The drainage system within the construction camp, construction facilities and the plant area will be designed to collect the runoff water and discharge it into the Filyos River after proper outlet structures to prevent off-site sediment transport.
- The wastewater from onshore pre-commissioning activities will be discharged to Filyos River by vacuum trucks or through rainwater drainage channels if analyses results are compliant with the Project Standards. If the results are not aligned with the standards, the produced wastewater will be transferred to licensed wastewater treatment plants by vacuum trucks.
- Discharge of wastewater to surface waters will be in compliance with the Project standards.
- To protect the environment from accidental contaminated water flowing into the river, manually operated sluice gate will be provided before the outfall location of the ditch for examination of stormwater for any contamination.
- All discharge points would utilize discharge dispersion methods (e.g., controlled rate of discharge and use of energy dissipaters, use of geotextile mats or other physical erosion prevention measures) to mitigate erosion. Measures to minimise scour and reduce sediment load will be implemented at locations where hydrotest water is discharged to Filyos River and discharge velocities will be regulated to prevent erosion.
- All discharges to Filyos River will be checked by periodical analysis.

3.5 Noise and vibration

Emission of noise from offshore Project components

The emission of underwater noise is expected both during construction and operation phases of the Project. During construction phase, underwater noise will be mainly created by offshore excavation and sediment storage processes, whilst is expected to originate from working vessels' propellers throughout technical and administrative activities, surveillance, monitoring and maintenance actions during the operation phase. The underwater noise may affect marine mammals if these are in the proximity.

Overall, vessels generate sound at low frequencies (<1 kHz). Compared to the sound generated by vessels, the underwater noise of being laid pipelines is reported to be negligible to unrecordable, and so may be dredging activities, whose emissions are in the low frequency band as well.

Cetaceans (which are the only marine mammals occurring in the area) highly rely on the acoustics, thus underwater noises have the potentiality to interfere with primary functions of such species, masking acoustic signals. However, this may happen only if the underwater noise is emitted in a frequency range that overlaps with the hearing and vocal abilities of the species. Nonetheless, low frequencies that characterize vessels' sound may only affect low frequency cetaceans (such as baleen whales) which are completely absent in the Black Sea. Taking into account these considerations, it can be stated that the noise produced during construction and operation phases is unlikely to seriously affect cetaceans.

Mitigation measures in order to control the level of noise produced will include:

- All vessels will be compliant with MARPOL.
- Outdated propellers will be avoided in favor of recent and well-maintained ones.
- Unnecessary anthropogenic noise and disturbance to marine mammals will be avoided.
- Noisiest activities will be scheduled away from the hours when marine mammals are most active, namely dusk and dawn.

Emission of noise and vibration from onshore Project components

Potential onshore noise impacts may be associated both with the Project construction and operations activities.

Construction noise is mainly associated with soil improvement works, operation of construction vehicles and equipment and general construction works. During the operation phase, the main sources of noise and vibration is expected to be produced by MEG units, gas engines and rotating equipment and to a lesser extent by flares, pumps, compressors, generators, and heaters.

Background (baseline) noise measurements in 15 sensitive receptors around the Project components and noise modelling using a specialized software were performed to support the assessment of the noise impact associated with the onshore operations and the vessels operating up to 2 km from the shore. Along the project field, 13 different receiver locations were selected to conduct noise impact assessment to predict the potential impact of the Project. Identified receiver locations are representing a cluster of receivers which have the same or similar background characteristics in terms of environmental noise levels. Moreover, receivers to be evaluated can be defined as representative points which have the highest possibility to expose to noise due to project operations.

The model output indicated that 6 sensitive receptors out of 13 during construction phase and 4 sensitive receptors out of 13 during operation phase exceeds the maximum 3 dBA exceedance criteria defined by IFC EHS Guidelines. Nevertheless, the mitigation measure proposed are expected to decrease the noise emission to meet with Project standards and a low impact level. The key mitigation measures to be implemented are the following:

- Speed limit applications will be applied throughout site for the Project vehicles that will transport construction materials/equipment.
- Machinery, equipment and vehicles with lower sound power levels and sound reduced models will be preferred. Maintenance of construction vehicles will be conducted regularly.

- Where applicable, silencers will be installed on the exhaust of vehicles.
- Portable barriers and acoustic enclosures will be put around equipment where necessary.
- Where practical, temporary noise barriers will be deployed near sensitive receptors.
- Natural topography will be used to create a barrier against noise where feasible.
- Construction traffic through the settlements will be avoided, whenever alternative routes and/or service roads are available.
- Idling of construction vehicles will be avoided.
- Night-time activities will be avoided where possible.
- A stationary shield (i.e., single layer of aluminum / steel composite panels) will be installed to the outer layer of the MEG Unit for operation phase.

Construction phase vibration assessment was modelled for the 13 receiver locations. Critical distances from the construction zone, which represents the distance within which a body must be found to be subject to impacts produced by vibration, are calculated as 10 meter according to the Regulation on Assessment and Management of Environmental Noise limit and 100 meters according to the BS 5225-2:2009 document. As none of the receiving bodies is within the critical distance, impacts are expected to be negligible and mitigation measures are not required neither for construction phase nor for the operation.

3.6 Waste management

General non-hazardous and hazardous wastes generated due to construction activities are mainly, municipal waste, packaging waste, waste oil, contaminated packaging wastes, hydraulic fluids, used batteries, empty paint and chemical containers, filters, fluorescent tubes, scrap metals and cables, welding waste, end-of-life tires, electrical and electronic wastes, treatment sludge, concrete sludge and medical waste. Significant additional waste stream specific to vessel operations are residues/sludge from scrubbers (exhaust gas cleaning), scrubber systems washing water, incinerator ash (if any), sludge from engine rooms, fuel tanks and/or oil sediments of vessels. As concerns the operation phase, typical non-hazardous and hazardous wastes routinely created at onshore facilities are general office and packaging wastes, municipal wastes, waste oils, oil contaminated rags, hydraulic fluids, used batteries, empty paint cans, waste chemicals and used chemical containers, used filters, fluorescent tubes, scrap metals and cables, end-of-life tires, electrical and electronic wastes, treatment sludge and medical waste. Significant additional waste stream specific to onshore oil and gas development activities is; monovalent salts (sodium, chloride, plus lesser quantities of potassium) and divalent salts (calcium, magnesium, iron, strontium and barium) recovered in the MEG system, slurry removed at liquid flash drums by sand jetting/fluidization, oily sludge recovered at liquid flash drums.

Waste management practices will be employed during the construction and operation stages including implementation of a Waste Management Plan and Pollution Prevention Plan detailing the measures for the classification, labelling, storage and disposal of wastes to prevent soil and water contamination.

3.7 Biodiversity aspects

SGFD Project offshore biodiversity impacts

The baseline information collected and processed as part of the ESIA included the assessment and evaluation of biodiversity in the offshore Project Area of Influence, including plankton, benthic habitats, fishes and marine mammals. All these components are expected to be differently impacted by the Project offshore activities. During construction phase, several impact factors may act on marine components, such as the minor leakage of contaminants into water, the emission of particulates and chemicals, the discharge of wastewater and the emission of light originated by offshore excavation activities, offshore pipeline laying, wastewater treatment discharge and pipeline hydrotesting, cleaning and gauging.

Plankton, which comprehends all the organisms floating in seawater, is particularly abundant and diverse in the study area. It is expected to be impacted by the potential emission of contaminants, particulates, chemicals and light expected during offshore excavation and pipeline laying activities that will take place during construction phase and pipeline testing. Several mitigation measures will be implemented to minimize the possible impacts on plankton: all vessels used will be compliant with MARPOL regulations. Regarding the emission of particulates and chemicals in water, pipeline testing fluids will be discharged following relevant standards. Furthermore, the same water will be used for multiple tests and the time that test water remains in the equipment or pipeline will be reduced to minimize the need for chemicals. The mitigation measures should allow to reach a low overall impact on plankton component. During construction phase, discharge of wastewater and minor leakage of contaminants are instead expected to generate higher impacts due to the potential alteration of seawater quality. After the implementation of the mitigation measures, in fact, a potential medium impact is expected.

For benthic communities, that is the flora and fauna related to the bottom of the sea, impacts are expected during construction phase due to offshore excavation, pipeline laying operations and the wastewater treatment discharge. Resuspension of sediments could directly affect the mortality to benthic organisms creating a chocking effect on the bottom. The pipeline laying could cause limited habitat disruption, through fragmentation of soft bottom habitats. Finally, water discharge could lead to chemical imbalances thus altering the benthic community. To minimize the impacts produced by such actions, various mitigation measures will be implemented: excavated sediments will be gently placed in mapped section of a temporary storage area in order to reduce the resuspension and to ensure that the original sediment type is not destroyed during backfilling operations. Moreover, to cope with discharge of wastewater, all discharge effluents will be compliant with relevant standards and located a sufficient water depth (25 m or below 25 m). The implementation of the abovementioned mitigation should allow a low impact on benthic component. In contrast, during operation phase benthic communities will likely experience a positive impact due to the presence of new offshore infrastructures, potentially forming biodiversity oases that may attract different species by providing a shelter for benthic organisms.

Fishes may be impacted both by offshore excavation activities and pipeline laying, that could lead to minor leakages of contaminants into water, emission of underwater noise, emission of particulates and chemicals and emission of light. Key mitigation measures include the compliance of the vessels with MARPOL and the use of recent and well-maintained propellers, in order to mitigate the impacts of both the emission of underwater noise and of contaminants. Regarding the emission of particulates and chemicals, fluids used for pipeline testing will be discharged following relevant standards, the same water will be used for multiple tests and the need for chemicals will be reduced by minimizing the time that water remains in the pipelines. Additionally, chemicals will be carefully selected based on their lower toxicity, higher biodegradability and lower bioaccumulation

potential. No mitigation measures are required for the emission of light. During operation phase, fishes could be impacted by the discharge of wastewater and the presence of new offshore infrastructures.

Marine mammals and critical habitats (specific areas that contain physical or biological features essential to conservation of certain species) are expected to be mostly impacted by the emission of underwater noise and the presence of moving vessels during construction phase. Low-frequency noise originated by working vessel propellers could potentially interfere with acoustic signaling. However, such low frequency activities are unlikely to impact the species present in the Black Sea given the non-overlap of frequencies generated by vessels and the ones cetaceans living in the area use. Regarding the presence of moving vessels, although collisions between vessels and large sized species are frequently observed, no large cetacean species occurs in the Black Sea. The compliance of the vessels with MARPOL standards and the definition and implementation of dedicated routes and speed limits should be sufficient to reach an overall low impact. During operation phase, emission of electromagnetic fields could also act as an impact factor, however the relationship between cetaceans' behavior and electromagnetic fields is still poorly studied.

SGFD Project onshore biodiversity impacts

Onshore biodiversity impacts were assessed taking into account several biological components, such as flora, freshwater fauna, terrestrial fauna, birds, habitats and legally and internationally protected areas.

Flora could be potentially impacted by vegetation clearing, site levelling and material transportation, that could lead to removal of natural vegetation, soil and to the emission of dust and particulate matters. About 78.5% of the Project footprint consists of highly modified area, corresponding to the preexisting Filyos Industrial Area, with only a 16% of natural habitat and a 5.5% of highly artificial forestry.

The natural vegetation within the Project' footprint is present only in the following two areas:

- The landfall area located in the dune habitat on the coast section where the offshore pipeline will be connected to the OPF.
- The ETL area where poles and electrical lines will be installed.

Although the removal of vegetation in these areas could cause habitat loss and habitat fragmentation, the sand dune area was subjected to an early mitigation program before site preparation commenced which consisted in the translocation of all individuals from the two main plant species characterizing the habitat.

Emission of dust and particulate matter generated by topsoil removal could negatively impact flora. Removal of vegetation and topsoil could facilitate the introduction and proliferation of alien flora species carried by vehicles, machinery and materials utilized in other sites and entering the construction area. Key mitigation measures for the flora include the realization of pre-construction survey in order to identify and relocate flora species, the establishment of clearing limits and the designation of routes which vehicles must follow. For the possible introduction of alien species, all vehicles and machinery will be checked for evident foreign plant material, soil and seeds. Vehicles covered with visible amounts of dirt will be washed in a controlled site. If spreading of invasive species is observed, an appropriate eradication program will be developed and implemented. In this way, flora component is expected to meet an overall low impact. During operation phase, flora may be impacted by the emission of dust, that will be treated as above leading to a negligible residual impact.

Regarding the freshwater fauna, construction and operation activities such as vegetation clearing, site levelling, material transportation and general construction works are expected to generate several impacts that could act

negatively on the abovementioned component. For example, demand of freshwater could lead to changes on water hydrology, affecting consequently the freshwater fauna. Leakages of contaminants into water, emission of dust and particulate matter, noise and vibrations and light are all expected to have a low impact on the freshwater fauna component. In contrast, the increase of traffic onshore and the possible introduction of alien species could have a medium level impact. Key mitigation measure include:

- For discharges of wastewater mitigation will be implemented as in section 3.4.
- For emissions of noise and vibrations mitigation will be implemented as in section 3.5.
- For emissions of dust and exhaust gas mitigation will be implemented as in section 3.1.
- For changes in flow/circulation in natural water bodies, the discharge from hydrotesting activities will be done at a reduced discharge flow to allow for the soil to absorb the majority of the water preventing any wash-off effect on the freshwater fauna in the area.
- For the emission of light, as far as practicable, no intense light will be directed towards the freshwater habitats. Downward-facing lights will be used to manage horizon glow, while shielded light fittings and directional lights will be used to manage light spill, Unnecessary lighting will not be used, including lights in unused areas, decorative lighting, or lighting that is brighter than needed for the task being carried out.
- For the possible introduction of alien species, no freshwater or moist soil is to be discharged to the Project Area without a proper inspection from environmental specialists or ecologists. Moreover, no freshwater procured outside of the Project Area will be discharged into Filyos River or any other nearby natural freshwater habitat, and if spreading of invasive species is observed, an appropriate eradication program will be developed and implemented.
- Finally, for the increase and modification of traffic onshore, speed limits and animal crossing signs will be installed on the access road. The accumulation of stagnant water and organic waste will be avoided in order to not attract wildlife. If freshwater fauna species are encountered (amphibians), employees and contractors will wait until it moves on by itself or they will ask the assistance of the environmental specialist for its safe removal and relocation in a suitable environment.

The mitigation measures thus identified will be such as to allow a negligible impact on freshwater fauna during the construction phase and low during the operation one.

The same activities and impact factors discussed for freshwater fauna are also expected to potentially impact terrestrial fauna during construction and operation phase (in the latter case, only emission of noise and vibration, light and the increase of traffic onshore are expected to potentially be impacting). Implementing the mitigation measures discussed also for the previous component should allow a low impact on terrestrial fauna during both construction and operation phases.

Birds could also be impacted by several construction activities, such as removal of natural vegetation, emissions of noise, vibrations and light, minor leakages of contaminants into water and increased traffic onshore. Impacts due to these activities will be mitigated as per the flora and fauna components. Regarding the emission of noise and vibrations, machines and equipment will be carefully selected to have low noise emissions. Night work will also be avoided as far as practicable in order to reduce impacts on nocturnal bird species. Finally, particularly noisy activities will be performed during the day and at regular times to promote the habituation of the local fauna to noise and to avoid disturbances during critical hours for many species (dusk and dawn). During the operation phase, the presence of onshore infrastructures such as the energy transmission line could also impact birds by causing habitat fragmentation and by increasing individuals' mortality due to collisions. To mitigate the potential impacts, line marking devices (e.g., marker balls, spirals, and other hanging devices) will be used to increase its visibility of the line. Dissuasion devices could also be utilized to prevent the entrance of birds in

wide access points to buildings. Overall, the mitigations should allow a low impact on birds both during construction and operation phases.

Possible impacts on habitats were also evaluated by averaging the impacts generated by each of the impact factors on all the above-mentioned components, leading to an overall low impact on habitats both during construction and operation phases.

Finally, potential impacts on legally protected areas and internationally protected areas were assessed. Based on the information collected for the definition of the baseline, no Protected Area falls within the Project Area of Influence. However, Key Biodiversity Areas (KBAs) and one relevant area for bird biodiversity (Important Bird Area, IBA) can be found. Legally and internationally protected areas could be affected during construction phase by several impacts, including the removal of natural vegetation, the emission of dust, light, noise and vibrations and the possible introduction of alien species. The removal of vegetation during the construction phase could cause the destruction of suitable habitats for fauna species, including birds, that use the vegetation present as food, shelter or nesting site. Dust emissions can affect the vegetation health, while emissions of light, noise and vibrations could affect the general biodiversity (freshwater and terrestrial fauna and birds). Lastly, the possible introduction of alien species (flora or fauna alike) could have a cascade effect on local biodiversity by changing the species compositions. During operation phase, impacts should only be expected from the emission of light, noise and vibrations. Implementing the mitigation measures discussed for the previous components should be sufficient to reach a negligible impact both during construction and operation phase.

3.8 Socio-economic impacts

Changes on the socio-economic environment and communities may originate from various positive and adverse environmental and social impacts that may result by the Project impact factors. Therefore, it is important to determine effective mitigation measures to minimize the negative impacts and enhance positive impacts of the Project.

Population and demography

Construction activities will generate an influx of population in the Area of Influence. This will be mainly due to the workers that will move to the AoI, which will consist in approx. 1,900 workers for the offshore section of the Project and an average of 6,500 workers for the onshore section of the Project. A large proportion of the workforce will be accommodated in the construction camps that will be established in autonomy by the contractors. The rest will be accommodated in rental houses and hotels in the vicinity of the Project area. In addition, informal immigration may occur due to people looking for employment opportunities in the Project and connected activities. This kind of influx can increase pressure on the local housing situation and on access to infrastructures, creating tensions with the local population. To cope with impacts from people influx, unskilled and semiskilled workers will be hired locally as possible. Accommodation to all non-local Project workers will be provided within the Project fence line, all Project workers are required to abide by the Code of Conduct of the Project, cultural awareness training will be given to non-local workers, mukhtars will be regularly engaged and a community level grievance mechanism will be implemented.

During operation phase it is planned to employ 120 people for Phase 1. Immigration of workers and other people could also affect population and demography, even if with negligible impacts. The operational activities may result in long term population increase at local level. On the other hand, the operational activities may attract people from other regions to migrate to the Project Area in parallel with economic development and urbanization at District level. Key mitigation measures include, increasing business entity competition through creating the local institutions necessary for faster development and structural adjustment, giving emphasis to local

processing of agricultural products, agroindustry, and other "clean" sections of the economy that will benefit from location benefits obtained from proximity to the market, identifying communities that can perform as the region's most efficient service, manufacturing, and commercial products.

Economy and employment

It is expected that the Project will contribute directly local and regional economy. Both direct and indirect working opportunities will generate positive effects on the income of the workers and on the overall livelihood conditions of the household. In addition to positive benefits from an economic standpoint, the Project will also generate an improvement of the skills of workers, which can then be useful to find future employment opportunities. Moreover, the demand of workers and hence the presence of workforce in the area will likely generate informal economic opportunities linked to selling products to workers such as food and small everyday items. Finally, construction activities will generate both a direct and an indirect demand of goods, materials and services providing an economic benefit to the companies involved and employment opportunities. If sourced locally, this increases the overall economic benefits created by the Project within the local community with a high to very high positive impacts expected.

On the other hand, interviews and surveys conducted for this ESIA indicate that the Project is likely to have caused an increase in local land prices because of the influx impact of the Project. Accommodations, rental houses, hotel and hostels provided to nonlocal workers could in fact lead to pressures on rental prices in the Project area. To address the potential impacts by the demand of workforce, the demand for goods and local inflation, several mitigation measures will be implemented, among which:

- The Project will implement human resource policies and procedures in compliance with the IFC PS-2: Labour and Working Conditions. Such policies are expected to provide more predictable employment opportunities for direct and indirect employees as well as outline benefits, contract conditions and workplace conditions
- The Project will enhance local employment through a preferential employment policy which prioritizes jobs for qualified local people.
- The Worker Grievance mechanism will be established and implemented.
- Equal tender process will be applied.
- Equal procurement opportunities will be provided lo local small businesses through the Local Procurement Plan.
- In order to reduce the impact on the local inflation, the Project will assess inflationary impacts through is regular stakeholder engagement and consultation. If feedback includes comments about a rise in prices, a more formal monitoring system will be set up to monitor prices for staple goods on a regular basis. If inflation can be linked to the Project, the Project will consider targeted support programs. The Project will also purchase at market rate the goods and services, land, and labor it procures.

During the operation phase the Project will continue demand for workforce and demand for goods and services. Thus, contributing to the national economy with less dependency to other countries. The increased investment create diversification of economic activities and capacity development of the local suppliers and new economic fields are expected to be active especially in Filyos Neighborhood and Çaycuma District. Overall, a high positive effect is expected for economy and employment during operation phase.

Land use

Construction of the Project units may lead to land acquisition and changes on the land use. The industrial zone area, where the OPF (including transformer station) will be constructed, is owned by the treasury and assigned to Turkish Ministry of Industry and Technology. Upon assent of Turkish Ministry of Industry and Technology, the pre-easement of this land was granted to TPAO. After EIA Positive Decision was obtained, right of easement

was granted by General Directorate of National Real Estate to TPAO for 49 years for the Project, with the consent of Ministry of Industry and Technology. With the Presidential Decree No. 5071 published in the Official Gazette dated 6 January 2022, this area was removed from the Filyos Industrial Zone area and allocated to TPAO as a special economic zone. The area between the shoreline and OPF, where the SURF passes through, is partly in the industrial zone and partly in the area where the right of easement was given in favour of the Ministry of Transport and Infrastructure and the use of land in the zoning plans was determined as a coastal logistics center. Energy transmission line passes through forest land which belongs to treasury except 1 private agricultural land which will be expropriated before construction works. Forest land will be allocated after the permission to be obtained from the Provincial Directorate of Agriculture and Forestry. Temporary camp site of one of the contractors which is also responsible for the Filyos Port construction is located in the land allocated to Ministry of Transport and Infrastructure and lastly lodgings are planned on an area of 2 hectares, approximately 1.8 km west of the Project area, to be used in the construction and subsequent phases of the Project. TPAO purchased the title deed from the Ministry of National Defense.

The part of the Project located on the seaside of shore edge line (onshore stretch of the Phase 1 SURF: MEG pipeline + gas pipeline) is situated within the state-owned lands, and the utilization permit for the area up to the boundary of territorial waters have been obtained from the Directorate General of National Property. In the Project's offshore section, one part of the subsea umbilical and pipelines are located in Turkey's territorial waters with a width of 12 nautical miles, while the other part is located in Turkey's exclusive economic zone. The entire subsea production system is located over 165 km offshore, at a depth of approximately 2,200 m, within the Turkey exclusive economic zone. Turkey's right of usage for the territorial waters located on the seaside of the Project is set out in the Territorial Waters Law. TPAO is thus not required to acquire any lands in this area.

The existing roads will be used and upgraded, if necessary, in the Projects' construction phase and no link road is planned.

To mitigate the impact of changes in land use, key mitigations will be implemented:

- The expropriation process and compensation process will be conducted in accordance with Turkish law, managed by relevant governmental bodies
- The Project will ensure that engagement and consultation will be conducted, and that compensation will be provided in accordance with IFC PS 5.
- The Project will conduct a census of all people affected by the expropriation process, in order to confirm the number of affected households and persons. An asset survey will be conducted to confirm the number, type, and qualities of the properties affected.
- The Project external/community grievance mechanism will be available to submit grievances related to the expropriation process and economic displacement caused.
- The Project will prioritise those affected by the Project land acquisition and expropriation for the recruitment of Project jobs.

Infrastructure and services

Project activities are likely to increase and modify traffic schemes onshore, increase the demand of freshwater and the demand for waste disposal services.

Construction activities will generate an increased traffic compared to the current situation for the transport of workers, goods and materials. The existing roads will be used during the land preparation and construction phase, and no link roads is planned for the construction phase. The roads that will be used by Project vehicles during the construction phase are shown in the figure below.

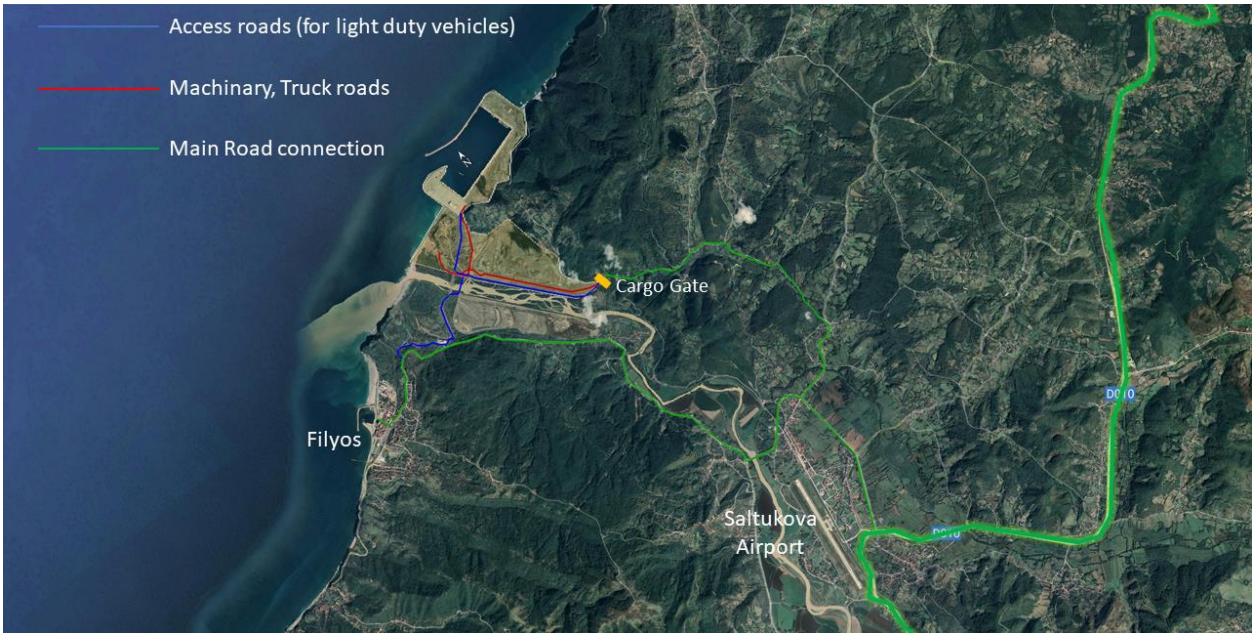

Figure 11: Access and Connection Roads

During the construction phase, at the peak of activities, several vehicles are expected to enter and exit the Project site. The increase of traffic can potentially create interferences with current traffic conditions, including congestions and increased time necessary to travel along the road. This can be particularly relevant in villages or in crossroads where traffic is already significant. The additional traffic can also worsen the conditions of the roads, especially if they are already not in a very good state. A Traffic Management Plan is developed to ensure the application of measures that can reduce impacts generated by the additional traffic due to the Project. Measures include liaising with local authorities to identify and agree on specific solutions, that can include avoiding traffic at certain hours or using alternative routes for specific vehicles.

Freshwater will be required by the Project during the construction phase mainly for workers, to prevent dust emissions and for the operation of concrete batching plant. Majority of the water needed in this phase will be supplied from groundwater wells inside the Project area and some from Filyos and Saltukova Municipalities with water tankers. The need of water for Project activities can create competition on water with other activities and can generate increased pressure on the overall water sourcing and distribution system, particularly in summer periods. According to the information collected, access to drinking and irrigation water does not seem to be an issue in most of the villages near the Project area, however in a couple of villages problems with the availability and quality of water were raised. Groundwater model and simulations were run for the impacts of the water demand from groundwater resources. It is concluded that the water source well of Sazköy Village, is being in the area of cone of depression, and it is expected to be impacted by groundwater abstractions during the construction phase. Beside this well, no other groundwater sources in and near the Project site is expected to be impacted by the cone of depression. Since Sazköy well is in a location affected by Project activities, a new well was constructed by TP-OTC as Sazköy Village's water resource. To mitigate the effects of increased demand of freshwater, water requirements will be monitored during the construction phase to ensure that water needs for the Project does not create shortages for other activities and local communities, particularly in summer and during dry periods.

Construction activities will entail the production of waste of various nature, both hazardous and non-hazardous, which will have to be disposed of. Waste will be managed in line with Turkish legislation through authorized

contractors. A Waste Management Plan that includes an identification of the waste disposal facilities for the Project and selects those that are less impacting from an environmental and social standpoint will be implemented.

During the operation phase, traffic created by the staff entering and exiting the site will be limited, thus no significant impacts are expected on traffic. Regarding the demand of freshwater, it will be required for the personnel, for the steam boiler and for the firefighting system. Unlike the construction phase, during the operation phase the Project will be self-sufficient through the water from wells. Similarly to construction phase, groundwater model and simulations were run for the impacts of the water demand of operation phase from groundwater resources. It is concluded that the water source well of Sazköy Village, is being in the area of cone of depression, and it is expected to be impacted by groundwater abstractions during the construction phase. Beside this well, no other groundwater sources in and near the Project site is expected to be impacted by the cone of depression. Since Sazköy well is in a location affected by Project activities, a new well was constructed by TP-OTC as Sazköy Village's water resource. Lastly, waste will be managed in line with Turkish legislation through authorized contractors, which are expected to be able to manage the amounts of waste generated by the Project. Considering the type and amount of waste produced during operation, the Project is not expected to add increased pressure on existing waste disposal systems and infrastructures.

Community health and safety

Community health and safety is expected to be potentially impacted during both construction and operation phases by dust emissions, exhaust emissions from vehicles and construction machinery, emission of aerial noise and vibrations and increase and modification of traffic onshore and immigration of workers generated through and by onshore construction activities and offshore excavation, sediment storage, offshore pipeline laying and onshore operations.

Specific measures and mitigations for dust and exhaust emissions and exhaust emissions from vessels are provided in the Air quality section (3.1). For the emission of aerial noise and vibration details are shown in the Noise and Vibration section (3.5).

Regarding immigration of workers, the arrival of workers from other parts of the country and from abroad may increase the possibility of spread of communicable diseases both among workers and within the local community, due to increased interactions between workers and local population. As stated in previous sections, most of the workforce will be accommodated in construction camps that will be in general terms self-sufficient, hence interactions between local population and workers will be limited, reducing the risk spreading communicable diseases between workers and local community. The camps will also include medical facilities to manage internally basic health needs those workers may have and to avoid using local facilities to the extent possible. Several mitigation measures will however be implemented:

- A health screening of all workers prior to beginning of work and on a periodic basis will be performed
- An induction training and periodic training to all workers on Health & Safety aspects and on communicable diseases will be provided.
- An Occupational Health and Safety (OHS) Management Plan compliant with national regulations, IFC standards and OHSAS18001 standard will be implemented. Also, Community Health, Safety and Security Management Plan and Emergency Preparedness and Response Management Plan will be implemented.
- A COVID-19 Management Plan that will identify additional measures necessary to manage the ongoing COVID-19 Pandemic among workers and local communities will be implemented.

Cultural heritage and archeology

According to definition of IFC PS8, cultural heritage refers to tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; unique natural features such as sacred groves, rocks, lakes, and waterfalls; and intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles. During the baseline studies field studies and interviews with village mukhtars, the presence of two 3rd degree archaeological sites, a modern cemetery and an ancient bridge was detected around the Project Area.

Cultural heritage could be impacted by the removal of soil during site levelling and grading activities performed in the course of construction phase, whilst no impacts are expected during operation phase. Several mitigations may be implemented for cultural heritage, such as:

- Information and training will be provided to the workers to raise awareness about the archaeological sites.
- In particular, truck drivers will be informed that the materials that are considered as waste should not be dumped into these areas.
- Measures will be taken to prevent access to such areas (i.e., by marking the archaeological site with signs similar to "no entry, sensitive zone").
- Boundaries of the site will be confirmed, and measures will be taken to prevent possible physical interventions in the site.
- Human and vehicle traffic along the boundaries of the area will be minimized.
- In case the usage of the ancient bridge is planned in order to access Project site, speed-reducing applications can be made, and speed can be reduced at this point with the signs to be placed on the road with the approval of relevant authority of the highways.

Although not identified, as regards of intangible cultural heritage, key mitigation measures are the following:

- Mobility of public and vehicles in the region during the planned activities will not be prevented
- It will be ensured that transit routes are left for uninterrupted access to areas regularly visited by the public
- Contractors and subcontractors will be trained on the code of conduct, including their approach to relations with local communities, during the employment phase and at regular intervals throughout the Project
- Information will be provided to contractors and subcontractors on any site-specific sensitivity/issue (e.g., festival locations, dates, events, etc.) regarding intangible cultural heritage.

Lastly, general mitigations will be implemented, such as:

- The Cultural Heritage Management Plan and Chance Finds Procedure prepared within the scope of the Project will be implemented throughout the Project. In case of chance find, all work must cease at the location where discovery is made and a temporary buffer zone around the chance find will be put in place. Cultural Heritage/Archaeological Monitoring Specialist will be informed site management and museum archaeologist immediately. Chance find site will be properly secured with flagging, no-entry signs etc.
- Protection of site: chance find should not be moved, removed or further disturbed
- In particular, all operators and Project workers assigned to land preparation works should receive training on project requirements, protection of cultural and archaeological heritage, laws and regulations regarding archaeological and cultural heritage, Cultural Heritage Management Plan and Chance Find Procedure.

Regarding marine archaeology, even if the information collected did not reveal the presence of evident marine archaeological heritage, in the eventuality that the removed sediment created by offshore excavation reveals some foreign object, this would be immediately inspected and photographed whenever the object/s are not immediately identifiable as modern age debris. The coordinates of the finding will be recorded, and the photos would be immediately provided to an archaeologist for a preliminary assessment of the material. The initial assessment will be then discussed with the responsible of offshore construction operations for an eventual temporary alt of the activities.

Ecosystem services (Fishery and Tourism)

According to the information collected, the fishing sector has importance in the Area of Influence of the Project in the last decades, and there is currently a high number of fisheries located in the AoI. Offshore excavation, pipeline laying and pipeline hydrotesting operations could cause a series of impact on the Fishery component through leakages of contaminants into water, emission of underwater noise, light and the presence of working vessels.

When dealing with a vessel, the leakage of small amounts (i.e., negligible, but still present) of contaminants (mostly oily and greasy) from the engines is considered “physiological” and inevitable. Contaminants of such typology are mostly insoluble in water and tend to remain on the surface, potentially affect the fishes and thus fishing activities. To deal with possible impacts generated by contaminants leakage, which is expected to be of a medium degree, all vessels will be compliant with MARPOL, outdated engines will be avoided in favour of recent and well-maintained ones and fishers will be informed in case any leakage occurs. Furthermore, impact on fishers’ livelihoods originated by the presence of working vessels will be continuously monitored and if negative impacts are found as a consequence of the Project, then fishermen will be compensated in accordance with the Livelihood Restoration Plan. The mitigation measures implemented are expected to allow the achieving of a low level of impact.

Hydrotesting could also generate the emission of chemicals into water. Nevertheless, this alteration is not expected to affect marine life, since the discharge point is located in the anoxic water layer, where no life exists.

Regarding the emission of light, since pipelay activities will be performed continuously, night working and the use of artificial light, will be required for the construction and port area. According to the results of the interviews with the fisheries, it was underlined that the artificial lights of the port is affecting fishing activities adversely. In order to cope with impacts generated by the emission of light, when practicable no intense light will be aimed directly towards the freshwater habitats within and in proximity of the Project Area. Lights will also be mounted as low as practicable and shielded light fittings and directional lights will be used to manage light spill. Use of artificial light will be limited to what required to maintain a safe working environment and unnecessary lighting will not be used, including lights in unused areas, decorative lighting, or lighting that is brighter than needed for the task being carried out.

During operation phase, the offshore environment is expected to be indirectly impacted by the discharge of wastewater produced by the onshore operations, such as industrial wastewater, civil sewage and rainwater drainages. Mitigation measures such as the wastewater effluents to be compliant to national and international standards will thus be implemented. Minor leakages of contaminants could also occur due to maintenance/repair operations of the SPS and pipelines that are planned for the operation phase of the Project. In this case, mitigation measures will be the same as the ones cited for the construction phase.

Tourism is expected to be mainly impacted by the presence of cofferdams and working vessels during offshore excavation, sediment storage and pipeline laying operations. Both the presence the cofferdams and the presence of working vessels are expected to have a short-term impact. However, impacts on tourism may be originated through limitations or prohibition of public access to the Filyos beach, in order to prevent impacts on

tourists' health and safety. The key mitigation consists in developing a schedule that avoids high traffic on the road accessing the beach. Whether not possible, a schedule for moving the machineries earlier in the morning so that main traffic would be avoided will be designed.

Marine Traffic

Similarly, to fisheries, marine traffic could be negatively impacted by the presence of moving vessels during offshore operations. With the implementation of the Project, there will be an increase in maritime traffic density, which may pose risks to the community as a result of vessel collisions, fires and other accidents. Such incidents may result in spills and discharges that might spread, also affecting marine life. To cope with predicted impacts, pipeline construction activities, maneuvering routes and areas will be timely discussed with local fishermen and other users of local harbors and ports. No significant vessel movement is instead expected during the Project operation phase.

Visual aesthetics

Visual aesthetics will potentially be affected by the Project via the removal of soil and natural vegetation, the emission of light and the change in land use.

Vegetation plays an important role in defining the visual character of an area. Natural vegetation is essentially found on the landfall area, located in the coastal dune habitat where the offshore pipeline will be connected to the OPF and in the ETL area, where poles and electrical lines will be installed. The removal of vegetation carried out due to construction activities will therefore alter the current visual character of the area. It should however be noted that the area where the Project will be constructed, and surrounding areas have already been significant altered by previous construction activities for the industrial zone and other infrastructures. Limits of clearing and construction areas will be clearly marked or fenced in order to avoid impacts outside this area, all vehicles will drive on designated routes unless otherwise authorized, and off-road driving will be strictly prohibited. Additionally, at the end of the construction phase open areas with no buildings will be revegetated to the extent possible with native species, so to ensure that the site blends in the surrounding landscape context as much as possible.

Regarding the emission of light, even if construction activities are planned to be performed during daytime, in some occasions it may be necessary to work at night time. Hence, artificial lighting will have to be used, therefore alter the appearance of the Area of Influence during the night. To reduce light spill, LED lighting and modern lighting systems will be used so as to avoid glare effects and light pollution. Whether necessary, agreements will also be taken with surrounding receptors and local communities to identify and implement measures to reduce unwanted lighting.

Finally, for the changes in land use, it should be noticed that the construction site is located in an industrial area that has already introduced changes to the overall landscape. Despite this, mitigation measure such as the selection of colours for buildings and structures that ensure that they blend as much as possible in the landscape context, the possible use of artificial and vegetations screens to reduce visibility of the Project from external viewpoints will be implemented. Additionally, visual impacts will be discussed with surrounding receptors and local communities to eventually implement measures to reduce visual impacts during the construction phase.

3.9 Cumulative impacts

In the context of the ESIA of the Project, the cumulative impacts are the impacts arising from the concurrent presence of impact factors caused by the Project and the other development projects are considered. The cumulative impacts (on onshore and offshore components) have been assessed taking into account spatial, temporal or thematic overlap with other projects or facilities in the AoI of the SGFD Project Phase 1. The analysis

of the potential cumulative impacts is carried out based on limited information collected from the relevant authorities, and in particular without the knowledge of the construction timeline.

The expected contributing facilities to any cumulative impact on physical and biological components within the Project's AoI are limited to those from the projects given below.

- Filyos Integrated Fertilizer Production Facility Project,
- Filyos Port/Industrial Zone Connections - Rail Road Project,
- BOTAŞ Onshore pipeline and FMS Phase 1,
- BOTAŞ Onshore pipeline Phase 2,
- TP-OTC SGFD Project Phase 2 – OPF – Additional Units.

The overall evaluation of such impacts showed a low to negligible contribution (residual impact) of the Project for all the identified components. In the eventuality of additional residual or direct impacts from the beforementioned projects the only elements requiring particular attention have been indicated as those regarding atmospheric emissions, riverine and seawater contamination, and the increase and modifications of traffic. The presence of such potentially criticalities, also affecting sensible components (i.e., habitats, birds, freshwater fauna, etc.), highlights the necessity to properly implement the monitoring measures proposed in this document and to promptly intervene to assess and, when needed, further mitigate in case any contamination or negative interaction with traffic is detected.

4.0 IMPACTS MITIGATION AND MANAGEMENT

To ensure these mitigation measures are effectively implemented, adequate resources and project management planning will be put in place as guided by an Environmental and Social Management Plan (ESMP) package available for the project.

The ESMP is an integral part of the ESIA as it is a system setting document for the Project and its contractors and represents a commitment towards environmental and social sustainability applied to the Project's entire life cycle. The ESMP is an overarching document developed in accordance with the corporate Parent (TPAO) and Subsidiary Company (TP-OTC) Integrated Management System policies and TPAO Sustainability policy, including the SGFD Project specific HR Policy and Procedure, with the commitments included in the Environmental and Social Impact Assessment (ESIA) and, more broadly, with the Turkish regulatory framework relevant to the Project as well as with the E&S Standards that apply to the Project. These include the IFC Performance Standards (IFC PS) and IFC General and Sector Specific Environmental, Health and Safety (EHS) Guidelines, and Equator Principles (EP) IV. The Project ESMP consists of several sub-management plans as demonstrated further in Table 1, in which the ESIA mitigation measures are reflected and compliance with applicable Project legislation, standards and limits are ensured.

A key objective of the ESMP is to "operationalise" the E&S (including occupational health and safety) commitments and mitigations as identified in the ESIA to ensure that the Project (including construction, operation, and decommissioning) is undertaken in a way to minimise the negative impacts on the physical, biological, and social environments in the Project-affected area.

More specifically, the ESMS defined within this ESMP will:

- Establish environmental and social management standards that comply with or surpass Good International Industrial Practices (GIIP) and reasonable community expectations
- Adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize and restore E&S impacts
- Develop and implement policies, plans and procedures to integrate E&S aspects within the overall project management framework throughout its lifecycle
- Facilitate the implementation of management plans as defined by the ESIA for the avoidance, minimisation and control of E&S impacts
- Inform Project personnel about their responsibilities with respect to E&S issues and to monitor the manner in which those responsibilities are implemented.
- Train project personnel, contractors and community representatives, as necessary, in relevant environmental and social procedures, actions, and monitoring programs.
- Establish a monitoring program to assess the effects of residual impacts on the environment and monitor the ESMS performance.
- Provide for periodic system audits and identify corrective actions, if necessary, to reach the planned objectives.

TP-OTC has developed a set of ESMPs and procedures consistent with their policies and commitments, addressing the environmental and social impacts and relevant mitigation measures identified in the ESIA for each component. The full set of ESMPs for fulfilling the commitments undertaken by the Project are presented in the table below with the relevant IFC PSs that each will contribute to comply with.

Table 1: ESMPs

Relevant IFC PS	Plans / Procedures
IFC PS1 5-24: Assessment and Management of Environmental and Social Risks and Impacts	■ ESMP – Framework (ESIA Chapter 12) ■ Training Plan ■ Stakeholder Engagement Plan
IFC PS2: Labour and Working Conditions	■ Human Rights Management Plan ■ Camp Site Management Plan ■ Offsite Accommodation Plan ■ Labor Management Plan ■ Contractor Management Plan ■ Human Resources Procedures ■ Covid-19/Pandemic Management Plan ■ Retrenchment Plan
IFC PS3: Resource Efficiency and Pollution Prevention IFC EHS Guidelines	■ Resource Efficiency Management Plan

Relevant IFC PS	Plans / Procedures
	■ Pollution Prevention Plan (e.g., air, noise, wastewater, soil, ground water contamination, hazardous material management, etc.) ■ Waste Management Plan ■ Soil Management and Erosion Control Plan
IFC PS4: Community Health, Safety, and Security IFC EHS Guidelines	■ Influx Management Plan ■ Traffic Management Plan ■ Community Health, Safety and Security Management Plan ■ Emergency Preparedness and Response Management Plan
IFC PS5: Land Acquisition and Involuntary Resettlement	■ Livelihood Restoration Plan
IFC PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	■ Biodiversity Management and Reinstatement Plan
IFC PS7: Indigenous Peoples	■ Not applicable
IFC PS8: Cultural Heritage	■ Cultural Heritage Management Plan (including Chance Find Procedure)

The ESMPs will be implemented:

- across the TP-OTC Project organization, including, contractors, subcontractors and primary suppliers over which TP-OTC has control or influence; and
- inside the Project Area of Influence including the associated facilities.

ESMPs will provide the objectives of the document, the reference legal requirements, roles and responsibilities for its implementation, links to other management plans as necessary, a list of the mitigation measures, monitoring and reporting requirements, identify qualitative or quantitative Key Performance Indicators (KPIs), Performance Indicators (PIs) and measures to be used to monitor the effectiveness of the mitigation measures identified during the impact assessment process, training requirements as needed. Besides a similar structure, the level of detail and complexity of each management plan will be commensurate with the expected impacts and risks of the Project as identified in the ESIA. Each management plan will include the mitigation measures identified in the relevant sections of the ESIA and will be disclosed to the stakeholders as provided by the SEP (5.0). The ESMPs will be shared with all contractors to ensure they will develop their own equivalent management plans, procedures and work instructions aligned with the ESMP with additional mitigation measures specific to their activities, as needed.

5.0 STAKEHOLDER ENGAGEMENT

Stakeholder engagement aims to inform stakeholders about the potential environmental and social impacts related to the project through appropriate disclosure of information, to ensure their perceptions of the proposed

development are as accurate as possible, to consult with them to obtain feedback, and to provide a mechanism for resolving any concerns or complaints they might have.

The stakeholder's identification and engagement processes started at early Project preparation stages and were performed by TPAO & TP-OTC employees and Project consultants during direct meetings with authorities, key stakeholders, and representatives of local community. The details of these meetings are presented in the table below.

Table 2: Stakeholder Engagement Activities Held by TPAO

Date	Stakeholder Group	Details of consultations
March 15th, 2021	Zonguldak Governorship	General information about the Project
March 15th, 2021	Çaycuma District Governorship	General information about the Project
March 15th, 2021	Çaycuma Municipality	General information about the Project
March 15th, 2021	Filyos Municipality	General information about the Project
March 15th, 2021	Sefercik and Sazköy Neighbourhood units, Filyos Chamber of Craftsmen, Çaycuma Association of Headmen, Filyos Fishery Cooperative, Çaycuma Chamber of Trade and Commerce	General information about the Project

Engagement activities for the Project continued with a Public Participation Meeting (PPM) held on March 16th, 2021. The PPM provided opportunity to the affected local residents to be informed about the Project and to express their opinions and concerns. The purpose of this meeting and how it was organized have been determined in the "Environmental Impact Assessment Regulation" which is published in the Official Gazette dated 25.11.2014 and numbered 29186 by the Ministry of Environment, Urbanization and Climate CHange.

Additional engagement meetings were held during the ESIA process to gather socio-economic information about each of the settlements in the Area of Influence.

Table 3: Stakeholder Engagement Activities Held During the ESIA Process

Survey	Stakeholder Group	Details of consultations
Community Level Surveys	Mukhtars of Derecikören, Yeşilyayla, Sefercik, Gökçeler, Aşağıihsaniye and Sazköy	Population, migration, ethnic composition, age distribution, social facilities and infrastructure, education, social conflict and ills, social cohesion, livelihoods, income generating activities, and land use.

Survey	Stakeholder Group	Details of consultations
Household Surveys	91 household surveys in Derecikören, Yeşilyayla, Sefercik, Gökçeler, Aşağıihsaniye and Sazköy Villages	• The level of knowledge of the Project; • Access to information mechanisms; • Complaints and feedback about the Project; • Socio-economic information, including education and skills; • Livelihoods and income generating activities; and • Land ownership and land acquisition information
Fisheries Survey	38 household surveys in Tarlaağazı, Boğazköy Bartın Çayı, Filyos Villages	Impact on their livelihoods and gather their recommendations to prevent the impact on the livelihoods
Focus Group Discussions	6 focus group discussions with women in each village	Engage with specific segments of the community that might require special engagement and attention, i.e., women, youth, elderly and vulnerable groups.
Key Informant Interviews	• Çaycuma District Governorship • Zonguldak Governorship • Filyos Municipality • Saltukova Municipality • Filyos Chamber of Craftsmanship • Filyos Fishing Cooperative • Environmental Protection Association • West Black Sea Development Agency • Provincial Port Manager • District Agriculture Directorate	Interviews with individuals who have specific knowledge and expertise in certain areas relevant to communities about the Project

Table 4: Stakeholder Engagement Activities Held After the ESIA Process and Risk Assessment

Survey	Stakeholder Group	Details of consultations
23/06/2022	Sefercik mukhtar and 8 villagers	Meeting held about access road to sea.

Survey	Stakeholder Group	Details of consultations
27.06.2022 -28.06.2022	Muhktars of Sazköy, Sefercik, Aşağıihsaniye, Derecikören, Yeşilyayla and Gökçeler	Meeting held whether there is any problem related to flooding and they need any assistance from the project.
07/07/2022	Filyos Fisheries Cooperative with participation of Cooperative Mayor, Deputy and members	Meeting held on general information about project activities in the sea. Detailed information about Castrone ship and pipe laying activity and expected end date was given.
04/08/2022	Head of Filyos Fisheries Cooperative	Meeting held whether there is any diver registered to Fisheries Cooperative.
09/08/2022	Sazköy, Aşağıihsaniye and Yeşilyayla villages	Meeting held on Cultural Heritage and then Communicable Diseases
10/08/2022	Gökçeler village	Meeting held on Cultural Heritage and then Communicable Diseases
12/08/2022	Sefercik village	Meeting held on • Cultural Heritage and then Communicable Diseases • Community Health and Safety • Road safety , traffic management and speed limits of project vehicles • Waste management • Dust suppression • Noise prevention
05/09/2022	Derecikören village	Meeting held on Cultural Heritage and then Communicable Diseases

Engagement activities have been held by BOTAŞ for the FMS and 36 km pipeline components which were identified as associated facilities of the Project as previously explained in Section 2.3. Information meetings were conducted for the expropriation that comply with national requirements

Table 5: Summary Table of Public Participation Meetings Held by BOTAŞ

No	District	Settlement/Village	Time
1	Çaycuma	Sazköy	08/01/2022

No	District	Settlement/Village	Time
2	Çaycuma	Aşağı İhsaniye	07/02/2022
3	Çaycuma	Derecikören	08/02/2022
4	Çaycuma	Gökçeler	08/02/2022
5	Çaycuma	Temenler	10/02/2022
6	Çaycuma	Esenyurt	09/02/2022
7	Çaycuma	Yukarı Göynük	10/02/2022
8	Çaycuma	Esentepe	10/02/2022
9	Çaycuma	Çayır	09/02/2022
10	Çaycuma	Güdüllü	15/02/2022
11	Merkez	Sofular	16/02/2022
12	Merkez	Sapça	16/02/2022
13	Merkez	Osmanlı	18/02/2022
14	Merkez	Gerdek (Himmetoğlu)	20/02/2022
15	Merkez	Kabalaklı	18/02/2022
16	Merkez	Elvanpazarcık / Elvan	21/02/2022
17	Merkez	Elvanpazarcık	21/02/2022
18	Çaycuma	Güdüllü,Derecikören, Gökçeler village	20/07/2022
19	Çaycuma	Sazköy,Temenler, Yukarıgöynük,Elvanpazarcık/Elvan villages and Elvanpazarcık district	21/07/2022
20	Merkez	Gerdek (Himmetoğlu), Osmanlı, Sapça, Sofular villages	22/07/2022

According to the outcomes of High-level Environmental and Social Assessment carried out in the ESIA process for the BOTAŞ components, detailed engagement activities were held. Issues discussed with BOTAŞ included a project-specific human resource management plan/procedure, code of conduct, labour contracts, E&S inductions, as well as community safety and security concerns perceived by the communities. The community safety and security concerns were particularly discussed in the focus groups for women.

Table 6: Summary of Fieldwork

Consultation Date and Method	City/ District	Settlements/ Stakeholders/ PAPs Categories	Consultation Summary
Project Affected Settlements			
16.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Aşağıihsaniye Village	Background information of the Project and PAPs/Stakeholders.

Consultation Date and Method	City/ District	Settlements/ Stakeholders/ PAPs Categories	Consultation Summary
16.04.2022 Face to face	Zonguldak/ Merkez	Mukhtar of Osmanlı Village	Socio-Economic information on settlements (e.g., background demographic information, vulnerable individuals and social issues, previous projects and construction, education, land and economy, housing and infrastructure, use of natural resources in the settlement, places of worship and cultural significance, gender and equality). Land acquisition process carried out. Stakeholder engagement and project perception.
16.04.2022 Face to face	Zonguldak/ Merkez	Mukhtar of Himmetoğlu Village	
17.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Esenyurt Village	
17.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Yukarıgöynük Village	
17.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Esentepe Village	
17.04.2022 Face to face	Zonguldak/ Merkez	Mukhtar of Kabalaklı Village	
17.04.2022 Face to face	Zonguldak/ Merkez	Mukhtar of Sapça Village	
17.04.2022 Face to face	Zonguldak/ Merkez	Mukhtar of Sofular Village	
17.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Temenler Village	
18.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Gökçeler Village	
18.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Derecikören Village	
18.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Sazköy Village	
18.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Çayır Village	
18.04.2022 Face to face	Zonguldak/ Çaycuma	Mukhtar of Güdüllü Village	
19.04.2022 Face to face	Zonguldak/ Merkez	Mukhtar of Elvanpazarcık/Elvan Quarter	
19.04.2022 Face to face	Zonguldak/ Merkez	Mukhtar of Elvanpazarcık/Merkez Quarter	
Stakeholders			
16.04.2022	Zonguldak/ Filyos	BOTAŞ Representatives	Background information of the Project. Land acquisition process carried out. Stakeholder engagement process and grievance mechanism.

Consultation Date and Method	City/ District	Settlements/ Stakeholders/ PAPs Categories	Consultation Summary
			Labor-related aspects. Community health and safety – related aspects.
19.04.2022 Face to face	Zonguldak/ Çaycuma	Çaycuma District Governorship	Background information of the Project. Stakeholder engagement process and grievance mechanism. Land and Economy-related aspects. Use of natural resources. Project perception.
19.04.2022 Face to face	Zonguldak/ Çaycuma	Çaycuma Municipality	
19.04.2022 Face to face	Zonguldak/ Merkez	Regional Directorate of Forestry	
Potential Vulnerability and Focus Group Discussion			
18.04.2022 Face to face	Zonguldak/ Çaycuma	Women Focus Group (Sazköy Village)	Women's livelihood activities. Education status of women. Public spaces used by women. Security problems. Project perception, expectations and information about project, women engagement of Project. Grievance mechanism.
17.04.2022 Face to face	Zonguldak/ Çaycuma	Women Focus Group (Esenyurt Village)	

The SEP will be progressively developed through updated versions in line with the phases of the Project and will be made accessible to local communities and publicly available on TPAO website at the following link: ***https://tp-otc.com/en/sustainability/***

According to the SEP, the engagement activities envisaged for the Project are mainly focused on the disclosure of the outcomes of the ESIA process and mainly includes engagement with the following key stakeholders:

- Primary stakeholders, namely the individuals and the communities who are affected by the Project impacts directly; and
- Secondary stakeholders, which are those who have an interest or influence on the Project.

The key stakeholders thus include:

Primary stakeholders

- National Authorities
- Regional /Local Public Authorities
- Affected Communities:
  - Residents living in close proximity to Project area: Çaycuma District and Filyos and Saltukova Town Villages of Çaycuma District
  - Local government and community representatives, local leaders, i.e. mukhtars and other community leaders/representatives.
  - Women, children, elderly people, and any other vulnerable people who live in the Project affected villages
  - General Public (including residents of, and visitors to, the Local Communities)
  - Community services and Infrastructure organizations.
  - Businesses in Filyos, Çaycuma and Saltukova villages

- Agricultural and Animal Husbandry Enterprises in Filyos and in Villages close to Project area.
- Fisheries and Fishery organizations representing those who perform fishing activities in the Project area.
- Land users for agricultural and animal husbandry purposes in the proximity of the Project area.
- Tourists using Filyos beach

Secondary stakeholders

- Employees of the Project
- Other businesses in the region
- Non-governmental organizations
- Media
- Academic and research organizations

The stakeholder engagement process of the Project will be monitored periodically. According to the outputs of the monitoring indicators, the SEP will be updated, and the necessary corrective actions will be implemented during the different stages of the Project by the Social Impact Specialist.

A key element of the SEP, the so-called “Grievance Mechanism”, provides an easy way for anybody to submit their, questions, suggestions or complaints (together called “grievances”) to the Project representatives. All stakeholders can submit any questions, suggestions or complaints; verbally during a meeting, via website, email, call, or official correspondence etc. using the contact details provided in section 1.0. Under the Grievance Mechanism, all such grievances submitted are tracked and must be responded to within 30 calendar days.

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