**January, 2015**

## ESIA-FINAL DRAFT

# 475 BEDS YOZGAT EDUCATION AND RESEARCH HOSPITAL

**Submitted to:**
YZG Sağlık Yatırım A.Ş.

REPORT

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Golder Associates

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# 1.0 ESIA OVERVIEW

## 1.1 Introduction

YZG Sağlık Yatırım A.Ş. (YZG) is planning to develop a Yozgat Education and Research Hospital ("Project") in Yozgat province, Turkey. The proposed project will have 475 bed capacity and it will be built on 74.906 $m^2$ treasury land.

Golder Associates ("Golder") was contracted by Renaissance, one of the shareholders of the project company, YZG, June 2013 to conduct a Bankable Environmental and Social Impact Assessment ("ESIA") study for the Project, according to the requirements of;

- International Finance Corporation ("IFC") Performance Standards on Environmental and Social Sustainability (2012 version);
- EBRD Environmental and Social Policy, 2008;
- IFC – EHS Guidelines; "Healthcare Facilities";
- EBRD – "Sub-sectorial Environmental and Social Guidelines: Health Services and Clinical Waste Disposal" and Equator Principles.

The Project is evaluated against Project Category B IFC and EBRD Requirementsand the scope and content of the ESIA is aligned with the IFC and EBRD expectations for such projects.

This document presents the ESIA for Yozgat Education and Research Project.

## 1.2 Project Rationale

The purpose of the project is to improve the quality of healthcare services and the number of beds by constructing a new healthcare facility in Yozgat. When the project is completed it will provide high quality healthcare services for Yozgat as well as surrounding cities and residency areas.

In parallel with the growing population of Yozgat province, need for healthcare services is increasing. The present hospital buildings in the province are generally very old. For example, Yozgat State Hospital was built in 1933. In addition, it is not possible to expand the hospital buildings since they are located in city center and these hospitals do not have enough car parking area and green space.

A population of 453.211 people was identified in Yozgat by Turkish Statistical Institute in 2012. This situation creates problems in benefiting from healthcare services in the province. The majority of the population lives in the city and district center. 0,5 percent of the population has green cards, this means that approximately 2.503 people have to go to hospitals under the Ministry of Health (MoH). Besides, since there is a university at the city, a lot of students come to Yozgat every year for their education. Yozgat is a central city for health services in the neighbourhood and the city provides healthcare for other provinces.

When the infant mortality and maternal mortality rate, which is one of the most important development indicators, is considered, it is observed that the average of the infant mortality rate and maternal mortality rate is lower than the country average. In addition, it should be considered that these numbers are too far behind European countries. The most important mitigation measure to improve these numbers is development of health services.

According to personnel distribution table ("PDC") obtained from Provincial Directorate of Health, which indicates the quotas of stuff needed for healthcare organizations, there is a need of general practitioner, specialist physicians, nurse and midwives at the health facilities in Yozgat. The need ratios are below the 40% for these branches according to PDC; however, a health worker per 1000 people ratio is below the OECD countries. Yet, World Health Organization emphasises that the number of health workers is quite important to decrease the infant mortality and maternal mortality. Another conclusion from this is that if the number of health workers is sufficient for existing medical centers in accordance with PDC, new medical centers are required to employ new health workers for population needs.

There are 766 beds within 15 hospitals in Yozgat according to the Ministry of Health. Besides, private hospitals have a capacity of 49 beds. Therefore, large part of healthcare services is provided by the public

sector. The bed capacity is quite low compared to EU countries. In order to close this gap, new investments for healthcare facilities should be provided for Yozgat province.

The hospitals in Yozgat are not satisfactory in terms of both bed capacity and quality. As stated before, the hospitals in the province are usually old. The biggest hospital of Yozgat under the Ministry of Health is Yozgat Public Hospital which is 77 years old. If another factor determining the quality of healthcare is taken into account, 62% of rooms in the hospitals have three and more beds in one room. However, according to recent policies of the Ministry of Health, in patient rooms more than two beds are currently not allowed.

Since majority of population is located in the city center of Yozgat and the province provides healthcare services to other provinces, most of the hospitals are located at the city center and closed area per bed is smaller at these hospitals than district hospitals'.

The total number of intensive care beds at hospitals in Yozgat (18 beds) is also unsatisfactory. Ministry of Health has determined a standard on the number of intensive care beds; there should be one intensive care bed at hospitals per 7% (at Education and Research Hospital, it is 10%) of usual care beds. Since this number is below the number MoH specified, Yozgat province needs investments on this subject. Intensive care beds can only be found in three out of fifteen hospitals in the province.

The average occupancy of full bed rate (including emergency observation and dialysis beds) of all hospitals in Yozgat is 57,4%. Especially, Yozgat and Saraykent State Hospitals and Bozok Maternity Children's Hospital are the busiest hospitals in the province. When Maternity and Surgery Branches and outpatient activities are examined, hospitals located in the city center are quite busy. Bozok Maternity Children's Hospital has an average of 30.936 patient treatments yearly, which results from patients coming to this hospital from other provinces or distinct.

When the data about haemodialysis patients and treatment facilities across the providence is viewed, there are 344 patients which are treated at hospitals under the Ministry of Health, University and private hospitals. 156 of these patients are treated at dialysis centres depend on Ministry of Health. In addition, there are 2,1 patients per dialysis machine in whole city. According to European Renal Association and European Society of Nephrology, patient should take dialysis 3 days per week, each session of 4 hours for effective and beneficial process. As a result, number of dialysis machines per patient should be 5. Therefore, it can be concluded that 2,1 is a good rate.

It is remarkable that number of hospital admissions increased in only two years (2008-2009) across the Yozgat. The city needs new hospitals and new polyclinics. When existing physical conditions are considered, there is no space for new additional polyclinics. In case a new clinic is opened, another unit of the hospital has to be closed, which might lead to a malfunction in the healthcare service provided by the hospitals. Spaces at bottom of stairs are revised and used for storage in hospitals because of limited space, thus it does not have even additional 1 $m^2$ space to utilize for additional services.

There were 2.050.070 patients treated in the hospital polyclinics under the Ministry of Health in 2009 in Yozgat, whereas the hospitals had a bed capacity of 766. When number of patients is considered, the physical conditions of hospitals have become insufficient and services provided cannot meet the desired level of quality. Polyclinic part of hospital becomes too busy especially during the early hours of day. Although the administration of hospitals tries to find solutions for this problem, solutions cannot become permanent, only temporary, due to limited space and not having a chance of physical expansion. Hospitals try to give well-qualified service at the emergency service but the service is too busy due to lack of physical space.

In 2009, pulmonary diseases service had 86% of bed occupation rate. Yozgat State Hospital has 7 and Sorgun Public Hospital has 5 surgery tables in operating room and there were 25.589 surgery operations across Yozgat in 2009.

Yozgat State Hospital was built on 20.115 $m^2$ closed area in 1966. Besides, since hospital is present in the busiest part of the city center, there is no possibility of expansion. Since the physical needs of the hospital have priority, there is no space allocated for car park and green area in the hospital campus.

According to 2009 data, there were 15 hospitals, 1 oral and dental health center, 6 tuberculosis dispensary,1 maternal and child health center, 96 cottage hospital and 1 private hospital in Yozgat province and its districts. Total number of beds from public, private and university hospital is 796. There are 1

specialist and practitioner per 1353 person. When population increase is considered, the rate is definitely expected to deteriorate.

In 2009, 2.058.070 patients applied to all the health agencies in Yozgat and 157.252 inpatients were treated. 25.589 surgeries were conducted in these agencies. Besides, of the 5.712 birth events, 3000 were normal and 2.712 required surgery in 2009.

When above issues are considered, it is obvious that Yozgat Education and Research Hospital should be constructed urgently due to its strategic location and patient potential of the province, urgent needs of new health investments in the province and the variety of these needs.

New Health campus will be a prestigious hospital for both Yozgat province and its neighbourhood. Helping decrease the patient load of existing public hospitals and it will help increase the quality of health services.

## ~~1.2~~1.3 Project categorization

The requirements from IFC and EBRD regarding the ESIA process and outcomes differ depending on the category of the project. ~~Category A projects require a full Environmental Impact Assessment while for Category B projects IFC's and EBRD's requirements are less stringent.~~

The Project is evaluated against Project Category B IFC and EBRD Requirements, and the scope and content of the ESIA is aligned with the IFC and EBRD expectations for such projects.

## ~~1.3~~1.4 ESIA Approach

### ~~1.3.1~~1.4.1 Overall Objectives and Components of the ESIA

A bankable ESIA needs to follow both national legislation and international standards. IFC Performance Standard 1 (IFC 2012) lists overall objectives for an ESIA, including:

- to identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence;
- to follow the mitigation hierarchy of avoidance, minimization of impacts, mitigation and if needed compensation, with respect to adverse impacts to workers, other affected people, and the environment;
- to conduct meaningful consultation; and
- to promote improved social and environmental performance of companies through the effective use of management systems.

The ESIA will be prepared in accordance with both Turkish Regulations and International Standards. As described in IFC Performance Standard 1 and EBRD Performance Requirements 1, main components of the assessment will include:

- the potential environmental and social impacts of the Project throughout the full development cycle – construction, operation, closure;
- a public consultation and disclosure plan to ensure that local communities and other key stakeholders are informed of the Project and have an opportunity to express their opinions concerning the Project;
- proposed mitigation activities to minimize adverse environmental impacts;
- the nature and significance of residual impacts (those adverse impacts that occur after mitigation has been applied) and ongoing monitoring and management plans to address them;
- the nature and significance of cumulative impacts;
- a social management plan to maximize benefits to the local community and promote a sustainable economy.

## ~~1.3.2~~1.4.2 Study area

The Project Site is located in Yozgat province in the Central Anatolia Region of Turkey. The area of influence of the Education and Research Hospital project is the area in which a direct or indirect impact on the biological, physical and social components might occur. A Study Area (SA) is defined for each environmental and social component.

The terrestrial SA is defined by a 1.000 m buffer around the project area.

The SA is expected to encompass the area affected by all potential environmental impacts (e.g. noise and air quality impacts), and it is consistent with the methodologies adopted by other studies of similar projects.

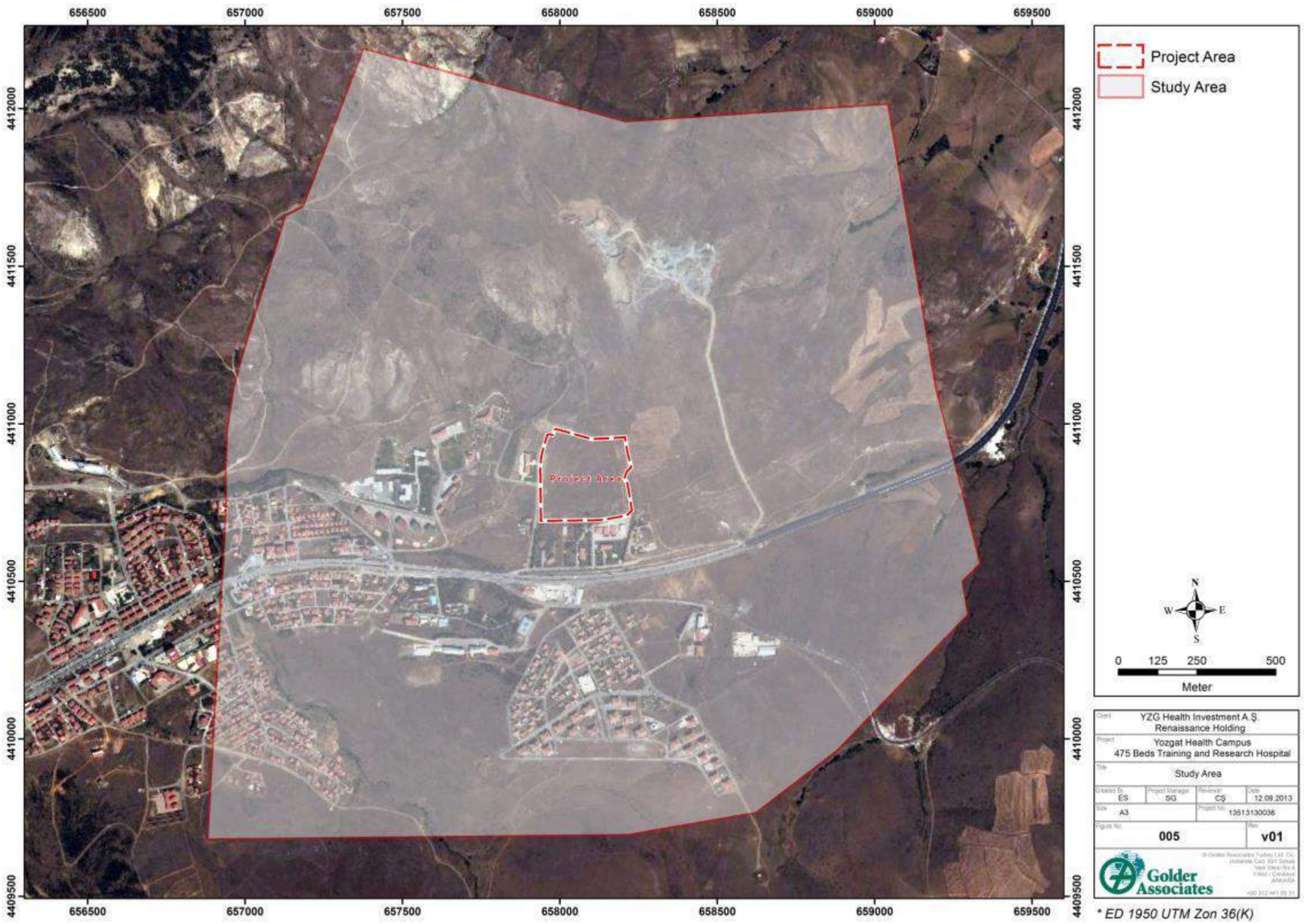


*Figure 1: Study area (SA)*



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## ~~1.3.3~~1.4.3 Potential impacts identification

Based on Project description, activities that could potentially contribute to environmental or social changes during the construction or the operational phases are identified and referred to as Project actions.

Environmental, biological and social components are analyzed against Project actions in a Leopold Matrix in order to identify the components potentially impacted (negatively or positively) by the Project actions during the construction or the operational phases.

Finally, impact factors able to interfere positively or negatively, in a direct or indirect way, are identified for each component during the construction and the operational phases. This analysis is based on the Project actions previously recognized.

## ~~1.3.4~~1.4.4 Baseline

The methodology used for the baseline studies is different for the different components; therefore it has been detailed in the paragraph corresponding to each component.

Data sources used for the assessment could be divided in two categories:

- literature research: including scientific publications for the characterization of the general regional area and grey literature for studies located inside or in close proximity to the SA;
- Field work specifically conducted for this ESIA:
  - biological characterization of the project area;
  - baseline measurements (noise, soil and air quality).

## ~~1.3.5~~1.4.5 Impact assessment

Impact assessment is performed for main issues for each ESIA component (discipline). The common impact assessment methodology consists of five main steps:

- identification of Project activities that could contribute to environmental or social change;
- evaluation of the potential effects;
- description of mitigations for potential effects;
- analysis and characterization of residual effects; and
- as necessary, identification of monitoring to evaluate and track performance.

The general methodology adopted by Golder for Environmental and Social Impact Assessment Studies is consistent with the DPSIR framework (Drivers-Pressures-State-Impact-Response) developed by the European Environmental Agency (“EEA”). The methodology has been designed to be highly transparent and allow a semi-quantitative analysis of the impacts on the various environmental and social components. In the following paragraphs the methodology is described in its general terms.

The framework is based on the identification of the following elements:

- **Drivers**: project actions which can interfere significantly with the environment as primary generative elements of the environmental pressures;
- **Pressures** (impact factors): forms of direct or indirect interference produced by the project actions on the environment, able to influence the environmental state or quality;
- **State** (sensitivity): sum of the conditions which characterize the present quality and/or trends of a specific environmental and social component and/or of its resources’;

- **Impacts**: changes undergone by the environmental state or quality because of the different pressures generated by the drivers;
- **Responses** (mitigation measures): actions adopted in order to improve the environmental conditions or to reduce pressures and negative impacts.

The overall impact analysis methodology has been developed by Golder based on its experience in the field of the environmental and social impact assessment; the methodology includes the following phases:

- definition of the current state or quality of the different environmental and social components potentially impacted based on the results of the baseline studies;
- identification of the impacts potentially affecting the environmental and social components in the different phases of the project (construction, operation and decommissioning/closure);
- definition and assessment of the effects of the planned mitigation measures.

The impact assessment on the single valued environmental and social component interfered in the different project phases is completed through the use of specific environmental impact matrices which compare the component state, expressed in terms of sensitivity, with the relevant impact factors, quantified on the basis of a series of parameters which include:

- duration (short, medium-short, medium, medium-long, long);
- frequency (concentrate, discontinuous, continuous);
- geographic extent (local, regional, beyond regional); and
- intensity (negligible, low, medium, high).

The quantification of the single impacts resulting from each factor acting on the environmental component is obtained assigning to each feature of the impact factor a score increasing in relation to the bigger entity of the impact related to it.

The features of the impact factors which are considered are hereinafter described.

The **duration** (D) defines the length of time when the impact factor is effective and it is differentiated in:

- short, within 1 year;
- medium-short, between 1 and 5 years;
- medium, between 5 and 10 years;
- medium-long, between 10 and 15 years;
- long, longer than 15 years.

The **frequency** (F) defines how often the potential impact factor occurs and is distinguished in:

- concentrate: if it presents one single and short event;
- discontinuous: if it presents an event repeated periodically or accidentally;
- continuous: if distributed uniformly over time.

The **geographic extent** (G) coincides with the area where the impact factor exerts its influence and it is defined as: local, regional, beyond regional.

The **intensity** (I) represents the entity of the impact factor, and can be represented by various physical quantities. The intensity can be also defined as: negligible, low, medium, high.

As the features of the impact factors influence in a different way the magnitude of the impact, a pondered coefficient is assigned to each of them using a pairwise comparison method.

The impact value results from the multiplication of the number resulting by a formula that connects all the parameters previously described, by the **sensitivity** (S) of the affected component to which a score has been assigned according to the evaluation carried out during the baseline activities.

Moreover the impact is assessed considering its probability of occurrence, its reversibility and its potential for mitigation.

The **probability of occurrence** (P) corresponds to the probability that the potential impact occurs, according to the evaluators experience and/or on the basis of the available bibliography. It is distinguished in low, medium, high and certain.

The **reversibility** (R) indicates the possibility to restore the qualitative state of the component following the modifications occurred because of the human intervention and/or through the component intrinsic resilience. It is distinguished in: short-term reversibility, medium-long term reversibility, irreversible.

The **mitigation** (M) corresponds to the possibility to alleviate the potential negative impact with proper design and/or management practices. The following mitigation classes are considered: high, medium, low, none.

The impact value results from the relation below which connects all the parameters previously described, and considering the **sensitivity** (S) of the affected component to which has been assigned a score according to the calculation procedure described above.

Impact= 2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S

Where:

D: Duration

F: Frequency

G: Geographic Extent

I: Intensity

R: Reversibility

P: Probability of occurrence

M: Mitigation

S: Sensitivity

The entity of the impact can vary, in absolute value, in an interval comprised between 0, 1 and 15.

The Impact value is assigned distinguishing if the impact itself is to be considered positive or negative with respect to the affected component, considering as positive a reduction/mitigation of the negative impacts already existing or potential future positive impacts on the environmental or social component.

The Impact value (negative or positive) on each impact factor is valued according to the following scale:

- level 1: negligible overall impact;
- level 2: low overall impact;
- level 3: medium-low overall impact
- level 4: medium overall impact;

- level 5: medium-high overall impact;
- level 6: high overall impact.

Which corresponds to:

| | | |
|---|---|---|
| 0.010 | 1 | Negligible |
| 1.675 | 2 | Low |
| 3.340 | 3 | Medium-low |
| 5.005 | 4 | Medium |
| 6.670 | 5 | Medium-high |
| 8.335 | 6 | High |

# 2.0 REGULATORY FRAMEWORK

After discovery of possibility to mix resources and talents of private sector with public sector, basics/rules of PPP application methods have begun to develop in recent years. Initially, PPP investment model was used only for highways, roads and other infrastructure projects. However, this method is started to be used for social infrastructure projects like construction of schools and hospitals.

Many countries in Europe like United Kingdom, Spain, and Italy have turned to investments in PPP model. Investments, which shall be determined by the Ministry of Health by bidding, can rent public lands up to 25 years according to existing legal instruments.

Planning of new health facilities, determination of rural needs, investigation of alternative solution methods for new investment and determination of investment need as short, middle and long terms are needed. Therefore; in addition to financial sources like general budget, working capital, treasury land sales and swaps, local sources (support of non-governmental organizations, charitable, municipalities and special administrates), it is very important to provide financial support of domestic-foreign private sector by PPP Financial Model to bring needed health facilities to health system.

Public-Private Partnership (PPP) financing method started to be used in health sector according to Law No. 5396 authorized the MoH to contract with the private sector for long durations for building health units and providing non-clinical services in return for yearly rent payments passed in 2005, called the Build-Lease-Transfer model.

“Regulation on Construction of Healthcare Facilities by Renting and Renewal of Services and Areas Other than Medical Service Areas by Operating” was published on 22nd July 2006 dated Official Gazette.New law on PPP, Law No. 6428 passed by parliament within February and passed by the President within the first week of March 2013. The bill defines the rules and methods of construction of the health facilities on the basis of construction right of independent and continuous nature as not to exceed 30 years on the immovable owned by the Treasury, renewal of the existing facilities and commissioning of the facilities required by the Ministry of Health and subsidiaries.

The application of PPP financing method provides many advantages as listed below:

- Financial sources of private sector are used for public sector investments.
- Private sector’s quick decision making and decision applying ability, creativity is integrated with the project.
- The financial risks of the projects are shared.
- Until the health facility is established, no cost is undertaken by Public sector.
- Building construction period is about 8-10 years for public sector due to lack of appropriations. This period is shortened by private sector.
- Investment load on limited public sources is distributed to years by renting.

Yozgat Education and Research Hospital project will be constructed in two years and operated for 25 years by YZG Sağlık Yatırım A.Ş. within the context of the Healthcare PPP Program.

## 2.1 Current National Environmental Legislation

### 2.1.1 Outline

The Turkish legal framework for environmental protection was developed in line with national and international initiatives and standards, and some of them have been revised recently to be harmonized with the European Union (EU) Directives in the scope of pre-accession efforts of Turkey to the EU. In the following sections, related institutions, legislation, processes and procedures that are related to the environmental and social aspects of the proposed project are described.

The Ministry of Environment and Urbanization (MoEU) is the responsible organization for the issuing and implementation of policies and legislation adopted for protection and conservation of the environment, and for sustainable development and management of natural resources.

The Turkish Environmental Law No. 2872, which came into force in 1983, deals with a very broad range of environmental issues. According to the basic principles that govern the application of the Environmental Law, and as stated in the Constitution, citizens as well as the State bear responsibility for the protection of environment. Complementary to the Environmental Law and its regulations, other laws also govern the protection and conservation of the environment, the prevention and control of pollution, and the implementation of measures for the prevention of pollution.

The Environmental Law of 1983 has a comprehensive structure that has a holistic and integrated vision for the environment. ”Polluter pays” and “user pays” principles and carrying capacity concepts form the basis of regulatory tools in the Environmental Law. The Law is supported by numerous Regulations and decrees prepared or updated in the process of alignment with EU legislation, thus contributing significantly in filling the gaps in the former legislative system of Turkey.

Other relevant laws in the area of environmental legislation are as follows:

- Healthcare Services Basic Law,
- Expropriation Law,
- Public Settlement Law,
- Resettlement Law,
- Land Deed and Registration Law,
- Law on General Sanitation,
- Law on Energy Efficiency,
- Law on Groundwater.

### 2.1.2 EIA Regulation

In the Environmental Law, the general scope of the Environmental Impact Assessment (EIA) procedure is set out in Article 10. Within this legal framework the EIA Regulation has been first put into force by its publication in the Official Gazette No. 21489 on February 7, 1993. The EIA Regulation was subsequently revised several times and reissued in Official Gazette on June 23, 1997, June 6, 2002 , December 16, 2003, July 17, 2008. The final version was published recently on October 3, 2013 in the Official Gazette No. 28784 and is currently in force.

For the projects listed in Annex-I an Environmental Impact Assessment Report is prepared and submitted to Ministry of Environment and Urbanisation (MoEU) and more comprehensive EIA procedure including Public Participation Meeting will be followed. At the end of the full EIA procedure Environmental Impact Assessment is Positive or Environmental Impact Assessment is Negative decision is obtained.

For the projects listed in Annex-II of the EIA Regulation, a Project Description File (PDF) is prepared according to 16th Article of the EIA Regulation and submitted to the Provincial Directorates of MoEU. The PDF is investigated according to the criteria given in the Annex-IV of the Regulation. At the end of the investigations and evaluations on the PDF the final report is presented and “Environmental Impact Assessment Is Required” or “No Environmental Impact Assessment Is Required” decision is given. This decision is announced by the Governor to the public. For the projects that have “No Environmental Impact Assessment Is Required” decision the investment should be started within 5 years otherwise the decision will be invalid. For the projects that have “Environmental Impact Assessment Is Required” decision, the reasoned decision is presented to the Ministry. These projects are subjected to Environmental Impact Assessment procedure according the 7th Article of the Regulation. For these

projects the Environmental Impact Assessment Procedure is started according to the 8th Article of the Regulation.

According to the EIA Regulation, hospitals with a capacity of 500 beds or more are listed in Annex I of EIA Regulation. Hospitals with a capacity of 50 – 500 beds are listed in Annex II of EIA Regulation.

Yozgat Health Campus is an Education and Research Hospital project which will have a bed capacity of 475 beds is evaluated as Annex II project. A Project Description File was prepared according to 16th Article of the EIA Regulation and submitted to the Yozgat Provincial Directorates of MoEU. At the end of the investigations and evaluations on the PDF the final report is presented and "No Environmental Impact Assessment Is Required" decision was given.

### 2.1.3 Other Environmental Laws and Regulations

A list of regulations, including but not limited to, currently in force and applicable to the context of the project is outlined in the table below. For the EIA process, the governing regulation is the EIA Regulation, which refers to all other regulations relevant to permitting and EIA approval processes.

**Table 1: Current Environmental Laws and Regulations in Turkey**

| Regulation | Date and No of Issuing Official Gazette |
|---|---|
| **Permitting** | |
| Regulation on Permission to Mining Activities | 21.06.2005, 25852 |
| Regulation on Environmental Impact Assessment | 03.10.2013, 28784 |
| Regulation on Environmental Auditing | 21.11.2008, 27061 |
| Regulation on Permits and Licenses to be Secured According to the Environmental Law | 29.04.2009, 27214 |
| **Air Quality** | |
| Regulation on Air Pollution Caused by Heating | 13.01.2005, 25699 |
| Regulation on Assessment and Management of Air Quality | 06.06.2008, 26898 |
| Regulation on Decreasing the Ozone Depleting Materials | 12.11.2008, 27052 |
| Regulation on Control of Exhaust Gas Emission | 04.04.2009, 27190 |
| Regulation on Control of Industrial Air Pollution | 03.07.2009, 27277 |
| Regulation on Control of Odor Causing Emissions | 19.07.2013, 28712 |
| Regulation on Large Combustion Plants | 08.06.2010, 27605 |
| Regulation on Following Green House Gas Emissions | 17.05.2014, 29003 |
| **Water Quality** | |
| Regulation on Water Conservation against Pollution Caused by Nitrates from Agricultural Sources | 18.02.2004, 25377 |
| Regulation on Water Pollution Control | 31.12.2004, 25687 |
| Regulation on Protection of Wetlands | 04.04.2014, 28962 |
| Regulation on Quality of Drinking Water to be Obtained or Planned to be Obtained from Surface Water | 29.06.2012, 28338 |
| Regulation on Control of Pollution Caused by Dangerous Substances in Water and its Environment | 26.11.2005, 26005 |

| | |
|---|---|
| Regulation on Urban Wastewater Treatment | 08.01.2006, 26047 |
| Regulation on Following Surface Water and Subsurface Water | 11.02.2014, 28910 |
| **Soil Quality** | |
| Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources | 11.07.2013, 28704 |
| Regulation on Use of Domestic and Urban Treatment Sludge in Soil | 03.08.2010, 27661 |
| Regulation on Quality of Surface Water Which Drinking Water is Supplied or Planned to be Supplied from | 29.06.2012, 28338 |
| Regulation on Prevention of Ground Water from Contamination and Degradation | 07.04.2012, 28257 |
| Regulation on Management of Surface Water Quality | 30.11.2012, 28483 |
| **Waste Management** | |
| Regulation on Control of Solid Wastes | 14.03.1991, 20814 |
| Regulation on Control of Excavation Soil and Construction Debris | 18.03.2004, 25406 |
| Regulation on Control of Waste Batteries and Accumulators | 31.08.2004, 25569 |
| Regulation on the Wastes Generated from the Use of Radioactive Materials | 02.09.2004, 25571 |
| Regulation on Control of Hazardous Wastes | 14.03.2005, 25755 |
| Regulation on Control of Vegetative Oils | 19.04.2005, 25791 |
| Regulation on Control of Medical Wastes | 22.07.2005, 25883 |
| Regulation on Control of End of Life Tires | 25.11.2006, 26357 |
| Regulation on Control of Packaging Wastes | 24.08.2011, 28035 |
| Regulation on Control of PCB and PCTs | 27.12.2007, 26739 |
| Regulation on Restriction of Some Hazardous Materials in Electrical and Electronic Devices | 30.05.2008, 26891 |
| Regulation on Control of Electrical and Electronic Devices | 22.05.2012, 28300 |
| Regulation on General Principles of Waste Management | 05.07.2008, 26927 |
| Regulation on Control of Waste Oils | 30.07.2008, 26952 |
| Regulation on Control of End of Life Vehicles | 30.12.2009, 27448 |
| Regulation on Landfills (Regular Storage of Wastes) | 26.03.2010, 27533 |
| Regulation on Control of Waste Electrical and Electronical Goods | 22.05.2012, 28300 |
| **Chemicals Management** | |
| Regulation on Radiation Safety | 24.03.2000, 23999 |
| Regulation on the Safely Transportation of Radioactive Materials | 08.07.2005, 25869 |
| Regulation on the Transportation of Dangerous Goods by Road | 31.03.2007, 26479 |
| Regulation on Classification, Package, and Labeling of the Hazardous Materials and Aids | 26.12.2008, 27092 |
| Regulation on Preparation and Distribution of Material Safety Data Sheets on Hazardous Materials and Aids | 26.12.2008, 27092 |
| Regulation on Restrictions on the Production, Placing on the Market, and Use of Some Hazardous Materials | 26.12.2008, 27092 |

| | |
|---|---|
| Regulation on Inventory and Control of the Chemicals | 26.12.2008, 27092 |
| Regulation on Measures to be taken for Protection of Environment and Public Health Against Negative Effects of Non-Ionize Radiation | 24.07.2010, 27651 |
| Regulation on Control of Big Scale Industrial Accidents | 18.08.2010, 27676 |
| **Noise Management** | |
| Regulation on Assessment and Management of Environmental Noise | 04.06.2010, 27601 |
| **Nature Conservation and Biodiversity** | |
| Regulation on Wildlife Protection and Wildlife Enhancement Areas | 08.11.2004, 25637 |
| Regulation on Management of Areas in Natural Parks, Natural Protected Areas and Special Environmental Protection Area which are Rule and Authority of the Government | 02.05.2013, 28635 |
| **Regulations on Certain Activities** | |
| Regulation on the Obtaining, Processing and Control of the Sand, Gravel and Similar Materials | 08.12.2007, 26724 |
| Regulation on the Restoration of the Lands Disturbed by Mining Activities | 23.01.2010, 27471 |
| **Resources Management** | |
| Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage | 25.10.2008, 27035 |

### 2.1.4 Local and National Occupational Health and Safety Requirements

Labor and occupational Health & Safety issues in Turkey are governed by the Ministry of Labor and Social Security. Turkish law and the major regulations, including but not limited to, relevant to labor and working conditions are listed in the table below.

**Table 2: Existing Labor and Health & Safety Regulations in Turkey**

| Existing Labour and H&S Law and Regulations | Date and No of Issuing Official Gazette |
|---|---|
| **Laws** | |
| The Labour Law – No.4857<br>*(Aims to regulate the working conditions and work-related rights and obligations of employers and employees working within the confines of an employment contract.)* | 10.06.2003, 25134 |
| Occupational Health and Safety Law – No.6331 | 30.-06.2012, 28339 |
| Social Security and General Health Insurance Law No:5510 (Official Gazette No: 26200, 16.06.2006) | 16.06.2006, 26200 |
| **Regulations** | |
| Statue on Measures for Workplaces Where Flammable, Explosive, Dangerous and Hazardous Materials are Used | 24.12.1974, 14752 |
| Regulation on Machine Guards | 17.05.1983, 18050 |
| Regulation on Health and Safety Risk Assessment | 29.12.2012, 28512 |

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|---|---|
| Regulation on Workers Health and Work Safety<br>*(Stipulates the legal rights of employees. In addition, stipulates health and safety conditions within workplaces in detail, including construction activities.)* | 09.12.2003, 25311 |
| Regulation on Safety and Health Requirements Working With Display Screen Equipment | 16.04.2013, 28620 |
| First Aid Regulation | 22.05.2002, 24762 |
| Regulation on Prevention of Workers from Risks Created from Vibration | 22.08.2013, 28743 |
| Regulation on Prevention of Workers from Risks Created from Noise | 28.07.2013, 28721 |
| Regulation on Management of Dust | 05.11.2013, 28812 |
| Regulations on the Prevention of Biological Exposure Risks | 15.06.2013, 28678 |
| Regulation on Radiation Safety | 24.03.2000, 23999 |
| Regulation on the Exposure Limits and Working Conditions for the Personal with Ionizing Radiation at Health Care Facilities | 05.07.2012, 28344 |
| Regulation on Health and Safety Signs | 23.12.2003, 25325 |
| Regulation on Health and Safety at Construction Sites | 05.10.2013, 28786 |
| Regulation on Protection of Workers from the Risk of Explosive Media | 30.04.2013, 28633 |
| Regulation on Health and Safety Precautions Regarding Working with Asbestos | 25.01.2013, 28539 |
| Regulation on Manual Handling | 24.07.2013, 28717 |
| Regulation on Principles and Procedures for Health and Safety Training of Employees | 15.05.2013, 28648 |
| Regulation on Health and Safety Precautions Regarding Workplace Buildings and Their Annexes | 17.07.2013, 28710 |
| Regulation on Use of Personnel Protective Equipment in Workplaces | 02.07.2013, 28695 |
| Personnel Protective Equipment Regulation | 29.11.2006, 25673 |
| Regulation on Health and Safety Conditions Regarding Use of Work Equipment | 25.04.2013, 28628 |
| Regulation on Health and Safety Regarding Temporary Works | 15.05.2004, 25463 |
| Regulation on Workplace Establishment Permit | 04.12.2009, 27422 |
| Regulation on Health and Safety Precautions Regarding Working with Chemicals | 12.08.2013, 28733 |
| Regulation on Subcontractor | 27.09.2008, 27010 |
| Regulation on Workplace Health and Safety Units and Common Health and Safety Units | 15.08.2009, 27320 |
| Regulation on the Employment of Pregnant or Lactating Women, children's Care Homes and Breastfeeding Rooms | 14.07.2004, 25522 |
| Regulation on the Procedures and Principles of the Employment of Children's and Young Workers | 06.04.2004, 25425 |
| Regulation on Working Hours Regarding Labour Law | 06.04.2004, 25425 |

### 2.1.5 International Agreements which Turkey is a Party

Intergovernmental agreements, protocols and conventions, to which Turkey is a party or signatory, are provided in the table below.

**Table 3: International Agreements which Turkey is a Party**

| International Convention / Protocol | Date and No of Issuing Turkish Official Gazette |
|---|---|
| European Cultural Convention; 19.12.1954 | 17.06.1957, 9635 |
| International Convention for the Establishment of the European and Mediterranean Plan Protection Organization; Paris, 1951 | 10.08.1965 |
| The Convention for the Protection of Cultural Property in the Event of Armed Conflict; 14.04.1954 | 08.11.1965, 12145 |
| International Convention for the Protection of Birds; Paris, 1959 | 17.12.1966, 12480 |
| Convention on Legal Responsibilities about the Nuclear Energy Field; 29.1.1960, and its addendum protocol dated 28.01.1964 | 13.06.1967, 12620 |
| The Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (GFCM); Rome, 1949 | 07.07.1967, 12641 |
| Radiation Protection Convention; Geneva, 1960 | 15.11.1969 |
| Agreement on an International Energy Program; Paris, 1974 | 04.05.1981 |
| Convention for the Protection of the Mediterranean Sea against Pollution; Barcelona, 1976 | 12.06.1981, 17368 |
| Protocol for the Prevention of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft; Barcelona, 1976 | 12.06.1981, 17368 |
| The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention); Barcelona, adopted on 16.02.1976, entered into force 12.02.1978 | 12.06.1981, 17368 |
| Convention for the Protection of the World Cultural and Natural Heritage; Paris, 1972 | 14.2.1983, 17959 |
| Convention on Long-Range Transboundary Air Pollution; Geneva, 1979 | 23.03.1983,17996 |
| The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention); Bern, opened for signature on 19.09.1979, entered into force on 01.06.1982 | Ratification date: 02.05.1984<br>Entered into force: 01.09.1984 |
| Protocol to the Convention on Long-Range Transboundary Air Pollution on the Financing of the Co-operative Program for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe; Geneva, 1984 | 23.07.1985, 18820 |
| Protocol for the Protection of the Mediterranean Sea against Pollution from the Land-Based Sources; Athens, 1980 | 18.03.1987, 19404 |
| Protocol Concerning Specially Protected Areas in the Mediterranean; Geneva, 1982 (date of signature 06.11.1986) | 23.10.1988, 19968 |

| | |
|---|---|
| International Convention for the Prevention of Pollution From Ships ( MAR-POL 73/78); 1973, modified by the Protocol of 1978 (entered into force on 2 October 1983) | 24.06.1990, 20558 |
| Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention); signed on 21.04.1992, entered into force on 15.01.1994 | 06.03.1994, 21869 |
| Convention on the Control of Transboundary Movements of Hazardous Waste and Disposal; Basel, 22.03.1989 | 15.05.1994, 21935 |
| The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention); entered into force on 21.12.1975 | 17.05.1994, 21937 |
| Montreal Protocol on Substances That Deplete the Ozone Layer; Montreal, opened for signature on 16.09.1987, entered into force on 1.1.1989 ( revisions: 1990,London; 1991,Nairobi; 1992, Copenhagen; 1993, Bangkok; 1995,Vienna; 1997,Montreal; and 1999,Beijing) | 28.12.1994, 22155 |
| Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); opened for signature on 3.3.1973, entered into force on 1.7.1975 | 20.06.1996, 22672 (entered into force on 22.12.1996) |
| United Nations Convention to Combat Desertification; Paris, 17.6.1994, entered into force in December 1996 | 1997 |
| Biodiversity Convention; opened for signature at the Earth Summit in Rio de Janeiro on 5.6.1992, entered into force on 29.12.1993 | 27.12.1996, 22860 |
| United Nations Framework Convention on Climate Change; 2004, and Kyoto Protocol on Global Warming; 2008<br><br>*General principle of Kyoto is, the signatory parties should decrease their GHG emissions by 5.2% of the 2009 amount till the end of 2012. After 2012, a new agreement and new emission limits will come into picture.* | Turkish Parliament accepted to be a signatory of Kyoto Protocol in February 2009. However, Turkey is not a party in the Protocol, thus has no commitment, until the end of 2012. |
| New “Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean” entered into force on 12 December 1999, replacing the Protocol Concerning Mediterranean Specially Protected Areas adopted in 1982.<br>The new Protocol concerning the “Specially Protected Areas and Biological Diversity in the Mediterranean” was ratified by Turkey in 2002. This protocol represents a strengthening of the Geneva Protocol in several aspects. Some of these are relevant to the ESIA, in particular the following:<br>• the extension of the Protocol to the protection and management of endangered and threatened species, and to the conservation and sustainable use of biodiversity;<br>• the drawing up of a list of endangered or threatened species and list of species whose exploitation should be regulated;<br>• provisions concerning the environmental impact assessment, establishing inventories, and the introduction of non-indigenous or genetically modified species. | |

## 2.2 Current National Social Legislation

Labor and occupational Health & Safety issues in Turkey are governed by the Ministry of Labor and Social Security. Major regulations relevant to labor and working conditions are:

- Labor Law No. 4857 (10 June 2003): Aims to regulate the working conditions and work-related rights and obligations of employers and employees working within the confines of an employment contract.
- Regulation on Workers Health and Work Safety (09 December 2003): Stipulates the legal rights of employees. In addition, Regulation on Workers Health and Work Safety stipulates health and safety conditions within workplaces in detail.
- Occupational Health and Safety Law No. 6331 (30 June 2012): Regulate studies, authority, responsibility, rights and obligations of employers and workers in order to ensure occupational health and safety at workplaces and to improve existing health and safety conditions.

The protection of cultural heritage in Turkey is governed by the Ministry of Culture and Tourism. Law on Protection of Cultural and Natural Assets determines the criteria for designation of protected areas, principles related with the protection measures and limitations on the use of these areas under the supervision and power of the Committee on Protection of Cultural and Natural Assets.

Other relevant social laws are as follows:

- General Public Health Law (24 April 1930);
- Public Settlement Law (21 June 1934);
- Expropriation Law (no. 2942);
- Land Deed and Registration Law (no. 3402);
- Resettlement Law (21 June 1934);
- Communication Law (no. 7201);
- Procurement Law (no. 2986).

## 2.3 ~~Equator Principles, IFC Standards, EBRD Requirements and Guidelines~~International Standards

The Equator Principles Financial Institutions (EPFIs) emphasize that they will not provide loans to projects where the borrower will not or is unable to comply with the EPFIs social and environmental policies and procedures that implement the Equator Principles.

In addition, the EPFIs endorse the applicable IFC Performance Standards, IFC General EHS Guidelines and IFC Industry Specific EHS Guidelines. The Performance Standards establish the standards that the project is to meet throughout the life of an investment by IFC or other relevant financial institution. General and Industry Specific EHS Guidelines provide implementation guidelines and environmental quality limits that projects should comply with.

### 2.3.1 Equator Principles

The Equator Principles Financing Institutions (EPFIs) have ten principles:

- Principle 1: Review and Categorization
- Principle 2: Social and Environmental Assessment
- Principle 3: Applicable Social and Environmental Standards

- Principle 4: Action Plan and Management System
- Principle 5: Consultation and Disclosure
- Principle 6: Grievance Mechanism
- Principle 7: Independent Review
- Principle 8: Covenants
- Principle 9: Independent Monitoring and Reporting
- Principle 10: EPFI Reporting.

### 2.3.2 IFC Performance Standards

The eight Performance Standards (PSs) establish the standards that the project is to meet throughout the life of an investment by IFC or other relevant financial institution:

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

#### ~~*2.3.2.1 Critical habitat identification*~~

~~The International Finance Corporation's (IFC's) Performance Standard 6 (PS6; IFC 2012a) and the associated Guidance Note 6 (GN6; IFC 2012b) focus specifically on the protection and conservation of biodiversity and introduce three classes of habitat to which the performance standard applies:~~

- ~~modified habitat;~~
- ~~natural habitat;~~
- ~~critical habitat.~~

~~Modified habitats are found in areas that have previously been altered by human activity and may contain large portions of non-native plants and animals. Examples include agricultural landscapes and reclaimed areas. Modified habitats may or may not retain ecological functions that support significant biodiversity value. Where modified habitats retain significant biodiversity value they are subject to PS6, but are exempt otherwise (PS6, Paragraph 12). Natural habitats are those where the species composition and primary ecological functions of the area have not been fundamentally altered by human activity. Critical habitats are a subset of either modified or natural habitats that constitute areas of significant importance for biodiversity conservation.~~

~~The purpose of defining critical habitat is to identify areas of a particularly sensitive nature for biodiversity conservation that deserve special attention and may require extraordinary mitigations.~~

~~The critical habitat concept developed by the IFC considers and expands on a variety of pre-existing ideas and definitions for priority sites for biodiversity conservation, such as Important Bird Areas,~~

~~Alliance for Zero Extinction sites, World Heritage Sites, and Ramsar Convention on wetlands of international importance. The IFC's approach is supported by a broad array of conservation organizations and is increasingly accepted and applied by a variety of banks (as lenders) and other private companies (as developers). Hence, PS6 and the concept of critical habitat are emerging as best-practice guidelines for biodiversity conservation in the private sector.~~

~~Five primary criteria, provided in Paragraph 16 of PS6, are used to identify critical habitats:~~

~~1) habitat of significant importance to Critically Endangered (CR) and/or Endangered (EN) species;~~

~~2) habitat of significant importance to endemic and/or restricted-range species;~~

~~3) habitat supporting globally significant concentrations of migratory species and/or congregatory species;~~

~~4) highly threatened and/or unique ecosystems; and/or~~

~~5) areas associated with key evolutionary processes.~~

~~Where critical habitat is present, the restrictions on development and requirement to achieve net gain identified in paragraphs 17 and 18 of PS6 applies to biodiversity values for which the critical habitat has been designated.~~

### 2.3.3 IFC General EHS Guidelines

General EHS Guidelines (dated April 30, 2007) provides guidance to users on common EHS issues potentially applicable to all industry sectors. During the design, construction, operation and decommissioning of the project (the project lifecycle) the project owner will consider ambient conditions and apply pollution prevention and control technologies and practices (techniques) that are best suited to avoid or, where avoidance is not feasible, minimize or reduce adverse impacts on human health and the environment while remaining technically and financially feasible and cost-effective. The project-specific pollution prevention and control techniques included in General EHS Guidelines are listed below:

1) Environmental

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

2) Occupational Health & Safety

3) Community Health & Safety

4) Construction and Decommissioning

#### *2.3.3.1 IFC EHS Guidelines for Healthcare Facilities*

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). When one or more members of the World Bank Group are involved in a project, these EHS Guidelines are applied as required by their respective policies and standards. These industry sector EHS guidelines are designed

to be used together with the General EHS Guidelines document, which provides guidance to users on common EHS issues potentially applicable to all industry sectors.

The EHS Guidelines for Healthcare Facilities include information relevant to the management of EHS issues associated with healthcare facilities (HCF) which includes a diverse range of facilities and activities involving general hospitals and small inpatient primary care hospitals, as well as outpatient, assisted living, and hospice facilities. Ancillary facilities may include medical laboratories and research facilities, mortuary centers, and blood banks and collection services. Annex A of the document provides a description of activities in this sector. This document is organized according to the following sections:

Industry Specific Impacts and Management
Environmental
- Waste Management
- Emission to Air
- Wastewater

Community Health & Safety
- Exposure to Infections/Diseases
- Exposure to Hazardous Materials and Waste
- Radiation
- Fire Safety

Community Health & Safety
Performance Indicators and Industry Benchmarks
Environmental Performance
- Emissions and Effluent Guidelines
- Environmental Monitoring
- Resource Consumption, Energy Use and Waste Generation

Occupational Health & Safety
- Occupational Health & Safety Guidelines
- Accident and Fatality Rates
- Occupational Health & Safety Monitoring

### 2.3.4 EBRD Performance Requirements

Ten Performance Requirements (PRs) establish the standards that the project is to meet throughout the life of an investment by financial institution:

- PR 1: Environmental and Social Appraisal and Management
- PR 2: Labour and Working Conditions
- PR 3: Pollution Prevention and Abatement
- PR 4: Community Health, Safety and Security
- PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement
- PR 6: Biodivesity Conservation and Sustainable Management of Living Natural Resources
- PR 7: Indıgenous Peoples
- PR 8: Cultural Heritage
- PR 9: Financial Intermediaries
- PR 10: Information Disclosure and Stakeholder Engagement

### 2.3.5 EBRD Environmental and Social Policy

The EBRD is committed to promoting environmentally sound and sustainable development in the full range of its investment and technical cooperation activities pursuant to its constituent treaty. This Policy covers the environmental and social dimensions of sustainable development. The social dimension encompasses:

- Labor standards working conditions including occupational health and safety,
- Community impacts such as public health, safety and security, gender equality
- Involuntary resettlement

#### ~~*2.3.5.1 EBRD's Perspective for Healthcare Organizations*~~

~~For private healthcare providers, the consequences of poor standards of quality, safety and ethics can be disastrous. Ethical and responsible conduct is not only important for public relations, but also a necessary element in risk management. The reputation of a healthcare organization is critical in influencing patients' choice in seeking services.~~

~~Hospitals with good reputations also benefit from high staff retention and recruitment of the most qualified professionals. Quality improvement is linked to better performance as boosting quality tends to reduce costs.~~

~~From the EBRD's perspective, when we finance healthcare organizations, we have a stake in the reputation of our clients' commercial performance and their values and standards.~~

## 2.4 Other International Standards

The following standards are referred at IFC Guidelines:

- WHO Ambient Air Quality Standards
- WHO Drinking Water Standards

In addition, the following guidelines and standards have been considered:

- Dutch Intervention Values for Soil Quality, where needed.
- IUCN Red Data Book for protected species (fauna and flora).
- Action Plan for the conservation of marine vegetation in the Mediterranean Sea. Adopted in 1999 within the framework of the Barcelona Convention for the Protection of the marine environment and the coastal region of the Mediterranean.
- Strategic Action Programme for the conservation of Biological Diversity (SAP BIO) in the Mediterranean Region. Adopted by Contracting Parties of Barcelona Convention on 2003.
- Priority habitats according to the SAP/BIO Protocol (Barcelona Convention) (1999).
- Biodiversity in Impact Assessment Background Document to Decision VIII/28 of the Convention on Biological Diversity: - CBD Technical Series No. 26.

## 2.5 Regulatory Framework Applicable to the Project

### 2.5.1 Applicable National Regulations and International Guidelines

Turkish National Regulations and IFC Guidelines that are applicable to the Project are provided in the table below.

**Table 4: Relevant Regulations and Guidelines for the Hospital Project**

| Issue | Relevant Guidelines and Regulations |
|---|---|
| **Construction Phase** | |
| ***Environmental Issues*** | |
| **Air Quality** | • IFC General EHS Guidelines<br>- Environmental - Air Emissions and Ambient Air Quality<br>- Construction and Decommissioning – Air Quality<br>• Turkish Regulations<br>- Regulation on Control of Industrial Air Pollution<br>- Regulation on Assessment and Management of Air Quality<br>- Regulation on Control of Exhaust Gas Emission<br>- Regulation on Air Pollution Caused by Heating |
| **Energy Conservation** | • IFC General EHS Guidelines<br>- Environmental – Energy Conservation<br>• Turkish Regulations<br>- Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage |
| **Water And Wastewater Quality** | • IFC General EHS Guidelines<br>- Environmental - Wastewater and Ambient Water Quality<br>- Construction and Decommissioning – Wastewater Discharges<br>• Turkish Regulations<br>- Regulation on Water Pollution Control |
| **Water Conservation** | • IFC General EHS Guidelines<br>- Environmental – Water Conservation |
| **Hazardous Materials Management** | • IFC General EHS Guidelines<br>- Environmental - Hazardous Materials Management<br>- Construction and Decommissioning – Hazardous Materials<br>• Turkish Regulations<br>- Regulation on Restrictions on the Production, Placing on the Market, and Use of Some Hazardous Materials<br>- Regulation on Control of Hazardous Wastes |

| | |
|---|---|
| **Waste Management** | • IFC General EHS Guidelines<br>- Environmental - Waste Management<br>- Construction and Decommissioning – Solid Waste<br>• Turkish Regulations<br>- Regulation on Control of Solid Wastes<br>- Regulation on General Principles of Waste Management<br>- Regulation on Control of Excavation Soil and Construction Debris<br>- Regulation on Control of Hazardous Waste<br>- Regulation on Control of Waste Oils<br>- Regulation on Control of Medical Wastes |
| **Noise** | • IFC General EHS Guidelines<br>- Environmental - Noise<br>- Construction and Decommissioning – Noise and Vibration<br>• Turkish Regulations<br>- Regulation on Assessment and Management of Environmental Noise |
| **Soil Quality** | • IFC General EHS Guidelines -<br>- Environmental - Contaminated Land<br>- Construction and Decommissioning – Soil Erosion, Contaminated Land<br>• Turkish Regulations<br>- Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources |
| ***Occupational and Community Health and Safety Issues*** | |
| **Occupational and Community Health and Safety** | • IFC General EHS Guidelines<br>- Occupational Health and Safety<br>- Community Health and Safety<br>• IFC General EHS Guidelines<br>- Healthcare Facilities<br>• Turkish Regulations |
| **Operations Phase** | |
| ***Environmental Issues*** | |
| **Air Quality** | • IFC General EHS Guidelines<br>- Environmental - Air Emissions and Ambient Air Quality<br>• IFC General EHS Guidelines<br>- Healthcare Facilities<br>• Turkish Regulations<br>- Regulation on Air Pollution Caused by Heating |
| **Energy Conservation** | • IFC General EHS Guidelines<br>- Environmental – Energy Conservation<br>• Turkish Regulations<br>- Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage |

| | |
|---|---|
| **Water and Wastewater Quality** | • IFC General EHS Guidelines<br>- Environmental - Wastewater and Ambient Water Quality<br>• IFC General EHS Guidelines<br>- Healthcare Facilities<br>• Turkish Regulations<br>- Regulation on Water Pollution Control |
| **Water Conservation** | • IFC General EHS Guidelines<br>- Environmental – Water Conservation |
| **Hazardous Materials Management** | • IFC General EHS Guidelines<br>- Environmental - Hazardous Materials Management<br>• IFC General EHS Guidelines<br>- Healthcare Facilities<br>• IFC EHS Guidelines for Crude Oil and Petroleum Product Terminals<br>• Turkish Regulations<br>- Regulation on Restrictions on the Production, Placing on the Market, and Use of Some Hazardous Materials<br>- Regulation on Inventory and Control of the Chemicals<br>• European Legislation<br>- 91/689/EEC Directive on hazardous waste |
| **Waste Management** | • IFC General EHS Guidelines<br>- Environmental - Waste Management<br>• IFC General EHS Guidelines<br>- Healthcare Facilities<br>• Turkish Regulations<br>- Regulation on Solid Waste Control<br>- Regulation on General Principles of Waste Management<br>- Regulation on Hazardous Waste Control<br>- Regulation on Waste Oil Control<br>- Regulation on Medical Waste Control<br>- Regulation on Control of Waste Batteries and Accumulators<br>- Regulation on Control of Vegetative Oils<br>- Regulation on Control of PCB and PCTs<br>- Regulation on Package Waste Control<br>• European Legislation<br>- 2008/98/EEC Waste Framework Directive<br>- EC/850/2004 Regulation on persistent organic pollutants<br>- EC/1013/2006 Regulation on shipments of waste<br>- 2006/66/EC Directive on batteries and accumulators and waste batteries and accumulators<br>- 99/31/EC Directive on the landfill of waste<br>- 96/59/EC Directive on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT)<br>- 94/62/EC Directive on packaging and packaging waste |
| **Noise** | • IFC General EHS Guidelines<br>- Environmental - Noise<br>• IFC EHS Guidelines for Petroleum Refining<br>- Industry Specific Impacts and Management – Environmental – Noise<br>• Turkish Regulations<br>- Regulation on Assessment and Management of Environmental Noise |

| | |
|---|---|
| **Soil Quality** | • IFC General EHS Guidelines<br>- Environmental - Contaminated Land<br>• Turkish Regulations<br>- Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources |
| ***Occupational and Community Health and Safety Issues*** | |
| **Occupational and Community Health and Safety** | • IFC General EHS Guidelines<br>- Occupational Health and Safety<br>- Community Health and Safety<br>• Turkish Regulations |

### 2.5.2 Permitting Responsibilities

Yozgat Health Campus is an Education and Research Hospital project which will have a bed capacity of 475 beds is evaluated as Annex II project. A Project Description File was prepared according to 16th Article of the EIA Regulation and submitted to the Yozgat Provincial Directorates of MoEU. At the end of the investigations and evaluations on the PDF the final report is presented and "No Environmental Impact Assessment Is Required" decision was given.

Hospitals and healthcare facilities having capacity higher than 20 beds are included in Annex- 2 of the Regulation on Permits and Licenses to be Secured According to the Environmental Law. Hence, Environmental Permit for operation phase will be received from the Provincial Directorate of Environment and Urbanization.

## 2.6 Requirements of Environmental Limits in Turkish Regulations and IFC Guidelines and EU Regulations

### 2.6.1 Water and Wastewater Quality

#### *2.6.1.1 Water Quality*

The Regulation on Control of Water Pollution provides quality criteria for surface, marine and ground waters, rules and principles for water pollution control, and industry specific discharge (effluent) standards.

#### *2.6.1.2 Domestic Wastewater Effluent Quality*

Domestic waste water will be created during construction and operation phases of the project.

Regulation on Water Pollution Control - Table 21 indicates domestic wastewater discharge standards for equivalent population of 84 - 2,000. However, the provisions set in Turkish Urban Wastewater Treatment Regulation, of which the discharge quality standards will be valid by 31.12.2014, are exactly the same with the provisions set in EU Directive 91/271/EEC on Urban Wastewater Treatment. The EU Directive 91/271/EEC sets as a general rule the secondary treatment in all areas, and tertiary treatment with enhanced removal of nutrient is required for sensitive areas.

Table 5 gives the comparison between relevant Turkish, EU standards and IFC guideline values for domestic wastewater discharge.

**Table 5: Domestic Wastewater Discharge Standards – Turkish and EU Regulations and IFC Guidelines**

| PARAMETER | UNIT | Turkish Regulation on Water Pollution Control Table 21 Domestic Wastewater Discharge Standards for equivalent population of 84-2,000 | | Turkish Urban Wastewater Treatment Regulation (dated 8.1.2006) *(limits to be applied after 31.12.2014) | | Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment *(amended by Commission Directive 98/15/EC, Regulation (EC) No 1882/2003, Regulation (EC) No 1137/2008)* | | IFC General EHS Guidelines Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges |
|---|---|---|---|---|---|---|---|---|
| | | Composite Sample 2 Hour | Composite Sample 24 Hour | Concentration (mg/L) | Minimum Treatment Efficiency (%) | Concentration (mg/L) | Minimum Treatment Efficiency (%) | |
| Biochemical Oxygen Demand (BOD5) | mg/l | 50 | 45 | 25 | 70-90<br>40 | 25 | 70-90<br>40* | 30 |
| Chemical Oxygen Demand (COD) | mg/l | 180 | 120 | 125 | 75 | 125 | 75 | 125 |
| Suspended Solids (SS) | mg/l | 70 | 45 | 35<br>35 (more than 10,000 p.e.)<br>60 (2,000-10,000 p.e.) | 90<br>90 (more than 10,000 p.e.)<br>70 (2,000-10,000 p.e.) | 35<br>35 (more than 10,000 p.e.)<br>60 (2,000-10,000 p.e.) | 90<br>90 (more than 10,000 p.e.)<br>70 (2,000-10,000 p.e.) | 50 |
| pH | - | 6-9 | 6-9 | | | | | 6-9 |
| Total nitrogen | mg/l | | | | | | | 10 |
| Total phosphorus | mg/l | | | | | | | 2 |
| Oil and grease | mg/l | | | | | | | 10 |
| Total coliform bacteria | MPN** / 100 ml | | | | | | | 400 |

* Not applicable to centralized, municipal wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation.
** MPN = Most Probable Number

## 2.6.2 Air Quality

### *2.6.2.1 Ambient Air Quality*

The Regulation on Assessment and Management of Air Quality (RAMAQ) Annex I (Limit Values, Target Values, Long Term Targets, Evaluation Thresholds, Public Information Thresholds) provides ambient air quality values for human health and ecosystem after January 1, 2014. Annex I (A: Transition Period Short and Long Term Limits) provides quality values for human health and ecosystem for the period between January 1, 2009 and January 1, 2014.

IFC General EHS Guidelines - Environmental Air Emissions and Ambient Air Quality refers to WHO Ambient Air Quality Guidelines for recommended values, to be used in the absence of national standards. WHO Air Quality Guidelines for Europe, 2000 includes values also for sensitive vegetation and ecosystem.

A comparison of the limit values in national regulation and WHO guidelines are provided in the table below.

**Table 6: Comparison of Ambient Air Quality Standards in IFC (WHO) Guidelines and Turkish Regulations**

| Para-meter | Average Period | Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management | | | WHO Ambient Air Quality Guidelines | |
|---|---|---|---|---|---|---|
| | | Annex – IA: Transition Period Limits (*) | | Annex I: Future Target Values (year for target) | General Guidelines (for human health) | Guidelines for Europe (for ecosystem) |
| | | 2008 | 2014 | | | |
| $SO_2$ ($\mu g/m^3$) | **Hourly** | 900 | 750 | 350 (2019) *(not to exceed over 24 in a year)* | 500 (for 10 minutes - (guideline value) | |
| | **24 hr** | 400 (STL) (95% in a year) | 250 (STL) | 125 (2019) *(not to exceed over 3 in a year)* | 125 (Interim target-1) 50 (Interim target-2) 20 (guideline) | |
| | **Yearly and winter season** (Oct1 – March31) *(for wildlife and ecosystem)* | 60 (LTL) | 20 | 20 (2014) | | 20 (for forests and natural vegetation) 30 (for agricultural crops) |
| | **Winter average** (Oct1 – March31) | 250 | 125 | | | |
| | **Target Limit for yearly average** | 60 | | | | |
| | **Target Limit for winter average** | 120 | | | | |
| | **LTL yearly** | 150 (LTL) | | | | |
| $NO_2$ ($\mu g/m^3$) | **Hourly** | | | 200 (2024) *(not to exceed over 18 in a year)* | 200 (guideline) | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Yearly** | 100 (LTL) | 60 | 40 (2024) | 40 (guideline) | 30 |
| | **24 hr** | 300 (STL) (95% in a year) | | | | |
| **NOx** ($\mu g/m^3$) | **Yearly** *(for vegetation)* | | | 30 (2014) | | 30 ($NO_2$) |
| **$PM_{10}$** ($\mu g/m^3$) | **24 hr** | 300 (STL) (95% in a year) | 100 | 50 (2019) *(not to exceed over 35 in a year)* | 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline) | |
| | **Yearly** | 150 (LTL) | 60 | 40 (2019) | 70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) | |
| | **Winter average** (Oct1 – March31) | 200 | 90 | | | |
| **$PM_{2.5}$** ($\mu g/m^3$) | 24hr | | | | 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline) | |
| | 1 year | | | | 35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) | |
| **Lead** ($\mu g/m^3$) | LTL – yearly (human health) | 2 (LTL) | 1 | 0.5 (2019) 1.0 (for areas in the vicinity of and contaminated by industries) | | |
| **Benzene** ($\mu g/m^3$) | Yearly | | | 5 (2021) | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CO** (mg/m$^3$) | Max daily 8 hr average | | | 10 (2017) | | |
| | 24 hr | 30 (95% in a year) | 10 | | | |
| | Yearly | 10 | | | | |

LTL - Long-term Limit : The value not to be exceeded by the arithmetic average of all measurement results;
Long Term Value : Arithmetic average of all measurement results;
STL -Short Term Limit : The value not to be exceeded by 95% of maximum daily average measurement results or statistically all the measurement results;
Short Term Value : The value that 95% of maximum daily average measurement values or statistically all the measurement values are below and 5% are above;
(*): Until December 12, 2013; LTLs, STLs, and for $SO_2$ and PM10 winter standards are valid.

#### 2.6.2.2 Emissions

Regulation on Industrial Air Pollution Control regulates, with the following annexes, the rules, principles and emission limits that industrial facilities should follow:

- Annex-1: Regulation Principles and Limits for All Facilities
- Annex-2: Calculation of Contribution to Air Pollution and Air Quality Measurements
- Annex-5: Special Emission Limits for the Facilities of High Pollutant Capacity
- Annex-7: Emission Limits for Inorganic and Organic Dusts, Inorganic and Organic Vapors and Gases, Carcinogenic Substances, applicable after January 1, 2012
- Annex 12: Calculation of Non-Stack (Fugitive) Emissions Mass Flowrate

Turkish Regulation on Industrial Emission Control - Annex 2 provides rules of calculation of contribution to air pollution from facilities and air quality measurements. It is indicated in Annex-2 that; mass flow rate of emissions are measured for existing facilities and calculated for planned facilities using emission factors. Hourly or daily, monthly and annual Contribution to Air Pollution of emissions in influence area is calculated if mass flow rate exceeds limit value given in Table 2.1 of the regulation. The limit value of dust, which will be generated in construction phase of the project, from non-point sources is 1.0 kg/hour in Table 2.1.

### 2.6.3 Noise and Vibration

Regulation on Assessment and Management of Ambient Noise provides ambient noise standards in Annex-VII Table 4 for Industrial Facilities and Table 5 for Construction Sites. The corresponding limits are provided in the tables below.

**Table 7: Turkish Ambient Noise Limits Generated by Industrial Facilities**

| Receptor | LAeq (dBA) Day-time | LAeq (dBA) Evening-time | LAeq (dBA) Night-time |
|---|---|---|---|
| Noise sensitive areas - with training, culture and health areas, summer houses and camps | 60 | 55 | 50 |
| Combination of commercial and noise sensitive areas - with dense residential buildings | 65 | 60 | 55 |
| Combination of commercial and noise sensitive areas with dense commercial buildings | 68 | 63 | 58 |
| Industrial areas | 70 | 65 | 60 |

**Table 8: Turkish Ambient Noise Limits Generated by Construction Sites**

| Activity (construction, demolition and renovation) | LAeq (dBA) Day-time |
|---|---|
| Building | 70 |
| Road | 75 |
| Other sources | 70 |

IFC General EHS Guidelines Section 1.7 provides noise level guidelines based on WHO Guidelines. These guidelines are applicable to noise impacts beyond the property boundary of a facility and the provided levels are not-to-exceed levels for noise impact. Noise impact should not exceed the levels presented in Table 1.7.1 of IFC General EHS Guidelines or should result in a maximum increase in background levels of 3 dB at the nearest receptor location. Relevant noise level guidelines are presented in the table below.

**Table 9: IFC General EHS Guidelines - Noise Standards**

| Receptor | One Hour LAeq (dBA) | |
|---|---|---|
| | Daytime 07:00 - 22:00 | Night time 22:00 - 07:00 |
| Residential; institutional; educational | 55 | 45 |
| Industrial; commercial | 70 | 70 |

### 2.6.4 Soil Quality

Recent Regulation on Soil Pollution Control and Contaminated Sites by Point Sources was issued on June 8, 2010 in the Official Gazette No. 27605.

The Regulation on Soil Pollution Control and Contaminated Sites by Point Sources states that within two years after the issue of the Regulation (June 8, 2012), all the existing and prospected industries that are included in Annex 2 - Table 2 should declare an Activity Preliminary Information Sheet to the MoEU. The hospital project is included in the list of Annex-2 (code: 8610, hospital services).

The MoEU shall collect all the declared industrial sites in the Potentially Contaminated Sites List. Afterwards, MoEU shall make an assessment about the sites listed in Potentially Contaminated Sites List along with the Activity Preliminary Information Sheet Assessment Criteria explained below. Should at least one of the subject criteria is valid for an industrial site, it is included in Suspicious Sites List, and the steps identified in the Regulation are followed. If none of the subject criteria is valid for a site, then the site continues to stay in the Potentially Contaminated Sites List. The procedure for assessment of potentially contaminated sites is illustrated in the figure below.

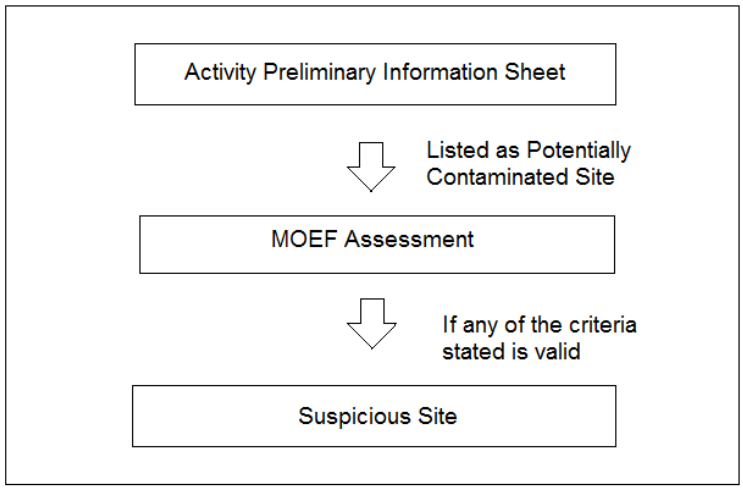


*Figure 2: Flow Diagram for Assessment of Potentially Contaminated Sites in Turkish Regulation*

The Regulation provides soil quality parameters to be measured for each industry and provides generic limits for all parameters. Quality parameters for hospital services are provided in Annex 2 - Table 2 of the Regulation with NACE code of 8610 and generic limits are given in Annex 1 of the Regulation; and this information is summarized in the table below.

**Table 10: Hospital Services Soil Quality Parameters and Generic Limits**

| Parameter | Generic Limits in Current Regulation on Soil Pollution Control and Contaminated Sites by Point Sources (Appendix I) | | | | | |
|---|---|---|---|---|---|---|
| | CAS-No | Absorption via ingestion of soil and dermal contact (mg/kg dry weight) | Respiration of volatile substances in ambient environment (mg/kg dry weight) | Respiration of fugitive dusts in ambient environment (mg/kg dry weight) | Transfer of pollutants from soil to groundwater and drinking groundwater (mg/kg dry weight) | |
| | | | | | SF=10 (dilution factor) | SF=1 (dilution factor) |
| Lead | 7439-92-1 | 400 | | | 135 | 14 |
| Baryum | 7440-39-3 | 15643 | | 433702 | 288 | 29 |
| Cadmium | 7440-43-9 | 70 | | 1124 | 27 | 3 |
| Molybdenum | 7439-98-7 | 391 | | | 14 | 1 |
| Selenium | 7782-49-2 | 391 | | | 0,5 | 0,05 |
| Silver | 7440-22-4 | 391 | | | 16 | 2 |
| Kadmiyum | 7440-43-9 | 70 | | 1124 | 27 | 3 |
| Stannum | 7440-31-5 | 46929 | | | 54794 | 5479 |
| Chromium +3 | 16065-83-1 | 117321 | | | | |
| Chromium +6 | 18540-29-9 | 235 | | 24 | 10 | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total Chromium | 7440-47-3 | 235 | | 24 | 900,000 | 1 |
| Copper | 7440-50-8 | 3129 | | | 514 | 51 |
| Zinc | 7440-66-6 | 23464 | | | 6811 | 681 |
| Mercury | 7439-97-6 | 23 | 3 | | 3 | 0.6 |
| Arsenic | 7440-38-2 | 0.7 | | 471 | 3 | 0.3 |
| Total Petroleum Hydrocarbons (Aliphatic) (EC5-EC8) | 0-01-0 | 4693 | | | 4 | 0.4 |
| Total Petroleum Hydrocarbons (Aliphatic) (EC8 >-EC16) | 0-01-1 | 7821 | | | 7 | 0.7 |
| Total Petroleum Hydrocarbons (Aliphatic) (EC16 >-EC35) | 0-00-9 | 156429 | | | 146 | 15 |
| Total Petroleum Hydrocarbons (Aromatic) (EC5-EC9) | 0-01-3 | 15643 | | | 15 | 1 |
| Total Petroleum Hydrocarbons (Aromatic) (EC9>-EC16) | 0-01-4 | 1564 | | | 1 | 0.1 |
| Total Petroleum Hydrocarbons (Aromatic) (EC16>-EC35) | 0-01-2 | 2346 | | | 2 | 0.2 |
| Antimony | 7440-36-0 | 31 | | | 2 | 0.2 |

TOX, TPH, Ag, As, Ba, Bi, Cd, Cr, Cu, Hg, Mo, Pb, Pt, Sb, Se, Sn, Zn

**Preliminary Site Assessment Criteria based on Activity Preliminary Information Sheet**

1) Presence of hazardous chemicals in the site and the storage type of any hazardous chemicals,
   a) For storage:
      - If the ground is not paved, or
      - If open areas are not provided with drainage system.
   b) For surface tanks:
      - If there is no leakage control for the tanks, or
      - If there is no leakage control for the pipes, or
      - If the ground is not paved.
   c) For underground tanks:
      - If the tanks are single-wall, or
      - If tanks ages are 10 or older, or
      - If there is no leakage control for the tanks, or
      - If there is no leakage control for the pipes, or
      - If there is no corrosion protection or cathodic protection.
2) Occurrence of industrial accidents
3) Presence of temporarily stored hazardous wastes; and
   a) If any of the stored wastes is marked by (A) in the Regulation on General Principals of Waste Management Annex-IV Waste List, or
   b) If the there is no impermeable ground at the temporary waste storage area, or

c) If there is no drainage system around the temporary waste storage area.

4) When a treatment plant is available for the industrial wastewater,
   a) If the sludge is stored temporarily in the site, or
   b) If the treated wastewater is discharged to the land.

Hospitals are included in the list of industries provided in Annex 2 - Table 2 of the Regulation that is required to prepare and submit Activity Preliminary Information Sheet. Hence, an Activity Preliminary Information Sheet should be prepared and submitted when the relevant statement of the Regulation comes into force. Some of the potential wastes that are expected to be stored temporarily at the Project Site are marked by (A) in the Regulation on Waste Management General Principals Annex-IV Waste List. Thus, the Project Site would potentially be identified as a "suspicious site" by the MoEU.

IFC Guidelines on Contaminated Lands provides principles and guidelines for soil contamination, but does not provide guideline values for soil quality.

# 3.0 PROJECT DESCRIPTION:

## 3.1 Project Components

Yozgat Health Campus is an Education and Research Hospital project which will have a bed capacity of 475 beds. Project is based on a Public Private Partnership scheme. The construction period (investment) is 2 years whereas the operation will be 25 years.

Health Campus will have 128.118,5 (not include commercial areas) m² total with 82.600 m² main hospital area, 41.148 m² car park area and 4.370 m² technical area, closed commercial areas. Yozgat Education and Research Hospital will satisfy the need for healthcare services of Yozgat province and the surrounding residency areas.

When the Education and Research Hospital starts to operate at full capacity, it will provide healthcare services in modern conditions with 184 specialist physician, physician associate, practicing physician and 437 auxiliary staff.

As a summary,

The following facilities are present within the Yozgat Education and Research Hospital:

- There are 132 policlinic rooms.
- Bed capacity of Newborn Intensive Care unit (ICU) is 27.
- Bed capacity of Intensive Care unit (ICU) is 34 (5 of which is Isolated Intensive Care Units). Thus there are totally 61 intensive care beds.
- There are 20 dialysis units at the project
- There is Extracorporeal shock wave lithotripsy (ESWL)
- There is an Automatic System Center TPN Precipitation Unit at the project.
- Project has an acute bed capacity of 406. There is a discrete unit, having separate entrance, designed for the arrested patients at the ground floor and eight of the acute beds (four for male, four for female) are booked at this unit.
- At the surgery suite; 15 beds patient preparation area and 20 beds patient waking up area are included.
- There are 15 operating rooms. (13 operating room + 2 daily operating room)
- There is an Oncology unit having ten chemotherapy seats.

- There is an Cancer Early Detection, Screening and Education Center.
- There is an advanced pathology unit.
- There are 2 gamma cameras and 1 PET CT reserve area for nuclear medicine unit.
- There are 8 beds LDRP- Labor, delivery, recovery, post partum.
- There is1 xray, 1 ultrasonography and 1 CT device at the emergency scanning center.
- There are 1MR, 2 CT, 4 x-ray, 4 Ultrasonography, 4 Doppler Ultrasonography, 2 Mammography, 4 EKO, 2 Bone Densitometry at the Radiology Department.
- 41.148 $m^2$ area is booked for car park.
- Closed area per bed ratio is 183 $m^2$/bed.

**Diagnostic and Treatment Services;** Endoscopy unit, radiology department, nuclear medicine, surgery suite, angiography/cardiac cath, emergency service, hemodialysis center, physiotherapy center, sterile processing department, advanced pathology unit, Cancer Early Detection, Screening and Education Center, chemotherapy.

**Support Services;** Conference Center, Main Entrance hall, café, patient relative waiting-café, archive, central clinical pathology, blood donation center, food service, morgue, pharmacy-inpatient, laundry, employee resting-dining hall, central kitchen, administration functions.

**Technical Services;** Car park, Technical Departments, Shelter, Workshops, Storages, etc.

Distribution of beds and area of facility according to medical units is given at the following Table.

**Table 11: Distribution of Hospital Beds**

| Name of Unit | Number of beds |
|---|---|
| Acute | 406 |
| ICU | 29 |
| Isolation room | 5 |
| NICU | 27 |
| LDRP | 8 |
| TOTAL BED CAPACITY | 475 |

The following commercial activities can be done within the campus:

- Indoor and Outdoor Parking for Commercial Fields
- Market / Bazaar
- Restaurant, Bakery and Café
- Post Office Branch, Bank Branch and ATM
- Transport services, Taxi services
- Foundations and Associations having social assistance purposes (hairdresser, gift shop)

## 3.2 Project Location/ Land Use

Project area is located in a developed area mainly surrounded by main road, green lands and a public building. According to the land use map below, Project area is classified as “Dry Agricultural” area.

Dry agricultural areas are the areas that can not be irrigated economically and water demand is only meet by rainfall.

Project site is mostly surrounded by green field. SHW (DSİ) is located at the south of the Projects Site, on the other hand the General Directorate of Land Registry and Cadastre is located at the west of the Project Site.

Access to the Project site is provided by Sivas-Yozgat road (E-88) and Alpaslan Türkeş Huzurevi Street.

Project specific area is declared as a medical infrastructure area according to the zoning plan of the Municipality (Appendix B).

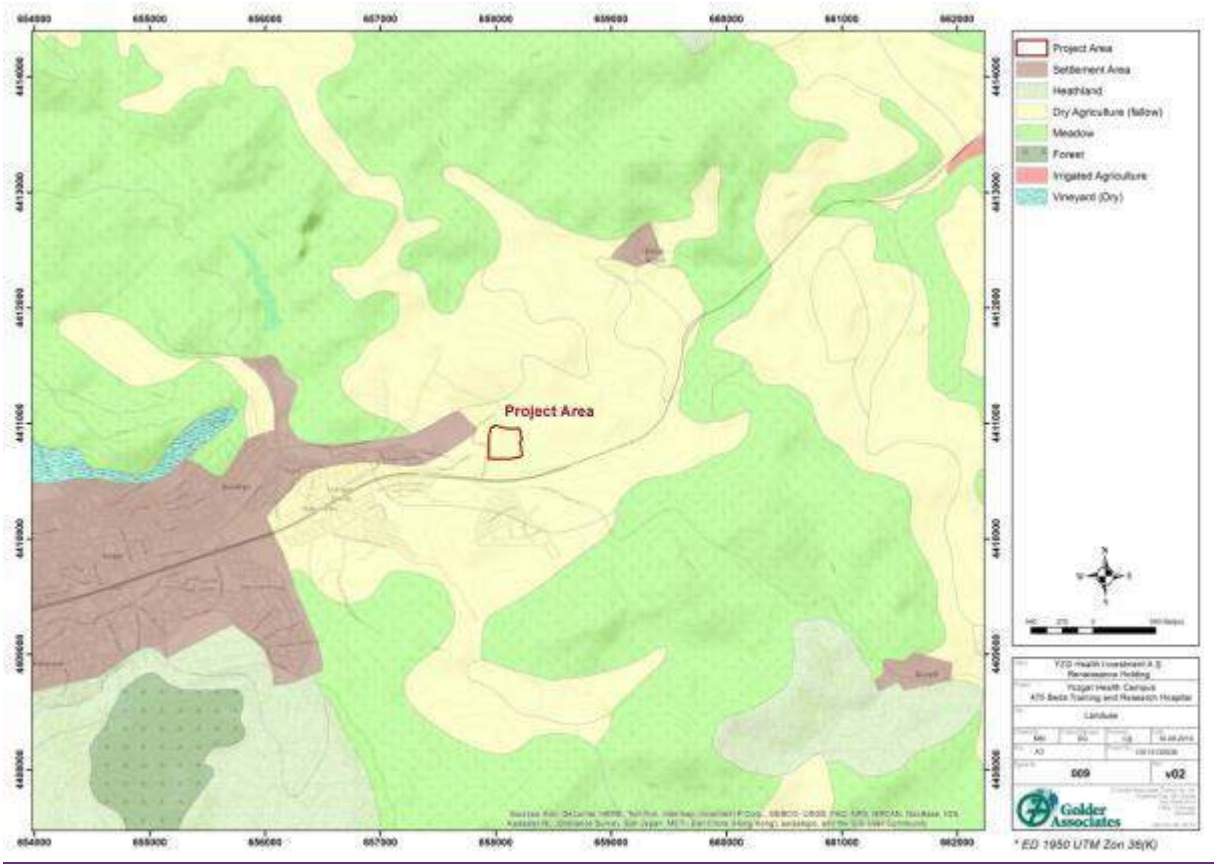


*Figure 3: Land Use Map*

# 4.0 POTENTIAL IMPACTS

## 4.1 Identification of the project actions

Activities or project actions that could potentially contribute to environmental or social changes during the construction or the operational phase of the Project have been identified through an analysis of the Project documentation available at the time of the preparation of this ESIA.

**Construction phase**

- surface leveling and grading;
- temporary stockpiling of the material;
- disposal of the excavated material;
- transport of construction material;
- road traffic;
- construction of the facilities;
- disposal of the waste deriving from construction.

**Operational phase**

- operation of the facilities (including use of consumer goods);
- road traffic;
- creation of waste; specifically medical wastes

## 4.2 Identification of the components

After the identification of the Project actions, a Leopold Matrix has been created (environmental, biological and social components against Project actions) as shown in the following Tables, in order to identify the components (highlighted sections) potentially impacted by the project actions.

**Table 12: Leopold Matrix for the physical components**

| Project phases | Actions | Physical components | | | | | |
|---|---|---|---|---|---|---|---|
| | | geology and geomorphology | soil (including land use) | surface water hydrology | hydrogeology | atmosphere (air quality, climate and metereology) | noise and vibration |
| Construction phase | surface leveling and grading | | | | | | |
| | temporary stockpiling of the material | | | | | | |
| | disposal of the excavated material | | | | | | |
| | transport of construction material | | | | | | |
| | construction of the facilities | | | | | | |
| | disposal of the waste deriving from construction | | | | | | |
| Operational | operation of the facility (including use of consumer goods) | | | | | | |

| Project phases | Actions | Physical components | | | | | |
|---|---|---|---|---|---|---|---|
| | | geology and geomorphology | soil (including land use) | surface water hydrology | hydrogeology | atmosphere (air quality, climate and metereology) | noise and vibration |
| | road traffic | | | | | | |

**Table 13: Leopold Matrix for the biological components**

| Project phases | Actions | Biological components | | | | |
|---|---|---|---|---|---|---|
| | | terrestrial Flora | terrestrial Fauna | habitat | protected areas | biodiversity |
| Construction phase | surface leveling and grading | | | | | |
| | temporary stockpiling of the material | | | | | |
| | disposal of the excavated material | | | | | |
| | transport of construction material | | | | | |
| | construction of the facilities | | | | | |
| | disposal of the waste deriving from construction | | | | | |
| Operational phase | operation of the facility (including use of consumer goods) | | | | | |
| | road traffic | | | | | |
| | disposal of waste deriving from operation (especailly medical waste) | | | | | |

**Table 14: Leopold Matrix for the social components**

| Project phases | Actions | Social components | | | | | |
|---|---|---|---|---|---|---|---|
| | | socio-economic conditions and housing issues | cultural resources, including archaeology | ecosystem services | resettlement and compensation | health issues and facilities | visual aesthetics |
| Construction phase | surface leveling and grading | | | | | | |
| | temporary stockpiling of the material | | | | | | |
| | disposal of the excavated material | | | | | | |
| | transport of construction material | | | | | | |
| | construction of the facilities | | | | | | |
| | disposal of the waste deriving from construction | | | | | | |
| Operational phase | operation of the facilities (including use of consumer goods) | | | | | | |
| | road traffic | | | | | | |
| | disposal of waste deriving from operation (especailly medical waste) | | | | | | |

Through the use of the matrices, the following components were identified as potentially impacted (negatively or positively) during the construction or the operational phases of the Project.

**Physical components**

- geology and geomorphology;
- soil (including land use);
- surface water hydrology;
- hydrogeology;
- atmosphere (air quality, climate and meteorology);
- noise and vibration;

**Biological components**

- terrestrial Fauna;
- terrestrial Flora;
- terrestrial habitat;
- protected areas;
- biodiversity.

**Social components**

- housing and employment issues;
- cultural resources, including archaeology;

- project stakeholders and any project-affected people - ecosystem services;
- human and ecological health risk;
- visual aesthetics.

## 4.3 Identification of the impact factors

Activities or Project actions that could potentially contribute to environmental or social changes during the construction or the operational phase of the Project have been identified through an analysis of the Project documentation available at the time of the preparation of this ESIA.

Project actions could potentially determinate, during the construction and operational phases, impacts factors able to interfere positively or negatively, in a direct or indirect way, on the components. Based on the components and Project actions previously listed, the main impacts factors identified are listed below:

- hydrological and hydrogeological change
- top soil and lower soil removal
- increasing of artificial surface
- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations;
- occupation of land;
- need of workforce;
- use of goods and services;
- demand for housing;
- unsatisfied occupational expectations,
- use of local infrastructures;
- increased road traffic;
- landscape features alteration;
- changes to land property and land use.
- creation of medical waste; storage, transportation and disposal

In order to show the correlation among the Project actions, the impact factors for different phases and the single components potentially impacted, the following correlation matrices were created.

**Table 15: Matrix of physical components - Project actions - impact factors**

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| **GEOLOGY AND GEOMORPHOLOGY** | surface leveling and grading | - | groundwater pollution; hydrogeological changing |
| | temporary stockpiling of the material | - | |
| | Excavation operations (foundations) | - | |

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| | disposal of waste deriving from construction | - | |
| | - | increase of traffic | |
| | | Medical waste storage, transportation, disposal | |
| SOIL AND LAND USE | surface leveling and grading | - | soil removal; occupation of land; pollutant emission in top soil |
| | temporary stockpiling of the material | - | |
| | Excavation operations (foundations) | - | |
| | disposal of the waste deriving from construction | - | |
| | - | increase of traffic | occupation of land; increase of artificial surface |
| | | Medical waste storage, transportation, disposal | Soil pollution |
| SURFACE WATER HYDROLOGY | Excavation operations (foundations) | - | Change in surface water run-off ; hydrological changing |
| | disposal of waste deriving from construction | - | |
| | - | Presence of the facility | hydrological changing |
| | | Medical waste storage, transportation, disposal | |
| HYDROGEOLOGY | surface leveling and grading | - | hydrogeological changing; groundwater pollution |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | Excavation operations (foundations) | - | |
| | disposal of the waste deriving from construction | - | |
| | | Medical waste storage, transportation, disposal | |
| ATMOSPHERE (AIR QUALITY, CLIMATE AND METEROLOGY) | surface leveling and grading | - | pollutant and dust emission in the atmosphere |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | transport of construction material | - | |
| | construction of the facilities | - | |

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| | disposal of the waste deriving from construction | - | |
| | - | road traffic | pollutant and dust emission in the atmosphere |
| | | Medical waste storage, transportation, disposal | |
| NOISE AND VIBRATIONS | surface leveling and grading | - | emission of noise and vibrations |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | transport of construction material | - | |
| | construction of the facilities | - | |
| | disposal of the waste deriving from construction | - | |
| | - | operation of the facility (including use of consumer goods) | emission of noise and vibrations |
| | - | road traffic | |

**Table 16: Matrix of biological components -– Project actions – impact factors**

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| TERRESTRIAL FLORA | surface leveling and grading | - | vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | disposal of the waste deriving from construction | - | |
| | - | operation of facility | occupation of land |
| | | Road traffic | pollutant and dust emission in the environment |
| | | Medical waste storage, transportation, disposal | |
| TERRESTRIAL FAUNA | surface leveling and grading | - | vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere; emission of noise and vibrations |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| | construction of the facilities | - | |
| | disposal of the waste deriving from construction | - | |
| | - | operation of the facility (including use of consumer goods) | occupation of land; emission of noise and vibrations |
| | - | road traffic | |
| | | Medical waste storage, transportation, disposal | pollutant and dust emission in the environment |
| HABITATS | surface leveling and grading | - | vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere; emission of noise and vibrations |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | construction of the facilities | - | |
| | disposal of the waste deriving from construction | - | |
| | - | operation of the facility (including use of consumer goods) | occupation of land; pollutant and dust emission in the environment; emission of noise and vibrations |
| | - | road traffic | |
| | | Medical waste storage, transportation, disposal | |
| PROTECTED AREAS | - | road traffic | pollutant and dust emission in the environment; emission of noise and vibrations |
| | | Medical waste storage, transportation, disposal | |
| BIODIVERSITY | surface leveling and grading | - | vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere; emission of noise and vibrations; |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | construction of the facilities | - | |
| | disposal of the waste deriving from construction | - | |
| | - | operation of the facility (including use of consumer goods) | occupation of land; pollutant and dust emission in the environment; emission of noise and vibrations. |
| | - | road traffic | |

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| | | Medical waste storage, transportation, disposal | |

**Table 17: Matrix of social components -– Project actions – impact factors**

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| **SOCIO-ECONOMIC CONDITIONS AND HOUSING ISSUES** | construction of the facilities | - | need of workforce; use of goods and services; demand for housing; unsatisfied occupational expectations, use of local infrastructures |
| | - | operation of the facility (including use of consumer goods) | need of workforce; use of goods and services, public safety. |
| | road traffic. | road traffic | |
| **CULTURAL RESOURCES INCLUDING ARCHAEOLOGY** | surface leveling and grading | - | damage and destruction of cultural resources. |
| | construction of the facilities | - | |
| **ECOSYSTEM SERVICES** | surface leveling and grading | - | emission of noise and vibration; landscape features alteration. |
| | construction of the facilities | - | |
| **HUMAN AND ECOLOGICAL HEALTH RISK** | surface leveling and grading | - | pollutant and dust emission in the atmosphere posing health and safety hazards for the community |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | construction of the facility | - | |
| | disposal of the waste deriving from construction | - | |
| | road traffic. | road traffic | |
| | | Medical waste storage, transportation, disposal | |
| **VISUAL AESTHETICS** | surface leveling and grading | - | presence of new constructions; landscape features alteration; |
| | construction of the facilities | - | |
| | - | presence of the facility | |

| Components | Project actions (construction phase) | Project actions (operational phase) | Impact factors |
|---|---|---|---|
| VEHICULAR TRAFFIC | surface leveling and grading | - | |
| | temporary stockpiling of the material | - | |
| | disposal of the excavated material | - | |
| | transport of construction material | - | |
| | construction of the facilities | - | |
| | disposal of the waste deriving from construction | - | |
| | - | operation of the facility (including use of consumer goods) | |
| | - | road traffic | |

# 5.0 PHYSICAL COMPONENTS

## 5.1 Geology and geomorphology

### 5.1.1 Baseline

#### *5.1.1.1 Study area*

Study area (also referred to as the "project area") is located in Merkez district of Yozgat and has a gently sloping topography. Based on the zoning plan, the eastern boundary of the Site is located at an approximate altitude of 1437 to 1439 m; and the western boundary of the Site is located at an approximate altitude of 1405 to 1410 m above sea level (asl). There are no known or reported problems with the drainage or slope. The study area is greenfield and there are no known or reported disasters at the study area.

#### *5.1.1.2 Methodology*

Geology and geomorphology baseline conditions have been assessed from desktop studies and literature data review.

Main sources reviewed are listed below:

- Geological Map prepared by MTA 1/500,000 Scale
- Geotechnical Survey Report (June 2013) by Kilci Mühendislik Müşavirlik Proje İnş. Taah.. San. ve Tic. Ltd. Şti
- Environmental Status Report of Yozgat Province, 2008

#### *5.1.1.3 Baseline results*

**General Geology**

The array of rocks that surface Yozgat region from older to younger, the deepest layer is the Cretaceous-aged ophiolite and ophiolitic rocks. Above them are volcanite such as Upper Cretaceous-aged basalt and spilit. Upper Cretaceous- Palaeocene-aged granitoids are found overlaying these units. Above them are; Eocene-aged acidic volcanic rocks, Mid-Upper Eocene-aged clastic and carbonate sedimentary rocks, Oligocene-aged terrestrial clastics and Upper Miocene-Pliocene-aged non-clastic terrestrial rocks are observed respectively. Top layer is Quaternary-aged alluvium, slope washes, alluvial fans and travertine.

Yozgat city was geologically formed in Tertiary period. It is detected that the obtained fossils remain from the Tertiary period. Faulted and folded metamorphic rocks are usually observed. This is justified by that limestone with marble characteristics are found in the surrounding. Limestone, gypsum, clay and marl are found among various deposits. Mesozoic-aged rocks are quite common in Yozgat. These series are formed by fine grained limestones and serpentines. Regions of Yerköy, Sorgun and Boğazlıyan are formed of limestone and marl. They are overlying with Mid-Eocene rocks. Fracture lines are quite rare in the district. Thick neogene volcanic nappes in regions that go into Kızılırmak Basin are also located among the lake sediments of related period. Halite which is one of the typical rocks of the period is abundantly found in this basin[1]

General Geology Map of Yozgat is presented in Figure 5-1.

[1] Environmental Status Report of Yozgat Province, 2008

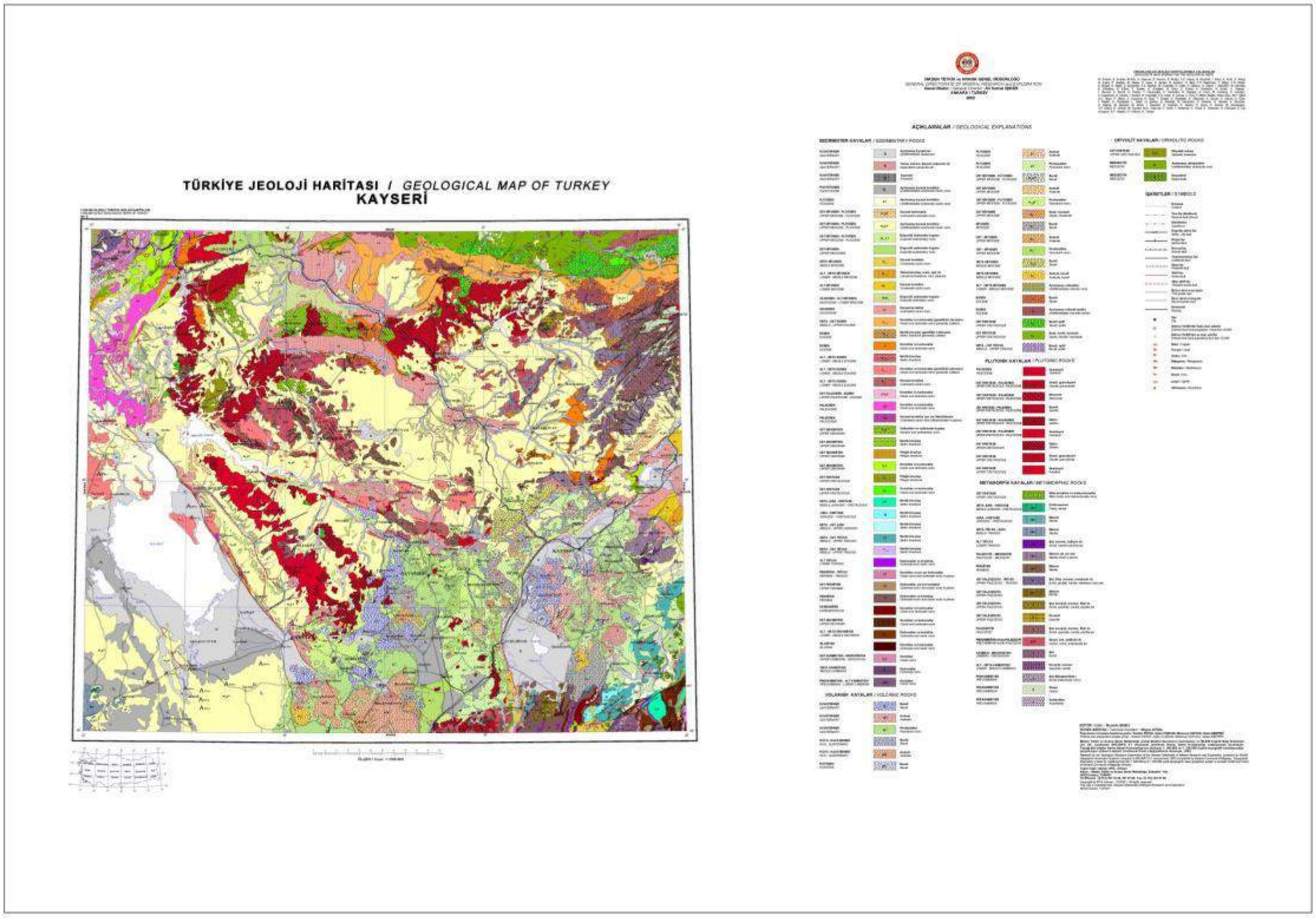


*Figure 4: General Geology Map of Kayseri-Yozgat-Kırşehir-Kırıkkale*[2]

[2] http://www.mta.gov.tr

Top 30-35 meters of the basement rocks, granite, granodiorite and gabbro units and fracture and fault zones of these units are permeable in terms of hydrogeology. Volcanic rocks present within the survey area are consisting of subsea volcanism and overlying pyroclastic rocks of the Lutetian and Volcanic extrusions on top.

Normal faults observed within the study area are due Neocene and Quaternary tectonism. Faults are oriented as E-W, WNW-ESE, NW-SE and N-S, and have small slip amounts. E-W and WNW-ESE oriented faults were developed as step faults. Bedding planes are generally east-west oriented with minor inclination. Gravelly, sandy and clayey alluvium found within Kirazlı and Bozok stream beds has a thickness of almost 40 m and is an important fresh water aquifer. Fault zones and reported hot water springs within the region may indicate a high geothermal gradient.

Throughout Yozgat province, outcrops belonging to Sakarya Continent, Central Anatolia Crystalline Complex (CACC) and İzmir-Ankara-Erzincan suture zone are observed. As defined by Şengör and Yılmaz (1981), these continental blocks and units belonging to the suture zone are from different age and the region is shaped by the closing of the northern branch of Neo-tethis Ocean and the following geodynamic evolution. Important structural features resulting from this evolution are thrusts, faults and folds. Important thrusts are formed with the movement of the ophiolites during the closing of the Noe-tethis Ocean. During this period basement and cover rocks of Sakarya Continent were thrusted onto ophiolites and ophiolites were placed towards south on CACC basement rocks and Eocene formations. Resulting from this thrust, south contact of Artova Ophiolitic Melange is a continuos thrust with Eocene units.

Basement rocks of Sakarya Continent (Devecidağ mélange), found at the northern part of the study area, was sliced internally and gained a folded structure. Jurassic-lower Cretaceous Ferhatkaya and Curcurum Formations, lying uncomformably on basement rocks, are highly faulted and folded.[3]

As a result of the closing of Neo-tethis Ocena and tectonic events, E-W oriented parallel mountain series and basins between these mountain series were developed north of Yozgat-Sorgun-Saraykent-Akdağmadeni line. Within this mountain series, generally units belonging to Devecicağ Melangé and Artova ophiolite belt can be found and Eocene and younger sediments can be found in the basins corresponding to synclines.

Yozgat can be considered stable in terms of mass material movement. Mass material movements within the province are localized landslides. Although water and other factors are playing role on these mass material movements, geological units, properties and topography are the main determining factors. Within the region a few landslides were determined within Oligo-miocene sediments, Eocene sedmients, Artova Melangé and Devecidağ mélange. Within these formations mass material movements are more likely compared to CACC. This is due to Lithological features, topographical features and the continental sediments found within (Deliceırmak formation).

[3] Geotechnical Survey Report (June 2013) by Kilci Mühendislik

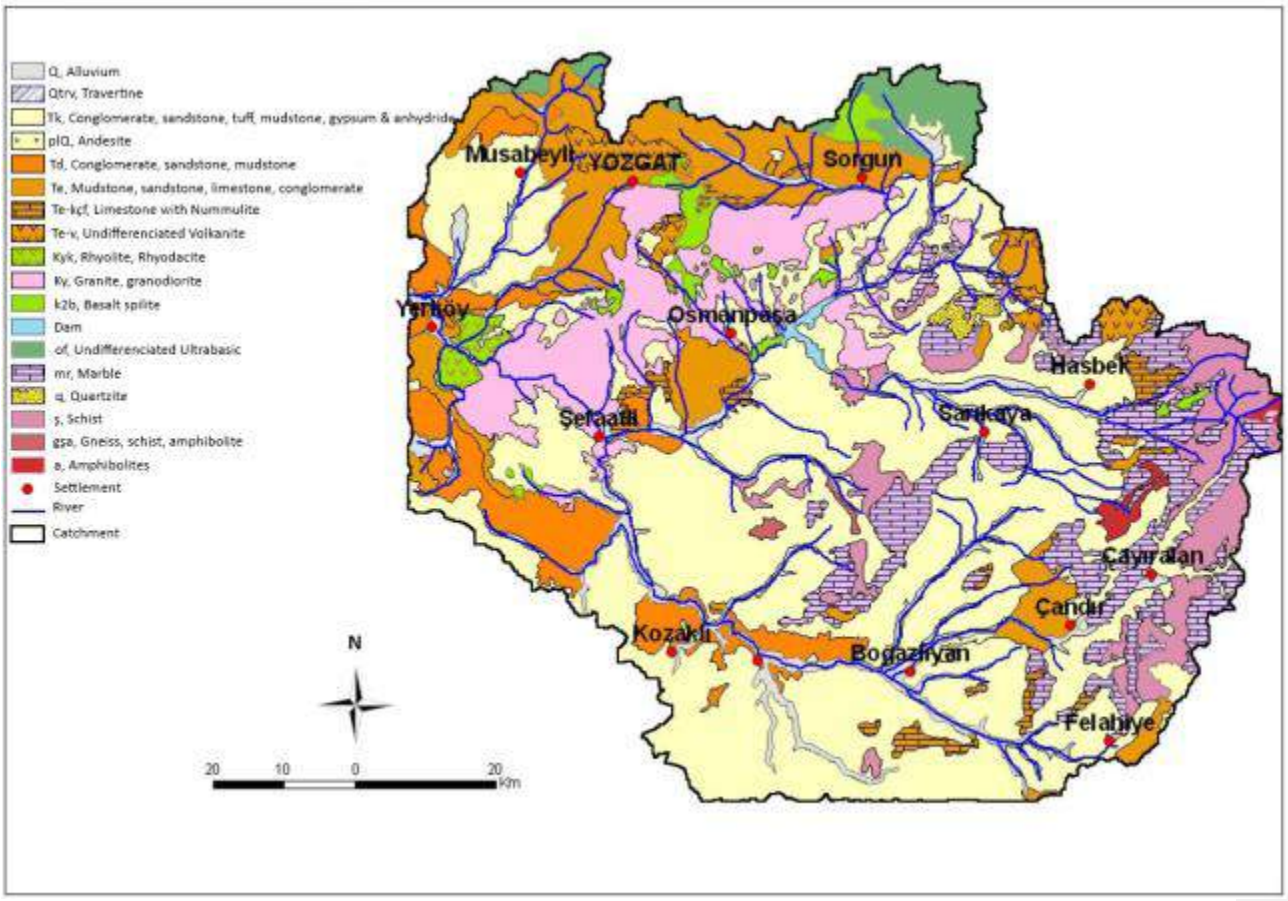


*Figure 5: Geological map of the study area and surrounding region*

**Structural Geology**

The region is located between Kırşehir crystalline massive and Northern Anatolia Mountains (Anatolids and Pontids). There are also a few thrusts and faults in the region. The region comes upon Upper Cretaceous Lower Eocene in the north and upon Lutetian and partially older formations and Oligo-Miocene. These movements are related to the Post-Lutetian Oligocene paroxysm. Movement has always been from north to south. Both metamorphic crystalline massives and Cretaceous and Eocene have been subject to a number of orogenic movements[4]

**Mineral Resources**

Yozgat has rich reserves of underground resources. According to the research by Mineral Research and Exploration Institute; there are steel, coal (lignite), lead, limestone, marble, quartzite, uranium, salt and graphite reserves within the city border.[5]

### 5.1.2 Impact Analysis Results

Based on analysis of the Project, impacts on geology in all phases will be limited to impacts on soil and groundwater which are discussed in the following sections of this report.

According to Geotechnical report “Considering the dominant soil unit, ground of the area consists of alteration of claystone-sandstone and andesite-basalt rock which have bearing capacity, settlement and no liquefaction risk in the event of earthquake”.

[4] Environmental Status Report of Yozgat Province, 2008

[5] Environmental Status Report of Yozgat Province, 2008

The most important geo-hazard expected during the all phases would be an earthquake. The facility (buildings) would be designed according to criteria presented in the geotechnical report.

Project design and engineering should be cautiously complied with the provisions of the "Regulation on the Structures to be Constructed in Disaster Areas and the Regulation on the Buildings to be Constructed on Earthquake Zones" (14.07.2007 O.G. No: 26582)

The earthquake map of the Yozgat Province produced from “Earthquake Research Department” is given in below figure.

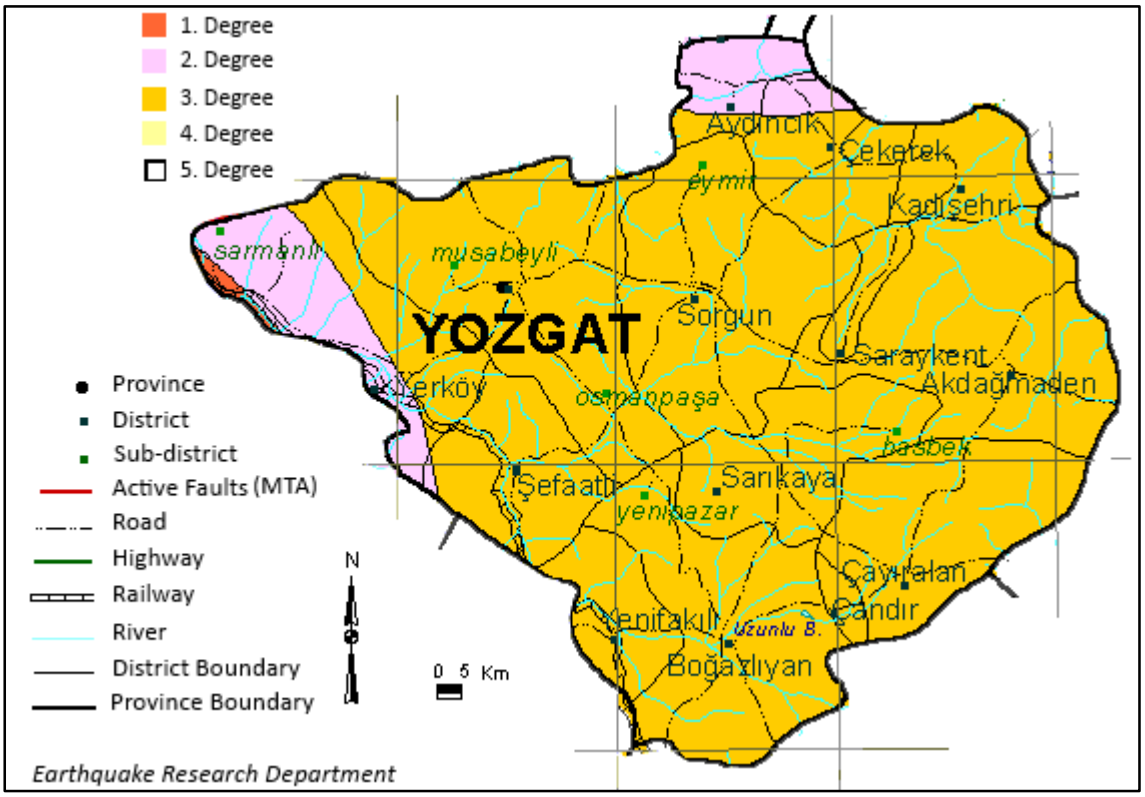


*Figure 6: Eartquake Map of Yozgat*

### 5.1.3 Mitigation measures

Mitigation measures should be applied by using best practices during construction activities, to reduce accidental contamination of the groundwater. When soil and/or groundwater contamination is encountered, soil storage will follow standards and best practices (see paragraph 5.2.1.3) and will be limited to areas with low soil and groundwater vulnerability.

To prevent or reduce impacts on groundwater, it would be suggested to develop and implement a water resource management plan, covering issues related to groundwater, surface water and wastewater in order to optimize water needs and minimize environmental impacts.

### 5.1.4 Residual impacts

Based on analysis of the Project actions, impacts on geology in all phases are expected to be limited to soil and groundwater which are discussed in Section 5.3, 5.4 and 5.5 of this report.

## 5.2 Soil (including land use)

### 5.2.1 Baseline

#### *5.2.1.1 Study area*

The study area is described above in Section 5.1.1.1.

The soil conditions and the land use of the study area have been the main focus of this section. A limited survey of the surrounding areas that might be impacted by the project activities has been completed as well. The impact analysis has only considered areas within the Study Area.

#### *5.2.1.2 Methodology*

Information regarding soil and land use has been collected through desktop studies and available reports.

Soil baseline conditions have been assessed from desktop studies, literature data review and also baseline studies including soil sampling.

Main sources reviewed are listed below:

- Geotechnical Survey Report (June 2013) by Kilci Mühendislik Müşavirlik Proje İnş. Taah.. San. ve Tic. Ltd. Şti
- Environmental Status Report of Yozgat Province, 2008

#### *5.2.1.3 Baseline results*

***General Soil Structure and Land Use***

Large soil groups had been formed in Yozgat city due to climate, topography and main substance differences. Besides, some field types, which are poor in soil structure, can also be observed.

*Alluvial Soils:* Area of Alluvial Soils in Yozgat city is 58.857 ha. 26.903 ha is of I. Class, 18.592 ha is of II. Class, 9882 ha is of III. Class, 1950 ha is of IV. Class, 20 ha is of V. Class, 1385 ha is of VI. Class, 125 ha is of VII. Class. On 6966 ha of Alluvial Soil dry agriculture is performed and on 40.504 ha irrigated agriculture is performed. Considering 3940 ha of poor irrigated agriculture and 179 ha of irrigated gardens, it is seen that a high percentage of 76% irrigation is performed on Alluvial Soils. Distribution of Alluvial Soils in districts seems almost equal, yet most Alluvial Soils are observed in Boğazlıyan district (12.151 ha), and least in Çayıralan district (905 ha).

*Hydromorphic Alluvial Soils:* The Hydromorphic Alluvial Soil group, which exists in very small amount in Yozgat, covers an area of 178 ha. 41 ha of this is of V. Class, and 137 ha of VII. Class. 137 ha remains in Çekerek district, 41 ha remains in Yerköy district fields. All these areas are used as pastureland.

*Colluvial Soils:* 96.511 ha of Yozgat Fields consists of Colluvial large soil groups. 1774 ha of this amount is of I. Class, 77.850 ha is of II. Class, 12.218 ha is of III. Class, 2944 ha is of IV. Class, 1493 ha is of VI. Class and 232 ha is of VII. Class. 80% of Colluvial Soils is II. Class. On 66.701 ha dry agriculture and 15.687 ha irrigated agriculture is performed. Almost 70% of these soils consist of dry agriculture fields.

*Non-calcareous Brown Soils:* Non-calcareous Brown Soils cover an area of 62.191 ha in Yozgat. 381 ha of this is of II. Class, 2313 ha is of III. Class, 11.307 ha is of IV. Class, 15.310 ha is of VI. Class, 32.880 ha is of VII. Class. On this soil group, mostly meadow-like (29.504 ha) fields are observed. Dry agriculture field is 24.438 ha, irrigated agriculture is not observed on this soil group.

*Brown Soils:* This is the most common soil group in Yozgat. Total area is 646.161 ha. 8645 ha is of I. Class, 47.732 ha is of II. Class, 144.490 ha is of III. Class, 189.872 ha is of IV. Class, 86.766 ha is of VI. Class, 168.656 ha Field is of VII. Class. On 2/3 of the soils in the group there is dry agriculture. After dry agriculture fields, the most common fields are pasture- like fields.

*Red Brown Soils:* In Yozgat, 48.289 ha of the field consists of Red Brown Large Soil Group. 2512 ha of this is of II. Class, 7648 ha is of III. Class, 14.704 ha is of IV. Class, 3221 ha is of VI. Class, 20.204 ha is of VII. Class. On 28.676 ha of the field, there is dry agriculture. 18.266 ha of field is pasture-like.

*Brown Forest Soils:* Brown Forest Soils cover the largest area after the Brown Soils. Of total 464.642 ha in this soil group, 19.644 ha is of II. Class, 32.092 ha is of III. Class, 41.706 ha is of IV. Class, 61.890 ha is of VI. Class, 309.490 ha is of VII. Class. Dry agriculture is performed on 114.553 ha of Brown Forest Soils. 140.270 ha is Forest, 113.336 ha is heath. 88.075 ha field is pasture-like.

*Non-calcareous Brown Forest Soils:* This soil group is 6019 ha and 1610 ha is of IV. Class, 1053 ha is of VI. Class, 3356 ha is of VII. Class. 667 ha is pasture-like and 5346 ha is Forest Field.

*Chestnut Soils:* In Yozgat, these soils have an area of 3437 ha; 504 ha id of II. Class, 1065 ha is of III. Class, 293 ha is of V. Class, 1575 ha is of VI. Class. Dry agriculture is performed on 1904 ha whereas 1521 ha is pasture-like.

*Irmak Flood Plains:* These are the fields where the rivers spread during overflow except their normal beds. Generally they are covered with a material including sand, grains and debris. Since they are exposed to washing with overflow waters, they do not contain soil material; and that's why they are specified as a field type. They are not suitable for agriculture, and there is no vegetation over them. In Yozgat, the total area of these fields is 60 ha.

*Bare Rocks and Debris:* These are areas covered with whole or fragmented hard rocks and stones without any vegetation over them. They generally lack vegetation. Sometimes there are forest trees, bushes and grass growing in soiled rock cracks or small pockets. In Yozgat, total area of these fields is 9383 ha.[6]

**Table 18: The Extent of the Area Covered by Large Soil Groups in Yozgat City**

| Large soil groups | Total Area (ha) |
|---|---|
| Alluvial Soils | 58857,0 |
| Hydromorphic Alluvial Soil | 178,0 |
| Colluvial Soils | 96511,0 |
| Brown Soils | 646161,0 |
| Non-calcareous Brown Soils | 62191,0 |
| Red Brown Soils | 48289,0 |
| Brown Forest Soils | 464642,0 |
| Non-calcareous Brown Forest Soils | 6019,0 |
| Chestnut Soils | 3437,0 |
| Field Types | 9959,0 |
| Water Surface | 22,0 |
| ***Total*** | ***1396266,0*** |

**Source:** Environmental Status Report of Yozgat Province, 2007

**Table 19: The Extent of the Area Covered by Large Soil Groups in Yozgat City Based on Districts**

[6] Field Asset Book, Prime Ministry General Directorate of Rural Affair Publications, Ankara 1999

| Districts | Alluvial Soils | Hydromorphic Alluvial Soils | Colluvial Soils | Brown Soils | Non-calcareous Brown Soils | Red Brown Soils | Brown Forest Soils | Non-calcareous Brown Forest Soils | Chestnut Soils | Field Types | Water Surface |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Merkez | 4958,0 | | 14491,0 | 96760,0 | 57821,0 | 544,0 | 27546,0 | | | 524,0 | |
| A.Madeni | 3231,0 | | 10260,0 | 15805,0 | | | 177435,0 | 6019,0 | | 182,0 | |
| Boğazlıyan | 12151,0 | | 13290,0 | 158230,0 | | 13443,0 | | | | 1020,0 | 22,0 |
| Çayıralan | 905,0 | | 6712,0 | 45684,0 | | 1688,0 | 65107,0 | | | 5677,0 | |
| Çekerek | 6919,0 | 137,0 | 8919,0 | 655,0 | | 3911,0 | 136692,0 | | 3437,0 | 111,0 | |
| Sarıkaya | 5058,0 | | 8379,0 | 79649,0 | | 4553,0 | 3255,0 | | | 1326,0 | |
| Sorgun | 9365,0 | | 13170,0 | 105488,0 | 2110,0 | | 46069,0 | | | 188,0 | |
| Şefaatli | 6573,0 | | 7785,0 | 73300,0 | 2260,0 | 2673,0 | 74,0 | | | 48,0 | |
| Yerköy | 9697,0 | 41,0 | 13505,0 | 70590,0 | | 21477,0 | 8464,0 | | | 883,0 | |
| ***Total*** | ***58857,0*** | ***178,0*** | ***96511,0*** | ***646161,0*** | ***62191,0*** | ***48289,0*** | ***464642,0*** | ***6019,0*** | ***3437,0*** | ***9959,0*** | ***22,0*** |

**Source:** Environmental Status Report of Yozgat Province, 2007

***Soil Texture***

In Yozgat city soil, there are various problems with either small or great impact levels such as erosion, shallow nature, stony structure, rocky structure, drainage, saltiness which impair plant growth and restrict agricultural usage. Characteristics of Yozgat city soil including Slope, stony structure, and shallow nature are given in the following table.

**Table 20: Class Characteristics of the soil in Yozgat**

| Usage Capability Class | Area (ha) | Class Characteristic |
|---|---|---|
| Class I | 44152,0 | Suitable for all types of agriculture |
| Class II | 245592,0 | Medium Level Soil Shallowness, Precaution for Drainage |
| Class III | 259129,0 | Little Erosion, Medium Slope, Stony, Drainage Problem |
| Class IV | 276260,0 | Erosion, Topographic Restrictions, Slopes, Stony |
| Class V | 42,0 | Severe Erosion, Shallow Soil, No Furrow |
| Class VI | 257510,0 | Very Shallow Soil, Severe Erosion, Vine etc by Terracing |
| Class VII | 276156,0 | No Furrow, Stony, Very Shallow, Soil can be Pasture |
| Class VIII | 53459,0 | Suitable for all types of agriculture |
| ***Total*** | ***1412300,0*** | |

**Source:** Environmental Status Report of Yozgat Province, 2007

***Land Use***

Yozgat city, which constitutes 1,82% of the country soils, generally exhibit a plain structure in terms of ground figures. Plateaus cover a majority of ground figures. There are mountains and hills on the plateaus which are not very high. Alluvial plains are formed in valley bottoms and hollow places which break the plateau surface. Ratio of the city soil in ground figures are as; plateaus 51,4%, mountains 37,7% and plains 10,9%. 96,2% of the city soil is general culture field whereas 3,8% is not available for

culture. There is a total area of 276.156 ha meadow and pasture fields in Yozgat. Meadow and pasture fields cover 19,67% of total agriculture fields. Existing meadow and pasture fields are based on agriculture within village residential borders; and there are large meadow and pasture fields based on stockbreeding. Usage situation of city soils are given in the below table.[7]

**Table 21: Distribution of Land Usage Situations in Yozgat**

| Type | Total Area (ha) | Percentage in Surface Area of the City (%) |
|---|---|---|
| Agriculture Field | 825133,0 | 58,78 |
| Meadow-Pasture Field | 276156,0 | 19,67 |
| Forest field | 257552,0 | 18,34 |
| Other | 44859,0 | 3,21 |
| ***Total*** | ***1403700,0*** | ***100,00*** |

**Source:** Environmental Status Report of Yozgat Province, 2008

***Field Classes***

Soils are studied in total 8 classes. Class Distribution of agricultural fields in the city are given in the below table.

**Table 22: Distribution of Land Usage Capability Classes in Yozgat Based on Districts**

| Districts | Total Agricultural Field | I. Class | II. Class | III. Class | IV. Class | V. Class | VI. Class | VII. Class | VIII. Class |
|---|---|---|---|---|---|---|---|---|---|
| Center | 114840,0 | 4114,0 | 19006,0 | 21296,0 | 23872,0 | 5,0 | 19644,0 | 25660,0 | 1209,0 |
| A.Madeni | 54760,0 | 2592,0 | 9632,0 | 10792,0 | 11100,0 | 3,0 | 8956,0 | 11512,0 | 173,0 |
| Aydıncık | 13814,0 | 1528,0 | 1964,0 | 2300,0 | 2667,0 | 1,0 | 2033,0 | 3188,0 | 133,0 |
| Boğazlıyan | 123646,0 | 13414,0 | 22600,0 | 28379,0 | 23604,0 | 4,0 | 18954,0 | 15564,0 | 1127,0 |
| Çandır | 10526,0 | 452,0 | 1683,0 | 1885,0 | 2113,0 | 1,0 | 1739,0 | 2534,0 | 117,0 |
| Çayıralan | 47199,0 | 2245,0 | 8345,0 | 8350,0 | 9485,0 | 2,0 | 7425,0 | 10774,0 | 573,0 |
| Çekerek | 37189,0 | 2343,0 | 5936,0 | 6426,0 | 8111,0 | 2,0 | 5928,0 | 8046,0 | 397,0 |
| Kadışehri | 17323,0 | 1012,0 | 3264,0 | 3700,0 | 2727,0 | 1,0 | 3100,0 | 3358,0 | 161,0 |
| Saraykent | 19714,0 | 2307,0 | 7141,0 | 4275,0 | 2434,0 | 4,0 | 1280,0 | 2194,0 | 79,0 |
| Sarıkaya | 82220,0 | 3328,0 | 43854,0 | 15524,0 | 17400,0 | 4,0 | 13319,0 | 17860,0 | 951,0 |
| Sorgun | 108562,0 | 4105,0 | 17970,0 | 20255,0 | 20828,0 | 5,0 | 19608,0 | 24684,0 | 1307,0 |
| Şefaatli | 69329,0 | 2943,0 | 109370, | 12253,0 | 13736,0 | 4,0 | 12303,0 | 16400,0 | 753,0 |
| Yenifakılı | 26349,0 | 1240,0 | 4613,0 | 5166,0 | 5791,0 | 2,0 | 3850,0 | 5372,0 | 315,0 |
| Yerköy | 99700,0 | 2529,0 | 18647,0 | 18530,0 | 20653,0 | 4,0 | 16275,0 | 22191,0 | 871,0 |
| ***Total*** | ***825133,0*** | ***44152,0*** | ***145592,0*** | ***159129,0*** | ***164521,0*** | ***42,0*** | ***134414,0*** | ***169117,0*** | ***8166,0*** |

**Source:** Environmental Status Report of Yozgat Province, 2008

***Erosion***

Erosion level throughout Yozgat city is given in the following table;

**Table 23: Erosion in Yozgat**

[7] Environmental Status Report of Yozgat Province, 2008

| Districts | Total Area of the District | Light Erosion | Medium Erosion | Severe | Very Severe | Total Area of the Land which Exposed to Erosion | Ratio (%) | Total Area of Erosion Free Land |
|---|---|---|---|---|---|---|---|---|
| Merkez | 201695 | 65872 | 10566 | 90372 | 21071 | 187881 | 13,30 | 13814 |
| A.Madeni | 189727 | 64022 | 10269 | 84288 | 18479 | 177058 | 12,54 | **12669** |
| Aydıncık | 39491 | 12558 | 2014 | 17300 | 4937 | 36809 | 2,61 | **2682** |
| Boğazlıyan | 136752 | 41163 | 8442 | 58101 | 17847 | 125553 | **8,89** | **11199** |
| Çandır | 17110 | 5643 | 905 | 7741 | 1615 | 15904 | 1,13 | **1206** |
| Çayıralan | 110051 | 36705 | 5887 | 47880 | 11741 | 102213 | 7,24 | **7838** |
| Çekerek | 77507 | 25282 | 4055 | 34685 | 8087 | 72109 | 5,11 | **5398** |
| Kadışehri | 57800 | 18853 | 3024 | 25866 | 6031 | 53774 | 3,81 | **4026** |
| Saraykent | 36953 | 8784 | 6988 | 14310 | 5423 | 35505 | 2,51 | **1448** |
| Sarıkaya | 120461 | 39249 | 6456 | 54219 | 11949 | 111873 | 7,92 | **8588** |
| Sorgun | 162134 | 55170 | 8449 | 70694 | 16047 | 150360 | 10,64 | **11774** |
| Şefaatli | 88735 | 28378 | 4551 | 39577 | 10176 | 82682 | 5,85 | **6053** |
| Yenifakılı | 28376 | 9540 | 1500 | 11626 | 3830 | 26496 | 1,88 | **1880** |
| Yerköy | 145508 | 47463 | 7617 | 65116 | 15182 | 135378 | 9,59 | **10130** |
| ***Total*** | ***1,412,300*** | ***458,682*** | ***80,723*** | ***621,775*** | ***152,415*** | ***1,3131,595*** | ***%93,02*** | ***98,705*** |

**Source:** Environmental Status Report of Yozgat Province, 2008

As it can be comprehended from the above given table, mostly Light and Severe erosions occur in Yozgat.

The Land use map of the Yozgat province which shows study area is given in Figure 6.

***Project Area Soil Structure and Land Use***

According to the land use map presented in Figure 3, land use type is classified as “Dry Agricultural” in the Project area. Soil type presented in the Project area also classified as non-calcareous brown soils in accordance with the soil groups map shown below.

Project area is declared as a “medical infrastructure area” according to the zoning plan of the Municipality (Appendix B).

Project site was first owned by Tresury. The site was then allocated to the Ministry of Health. According to the New law on PPP, Law No. 6428 passed by parliament within February, 2013 and passed by the President within the first week of March 2013, the rules and methods of construction of the health facilities on the basis of construction right of independent and continuous nature as not to exceed 30 years on the immovable owned by the Treasury, renewal of the existing facilities and commissioning of the facilities required by the Ministry of Health and subsidiaries.

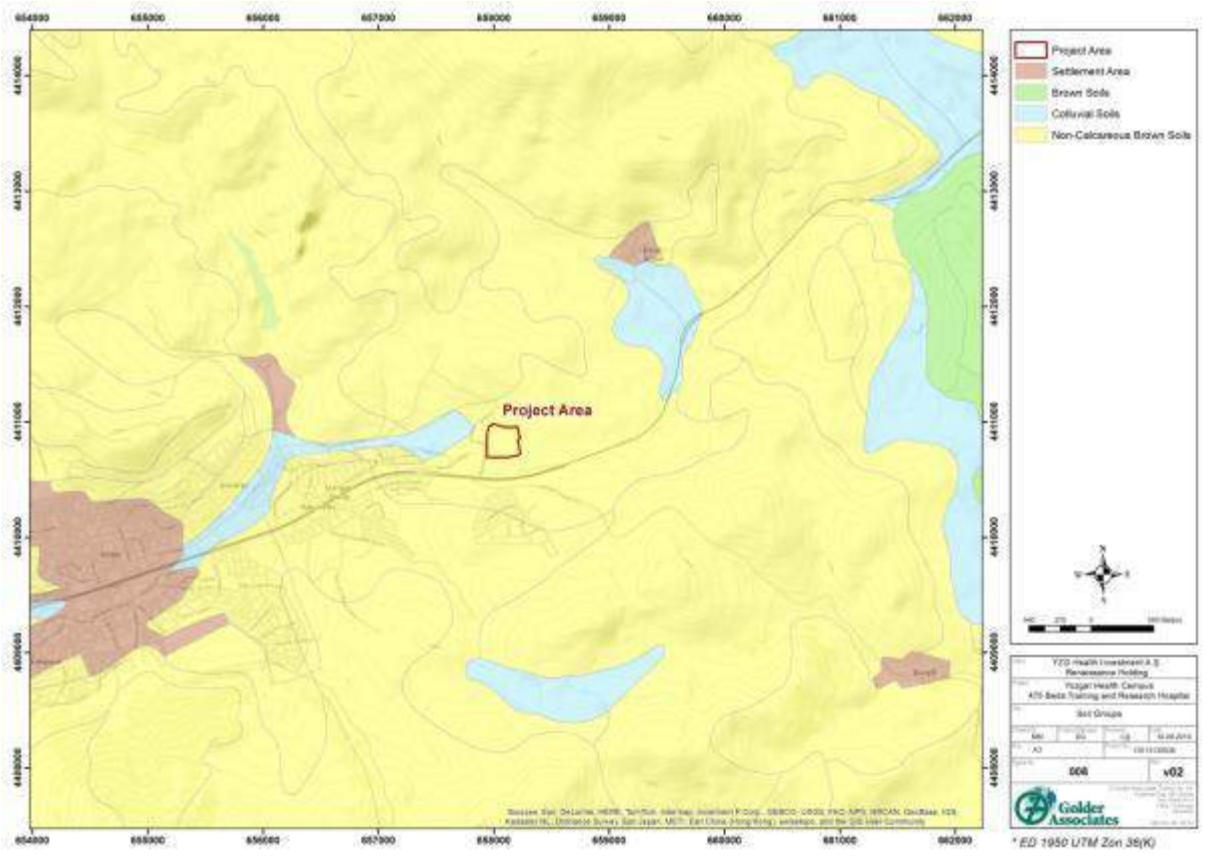


*Figure 7: Soil Groups Map*

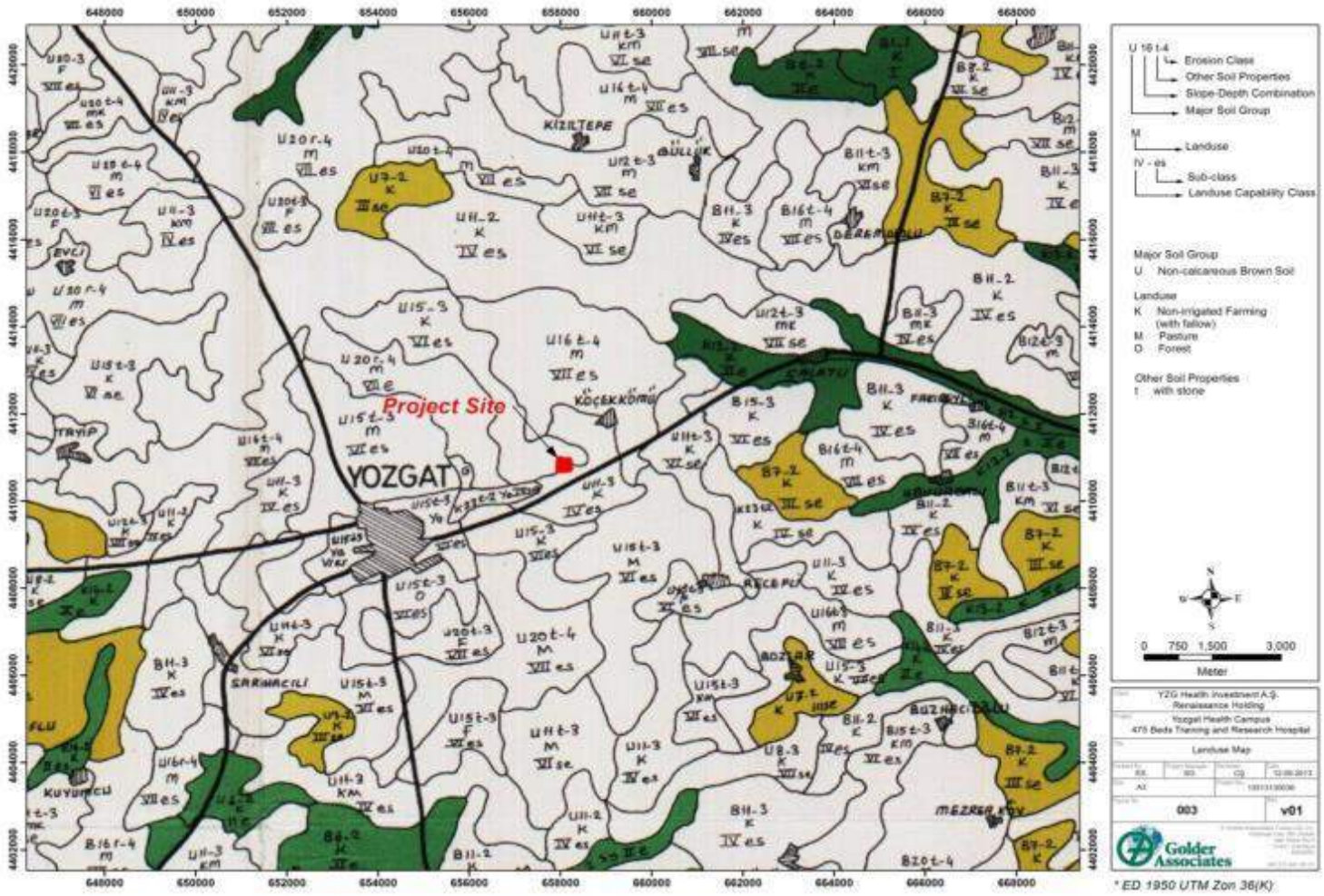


*Figure 8: Land use map of the Yozgat province which shows project area*

***Baseline Measurements***

There was no lithological changes and indication of contamination at site after visual inspection. In the light of this observation, in order to describe baseline soil conditions, 4 soil samples were collected from the topsoil layer (upper 30 cm) to represent the study area. The samples were taken from points close to surface, representing each quadrant of the study area.

All 4 soil samples were analyzed for Extractable Metals and 2 soil samples were analyzed for also Total Petroleum Hydrocarbons (TPH) and Total organic halogens (TOX) to determine baseline conditions and also pollution.

The soil sampling locations and the relevant sample information (coordinates, names, sampling date and time) are given in below table.

The soil samples were sent to the internationally accredited ALS Environmental Laboratory, Prague, Czech Republic for analyses.

Soil samples were scanned at the sampling location using the PID (Photo-Ionization Detector), for indications of Volatile Organic Carbon compounds (VOCs). Field measurement details of the samples collected including the sampling date and the field parameters measured for soil samples are presented in Table 24 and Table 25. The in-situ PID measurements (a qualitative way of assessing the presence of hydrocarbons) did not indicate the presence of volatile organic compounds at the time measurements were taken.

**Table 24: Soil Sampling Locations and PID Measurements of the Soil Samples**

| Sampling ID | Coordinates | | | Date | Time | PID Measurement (ppm) |
|---|---|---|---|---|---|---|
| | Zone | Easting | Northing | | | |
| **YT-1** | 36 | 657990 | 4410893 | 15.08.2013 | 09:00 | 2,7 |
| **YT-2** | 36 | 658119 | 4410886 | 15.08.2013 | 09:30 | 2,2 |
| **YT-3** | 36 | 658155 | 4410715 | 15.08.2013 | 09:50 | 1,5 |
| **YT-4** | 36 | 657963 | 4410691 | 15.08.2013 | 10:30 | 0,9 |

The map showing the study area and the soil sampling locations are given in Figure 7.


*Figure 9: Project Area*

The analytical results of the sampling for each sampling locations are given in Tables below.

**Table 25: Results of Soil Sampling Analysis for extractable metals**

| Sample Name | Units | LOR | YT-1 | YT-2 | YT-3 | YT-4 | Dutch Intervention Values (Soil, mg/kg) |
|---|---|---|---|---|---|---|---|
| Sampling Date | | | 15/08/2013 | 15/08/2013 | 15/08/2013 | 15/08/2013 | |
| **Physical Parameters** | | | | | | | |
| Active pH | - | 1 | 8.4 | 7.5 | 8.4 | 8.2 | NA |
| Dry matter @ 105°C | % | 0.1 | 89.6 | 97.2 | 96.3 | 97.3 | NA |
| **Extractable Metals / Major Cations** | | | | | | | |
| Aluminium | mg/kg | 1 | 36600 | 25600 | 17000 | 30800 | NA |
| Antimony | mg/kg | 0.5 | <0.53 | <0.50 | <0.50 | <0.52 | 22 |
| Arsenic | mg/kg | 0.5 | 7.42 | 9.51 | 11.7 | 12.2 | 76 |
| Barium | mg/kg | 0.2 | 124 | 143 | 113 | 115 | NA |
| Beryllium | mg/kg | 0.01 | <0.010 | <0.010 | <0.010 | <0.010 | NA |
| Bismuth | mg/kg | 1 | <1.0 | <1.0 | <1.0 | <1.0 | NA |
| Boron | mg/kg | 1 | 5 | 4.3 | 3.6 | 3.1 | NA |
| Cadmium | mg/kg | 0.4 | <0.40 | <0.40 | <0.40 | <0.40 | 13 |
| Calcium | mg/kg | 50 | 47400 | 5100 | 62000 | 8100 | NA |
| Chromium | mg/kg | 0.5 | 132 | 56.5 | 23.7 | 47.7 | NA |
| Cobalt | mg/kg | 0.2 | 19.2 | 18.5 | 18.2 | 22.2 | 190 |
| Copper | mg/kg | 1 | 28.6 | 16.2 | 21.9 | 91 | 190 |
| Iron | mg/kg | 10 | 37000 | 28500 | 44500 | 50700 | NA |
| Lead | mg/kg | 1 | 7.6 | 13.3 | 8.4 | 4.1 | 530 |
| Lithium | mg/kg | 1 | 34.4 | 19.9 | 10.2 | 18.3 | NA |
| Magnesium | mg/kg | 5 | 21800 | 7180 | 3540 | 8870 | NA |
| Manganese | mg/kg | 0.5 | 702 | 945 | 889 | 540 | NA |
| Mercury | mg/kg | 0.2 | <0.21 | <0.20 | <0.20 | <0.21 | 4 |
| Molybdenum | mg/kg | 0.4 | <0.40 | 0.42 | 0.44 | <0.40 | 190 |
| Nickel | mg/kg | 1 | 186 | 85.9 | 42.9 | 33.9 | 100 |
| Phosphorus | mg/kg | 5 | 184 | 253 | 592 | 261 | NA |
| Potassium | mg/kg | 5 | 3290 | 2350 | 1810 | 1480 | NA |
| Selenium | mg/kg | 2 | <2.0 | <2.0 | <2.0 | <2.0 | NA |
| Silicon | mg/kg | 50 | 128 | 165 | 176 | 180 | NA |
| Silver | mg/kg | 0.5 | <0.50 | <0.50 | <0.50 | <0.50 | NA |
| Sodium | mg/kg | 15 | 127 | 139 | 641 | 275 | NA |
| Strontium | mg/kg | 0.1 | 60.3 | 27.2 | 50.7 | 29.4 | NA |
| Sulphur | mg/kg | 30 | 98 | 217 | 131 | 131 | NA |
| Tellurium | mg/kg | 1 | <1.0 | <1.0 | <1.0 | <1.0 | NA |
| Thallium | mg/kg | 0.5 | <0.50 | <0.50 | <0.50 | <0.50 | NA |
| Tin | mg/kg | 1 | <1.0 | <1.0 | <1.0 | <1.0 | NA |

| Sample Name | Units | LOR | YT-1 | YT-2 | YT-3 | YT-4 | Dutch Intervention Values (Soil, mg/kg) |
|---|---|---|---|---|---|---|---|
| Sampling Date | | | 15/08/2013 | 15/08/2013 | 15/08/2013 | 15/08/2013 | |
| Titanium | mg/kg | 0.2 | 641 | 352 | 136 | 1020 | NA |
| Vanadium | mg/kg | 0.1 | 65.5 | 63.3 | 115 | 146 | NA |
| Zinc | mg/kg | 3 | 54.8 | 49.5 | 63.6 | 56.6 | 720 |
| Zirconium | mg/kg | 5 | 9.4 | 5.9 | <5.0 | <5.0 | NA |

**Table 26: Results of Soil Sampling Analysis for TOX and TPH**

| Sample Name | Units | LOR | YT-2 | YT-4 | Dutch Intervention Values (Soil, mg/kg) |
|---|---|---|---|---|---|
| Sampling Date | | | 20/08/2013 | 20/08/2013 | |
| **Nonmetallic Inorganic Parameters** | | | | | |
| Total Organic Halogens (TOX) | mg/kg | 10 | <10 | <10 | NA |
| **Aliphatic Fractions of Petroleum Hydrocarbons** | | | | | |
| C5 - C8 Aliphatic Fraction | mg/kg DW | 3.0 | <3.0 | <3.0 | NA |
| C8 - C16 Aliphatic Fraction | mg/kg DW | 17 | <17 | <17 | NA |
| C16 – C35 Aliphatic Fraction | mg/kg DW | 30 | <30 | <30 | NA |
| **Aromatic Fractions of Petroleum Hydrocarbons** | | | | | |
| C5 - C9 Aromatic Fraction | mg/kg DW | 4.0 | <4.0 | <4.0 | NA |
| C9 – C16 Aromatic Fraction | mg/kg DW | 16 | <16 | <16 | NA |
| C16 – C35 Aromatic Fraction | mg/kg DW | 30 | <30 | <30 | NA |

### *Assessment Criteria*

***Upcoming Soil Contamination Control and Point Source Contaminated Sites Regulation***

The assessment of soil in Turkey would be based on the “Regulation on Soil Pollution Control and Point Source Contaminated Sites“ originally published in the Official Gazette number 27605, dated 8 June 2010; and amended on 11 July 2013 in the Official Gazette number 28704 stating that the binding articles provisionally would be effective as of 08 June 2015.

The preceding regulation, namely the Soil Pollution Control Regulation (SPCR), which became ineffective as of 8 June 2010, did not provide specific guidelines related to dealing with specific types of contamination or activities. The limits given by SPCR did not differentiate the land use type and, thus, did not provide soil pollution limits for industrial areas. The SPCR required compliance with the limits given in the regulation regardless of where the site was located.

The articles 1, 2, 3, 4, 5, 6, 35, 40, 41 and 42 are already in effect. A brief summary of the articles among those may be relevant to the project when the regulation becomes effective are as follows:

“ARTICLE 4 (effective)

hh) Hazardous substance: Refers to hazardous substances and preparations defined in paragraph (I) of first sub-clause of Article 4 of Bylaw on Classification, Packaging, and Labeling of Hazardous Substances and Preparations, published in Official Gazette dated 26.12.2008 and numbered 27092, and to all substances defined under hazardous substances in Article 3 of Bylaw on Controlling Water Pollution, published in the Official Gazette dated 31.12.2004 and numbered 25687, “

“ARTICLE 5 (effective):

b) Those concerned in the fields having risk of pollution, and polluters in the polluted fields are obliged to prevent pollution, detect level of pollution, remove impacts of pollution, and reimburse such expenses in pursuant to Article 8 of Environmental Law.

"ARTICLE 6 (effective):

(1) Principles regarding prevention and removal of soil pollution are as follows:

a) It is essential to prevent soil pollution at source.

b) It is forbidden to engage in any activity such as releasing any and all kind of waste and residual into soil or stocking in the soil directly or indirectly in a way harmful to soil in contradictory with standards and methods stipulated in Environmental Law and relevant legislation.

c) Polluted soil cannot be mixed with clean soil.

ç) Required measures to prevent soil pollution shall be taken in activities and facilities where hazardous substances are used, stocked, and produced, and in the facilities where wastes are generated, disposed, or recovered, by considering risk of accidents."

These articles should be taken into consideration during day to day activities (especially in the construction period) that involve any hazardous materials.

According to Regulation (Annex 9: Comparison of Pollution Indicator Parameters Measured Values with Reference Values);

In the event that a definite decision cannot be made on the pollution state of suspicious area during site inspection in scope of First Stage Assessment or pollution of area is found to be suspicious the soil / surface – ground water / gas samples taken from the field thought / assumed to have been polluted due to point-source or human activity shall be subject to "pollution indicator parameter" measurements as mentioned in the Tables 1 and 2 in Annex 2. These measurements shall be called "measurement value (MV) and the higher one among these values shall be named as maximum measurement value (MVmax). MVmax shall be compared with field-specific "reference value" (RV).

Reference Value (RV) shall be determined with the "Pollution Indicator Parameter Measurements" done for First Stage Assessment on the soil / surface – ground water / gas samples taken from the field thought / assumed not to have been polluted due to point-source or human activity (which is clean) at the vicinity of suspicious field; and with Target Pollutant Concentration Measurements done for Second Stage Assessment. Reference Value is used to compare First Stage Assessment of Suspicious Field or Target Pollutant (Second Stage Assessment) concentration to the Measurement Value.

Scope and details of sampling approach to be applied in both RV measurement and MV determination shall be specified by the Ministry.

Deviation from Reference Value

Values measured at the field are compared to the reference values in order to determine deviation from reference value. Degree of deviation is used to determine whether field was affected or not affected by any point-source activity, and decide on the approach to be adopted.

Deviation: Maximum Measurement Value / Reference Value

Assessment shall be made according to general framework given in below Table. According to this; if ratio of maximum measured value to the reference value is equal to or smaller than 1 it shall be decided that the field does not require follow-up. If the value of deviation is between 1 and 25 the field shall be defined as the field requiring follow-up and shall be subject to Second Stage Assessment. If value of deviation is bigger than 25 it is decided that the pollution is large and dangerous and that the field is a Polluted Field which should be cleaned as per the process specified by the Ministry. In cases where more than one PIP parameters should be measured on the field the PIP deviation value showing the worst case shall be taken into account.

**Table 27: Pollution Assessment Based on Reference Value**

| Criterion (Deviation =MVmax/RV) | Result |
|---|---|
| < 1 | Field Requiring No Follow-Up |
| >1 | Field Requiring Follow-Up, which is Subject to the Second Stage Assessment |
| >25 | Polluted Area, which should Be Cleaned as per the Process Determined by the Ministry |

These measurements results are considered as reference values for the site according to estimation that The Site is unpolluted.

The result of soil sample analyses would be used as the reference/baseline values. In the event a potential contamination occurs in the future, samples would be collected to investigate would be compared with the reference/baseline samples and they would be compared with the samples that might be taken in the event of a suspect for contamination in the future. The results of soil samples indicate the baseline conditions of the study area. Considering the Site has not been occupied and had or has no chemicals stored, the soil is not expected to be contaminated. During the Site visit, no signs of soil contamination (such as distressed vegetation, stained soils, and/or stained paving) are observed. Results of the soil analyses also shows that there is no signs of soil contamination, since results are not extreme values.

***Dutch Standards***

The Dutch Standards which are environmental pollutant reference values used in environmental remediation, investigation and clean-up are utilized as well for determining the contamination status of the samples. They have been adopted as reference standards for many countries lacking national standards, including in Turkey.

Barring a few exceptions, the target values are underpinned by an environmental risk analysis wherever possible and apply to individual substances. In most cases, target values for the various substances are related to a national background concentration that was determined for the Netherlands.

The soil remediation intervention values indicate when the functional properties of the soil for humans, plants and animals is seriously impaired or threatened. They are representative of the level of contamination above which a serious case of soil contamination is deemed to exist. The target values for soil are adjusted for the organic matter (humus) content and soil fraction <0.2 µm. The values below are calculated for a 'Standard Soil' with 10% organic matter and 25% *lutum*.

A case of environmental contamination is defined as 'serious' if >25 m³ soil is contaminated above the intervention value.

Not all the analytical parameters sampled for during this investigation have corresponding Dutch Limits that they can be compared with.

***Result and Discussion***

No visual or olfactory contamination indicators were registered during the collection of the samples. The in-situ PID measurements (a qualitative way of assessing the presence of hydrocarbons) did not indicate the presence of volatile organic compounds.

In all soil samples, the aliphatic and aromatic hydrocarbon fraction concentrations are below the laboratory detection limits.

The parameters above compared with the corresponding Dutch Limits are below the Dutch Intervention Values except for Nickel in the sample YT-1. Nickel concentration is slightly above the Dutch limit value.

Formatte

Nickel occurs naturally in soils as a result of the weathering of the parent rock. The underlying geology and soil-forming processes strongly influence the nickel concentrations in soils.

### 5.2.2 Impact Analysis Results

Based on the analysis of the Project, impacts on soil and land use during the construction phase would be due to soil removal, because of the dismantling and lowering of natural and artificial areas prior to the construction of new facilities. Potential contamination from vehicles or any chemicals or hazardous materials that might be used during the construction, temporary storage of hazardous materials and/or wastes might also contaminate the soil. An impact on soil in terms of occupation of land, due to temporary stockpiling of soil before re-use or disposal may also be expected. An impact due to soil in terms of dust emissions from truck traffic and transport of construction materials and excavated materials may also expected.

During the operational phase, impacts on soil will be related to the occupation of land, to the increase of artificial surfaces due to presence of new buildings or facilities and to potential pollution on top soil related to the increase of road traffic. Also potential contamination from vehicles or temporary storage of hazardous materials and/or wastes might also contaminate the soil.

During the construction phase, the impact factors that could potentially affect soil and land use are:

- soil removal;
- soil contamination;
- dust emissions in top soil (road traffic and facilities construction);
- occupation of land.

Impact factors that could potentially affect soil and land use components during the operational phase are:

- soil contamination;
- occupation of land;
- increase of artificial surface

#### *5.2.2.1 Construction phase*

In the construction phase, activities related to civil engineering will involve excavation and removal of small volumes of top soil, possibly in the range of a few cm. The main impact will be due to the soil removal for the dismantling and lowering of natural and artificial areas prior to the construction of new facilities. Impact of soil removal is estimated to be low.

An impact due to truck traffic and transport of construction materials and excavated materials would be dust emissions. There are no existing buildings at the Project Area so there will be no dust emissions from demolition. The impact on soil related to traffic of trucks estimated negligible.

There may be potential spills from the vehicles and construction equipment that might contaminate the soil. The impact of the operation of vehicles and construction equipment on soil will be negligible.

A temporary occupation of land during construction activities will be necessary to place camp area and to stock excavation or construction material. The construction of new roads is not planned; instead existing infrastructures will be used with the enlargement of the roads. In the construction phase the impact on soil related to land occupation is estimated to be low.

**Table 28: Impact evaluation matrix for soil component during construction phase before mitigation**

| IMPACT EVALUATION MARTIX - SOIL AND LAND USE CONSTRUCTION PHASE | | Soil removal | Pollutant emission in top soil | Occupation of land |
|---|---|---|---|---|
| Duration (D) | short | | | |
| | medium-short | | | |
| | medium | | | |
| | medium-long | | | |
| | long | | | |
| Frequency (F) | concentrate | | | |
| | discontinuous | | | |
| | continuous | | | |
| Geographic extent (G) | local | | | |
| | regional | | | |
| | beyond regional | | | |
| Intensity (I) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | irreversible | | | |
| Probability of occurrence (P) | low | | | |
| | medium | | | |
| | high | | | |
| | certain | | | |
| Sensitivity (S) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1.80 | 0.91 | 1.81 |
| | | **Low** | **Negligible** | **Low** |

* in case of contamination sensitivity would be high and potential impact would be medium low; low; negligible.

### 5.2.2.2 Operational phase

Presence of buildings and facilities will cause an increasing of artificial surface, because structures are planned to be constructed on semi-natural areas. Occupation of land will occur due to presence of new infrastructure and road enlargement.

Potential pollution on top soil caused by the increase of road traffic, storage of chemicals and hazardous wastes/materials (will include medical wastes) is also expected. Impact expected for the soil component and land use is estimated to be low for each impact factor.

**Table 29: Impact evaluation matrix for soil component during operational phase before mitigation**

| IMPACT EVALUATION MARTIX - SOIL AND LAND USE OPERATIONAL PHASE | | Increase of artificial surface | Pollutant emission in top soil | Occupation of land |
|---|---|---|---|---|
| Duration (D) | short | | | |
| | medium-short | | | |
| | medium | | | |
| | medium-long | | | |
| | long | | | |
| Frequency (F) | concentrate | | | |
| | discontinuous | | | |
| | continuous | | | |
| Geographic extent (G) | local | | | |
| | regional | | | |
| | beyond regional | | | |
| Intensity (I) | negligible | | | |
| | Low | | | |
| | medium | | | |
| | high | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | irreversible | | | |
| Probability of occurrence (P) | Low | | | |
| | medium | | | |
| | high | | | |
| | certain | | | |
| Sensitivity (S) | negligible | | | |
| | Low | | | |
| | medium | | | |
| | high | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 2.33 | 1.75 | 2.33 |
| | | **Low** | **Low** | **Low** |

* in case of contamination sensitivity would be high and potential impact would be medium low for all of the impact factors.

#### 5.2.2.3 Decommissioning phase

Decommissioning activities could have an adverse impact on soil, due to short term traffic/demolition/removal, while a remedial impact can be expected due to the removal of structures. An impact related to traffic of trucks for the transfer of construction and excavated materials, with emission of dust and pollutant on soil is also expected. The production of dust will be concentrated during the demolition of the existing buildings, surface leveling and grading and temporary stockpiling of the material; impact is estimated negligible.

### 5.2.3 Mitigation measures

If soil contamination is suspected during construction related excavation, a detailed Phase I Environmental Site Assessment (ESA) should be conducted in order to determine if there are any contaminants sources present within the sit or in the near vicinity. After Phase I ESA, based on results, if needed, a Phase II Environmental Site Assessment would be conducted by collecting soil samples in order to determine if there is any contamination in the soil, types and distribution of the contaminants. This assessment would be based on the "Regulation on Soil Pollution Control and Point Source Contaminated Sites" originally published in the Official Gazette number 27605, dated 8 June 2010; and amended on 11 July 2013 in the Official Gazette number 28704 stating that the binding articles provisionally would be effective as of 08 June 2015.

In case that results of survey show the compliance with site-specific soil quality limits set by the regulation, materials coming from leveling activities could be excavated, transported, and used in the construction of embankments and/or backfill, after an assessment of physical properties.

If the soil is contaminated, it is recommended to work with the local regulatory agencies to select solutions for treatment or disposal, and in general to follow a standard practice:

- avoid or minimize temporary stockpiling of contaminated soils or hazardous material;
- if temporary stockpiling is necessary:
  - isolate the stockpile with impermeable liner or tarps;
  - install a berm around the stockpile to prevent runoff from leaving the area;
  - do not stockpile in or near storm drains or watercourses.

In order to reduce loss of top soil due to project actions in the construction phase, the following mitigations could be applied:

- removed topsoil could be stored in an appropriate area in the Project Site, to be used for landscaping after the construction (As required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 03, 2004 at Official Gazette no.25406);
- to avoid loss by surface runoff, stored soil will be covered by tarpaulins or gravel; the ground will be covered by impermeable material and the slope of the soils will not be over 5%;
- temporary cross ditches will be constructed to redirect surface runoff;

Mitigation related to store practice and reuse of soil are not applicable in case of evidence of soil contamination.

Although the connection road from the Project Site exists and paved; it is assumed that during the construction phase the road could be partially unpaved. Concerning potential emission of dust and pollution in top soil, in construction phase, mitigations measures could consist in the following:

- Vehicle restrictions to limit the speed, weight, or number of vehicles;
- Surface improvement, such as paving or adding gravel to the surface;
- Surface treatment, such as watering or chemical treatment.

During construction the measures to mitigate the possible contamination of soil through the operation of the vehicles and construction equipment should be taken. The measures will include

- Routine maintenance of the vehicles and equipment to prevent oil leaks
- Proper storage of the chemicals
- Clean-up of spills as it occurs

During the operational phase, the presence of new structures and related increase in artificial surface cannot be mitigated, although compensatory instruments should be contemplated during following steps of consultation with authorities.

Production of medical wastes will be a significant result of the operation of the facility. Medical wastes will create significant environmental risks in terms of soil pollution if not handled in line with ındustry practices and regulatory requirements. There will be a waste management plan prepared for the project where the details of the waste collection, segregation and disposal will be detailed. The minimum requirements of the waste management plan is detailed in Waste Management Plan (Appendix A)

### 5.2.4 Residual impacts

#### *5.2.4.1 Construction phase*

Mitigation measures can be applied to reduce the potential impacts; in the construction phase mitigation measures could ensure a residual low effect on soil removal and medium effect on pollutant emission, while no mitigation measures can be applied for the occupation of land.

Following the mitigation measures, impact on soil removal will be negligible instead of low.

**Table 30: Impact evaluation matrix for soil component during construction phase after mitigation**

| IMPACT EVALUATION MARTIX - SOIL AND LAND USE CONSTRUCTION PHASE | | Soil removal | Pollutant emission in top soil | Occupation of land |
|---|---|---|---|---|
| Duration (D) | Short | | | |
| | medium-short | | | |
| | Medium | | | |
| | medium-long | | | |
| | Long | | | |
| Frequency (F) | Concentrate | | | |
| | Discontinuous | | | |
| | Continuous | | | |
| Geographic extent (G) | Local | | | |
| | Regional | | | |
| | beyond regional | | | |
| Intensity (I) | Negligible | | | |
| | Low | | | |
| | Medium | | | |

| IMPACT EVALUATION MARTIX - SOIL AND LAND USE CONSTRUCTION PHASE | | Soil removal | Pollutant emission in top soil | Occupation of land |
|---|---|---|---|---|
| | High | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | İrreversible | | | |
| Probability of occurrence (P) | Low | | | |
| | Medium | | | |
| | High | | | |
| | Certain | | | |
| Mitigation (M) | High | | | |
| | Medium | | | |
| | Low | | | |
| | None | | | |
| Sensitivity (S) | Negligible | | | |
| | Low | | | |
| | Medium | | | |
| | High | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1.35 | 0.45 | 1.81 |
| | | **Negligible** | **Negligible** | **Low** |

* in case of contamination sensitivity would be high and potential impact would be: Low; Negligible; Negligible

### 5.2.4.2 Operational phase

Mitigation measures could be applied to reduce the potential impact in operational phase of pollutant emission on the soil component, reducing impact from low to negligible; no mitigation measures have been considered for the occupation of land and increase of artificial surface.

**Table 31: impact evaluation matrix for soil component during construction phase after mitigation**

| IMPACT EVALUATION MARTIX - SOIL AND LAND USE OPERATIONAL PHASE | | Increase of artificial surface | Pollutant emission in top soil | Occupation of land |
|---|---|---|---|---|
| Duration (D) | Short | | | |
| | medium-short | | | |
| | Medium | | | |
| | medium-long | | | |
| | Long | | | |

| IMPACT EVALUATION MARTIX - SOIL AND LAND USE OPERATIONAL PHASE | | Increase of artificial surface | Pollutant emission in top soil | Occupation of land |
|---|---|---|---|---|
| Frequency (F) | Concentrate | | | |
| | Discontinuous | | | |
| | Continuous | | | |
| Geographic extent (G) | Local | | | |
| | Regional | | | |
| | beyond regional | | | |
| Intensity (I) | Negligible | | | |
| | Low | | | |
| | Medium | | | |
| | High | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | İrreversible | | | |
| Probability of occurrence (P) | Low | | | |
| | Medium | | | |
| | High | | | |
| | Certain | | | |
| Mitigation (M) | High | | | |
| | Medium | | | |
| | Low | | | |
| | None | | | |
| Sensitivity (S) | Negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 2.33 | 0.88 | 2.33 |
| | | **Low** | **Negligible** | **Low** |

### 5.2.5 Monitoring

With regards to the soil component, main impacts have been identified as connected to soil pollution in construction and operational phase.

Monitoring actions could be undertaken to define baseline quality of the component before construction, and to verify any changes eventually occurred during construction and operational activities.

Monitoring sites would be selected among areas in which critical actions or activities are planned; frequency will be high during construction to plan corrective actions at the initial stage of pollution; during the operational phase it will be repeated with lower frequency.

Monitoring of the application of the waste management plan will be required through inspections and audits as necessary in order to ensure that the disposal of medical wastes are in line with the industry practices and regulatory requirements.

## 5.3 Surface water hydrology

### 5.3.1 Baseline

#### *5.3.1.1 Study area*

The study area for the hydrology and surface water quality component covers the Study Area and immediate surroundings, in order to provide a significant overview of the context.

#### *5.3.1.2 Methodology*

Information regarding Hydrology has been collected through desktop studies and available reports.

Hydrology baseline conditions have been assessed from desktop studies, literature data review. Main sources reviewed are listed below:

- Environmental Status Report of Yozgat Province, 2008
- DSİ (Devlet Su İşleri- State Hydraulic Works) Official Web Site - http://www.dsi.gov.tr/

#### *5.3.1.3 Baseline results*

***General Hydrological Structure***

There is no natural lake inside Yozgat City boundary. As the river beds are suitable, there are lots of dams constructed for irrigation, drinking water and flood protection purposes in the province of Yozgat. Surface water potential of the Yozgat is mostly provided from Delice River (572 hm³/year) and Çekerek River (461 hm³/year) Water sources potential of Yozgat province is given below table[8]:

**Table 32: Water Potential**

| **Surface water** | **1033 hm³/year** |
|---|---|
| Groundwater | 92 hm³/year |
| Total Water Potential | 92 hm³/year |

**Source:** Environmental Status Report of Yozgat Province, 2008

Water ponds/reservoirs in the Merkez District of Yozgat province are listed below;

- Fakıbeyli (12,5 km North-East of the Study Area)
- Derbent (23 km North-West of the Study Area)
- Topçu (11 km South of the Study Area)
- B.Cevdet Dündar (3 km South-West of the Study Area)
- Kirazlı Çiftlikdere (2 km North-West of the Study Area)
- Gelingüllü (30 km South-East of the Study Area)
- Musabeyli - under construction (15 km North-West of the Study Area)

[8] Environmental Status Report of Yozgat Province, 2008

***Project Area Hydrological Structure***

No streams or any other surface water bodies were observed during the Site visit at the Study are or close vicinity.

According to the baseline information, the hydrology component in the Study Area has the following characteristics:

- No rivers or streams are present;
- No water sources used for drinking water and irrigation purposes are present.
- Closest surface water bodies are Kirazlı ponds with a 2km and 3km distance and Cevdet Dündar Pond with a 2.5km distance.

The surface bodies near the Project Area and the distance between them are shown in below figure.

Sensitivity of hydrology component can be evaluated to be negligible. Surface bodies close to of Project Area are given in below figure.

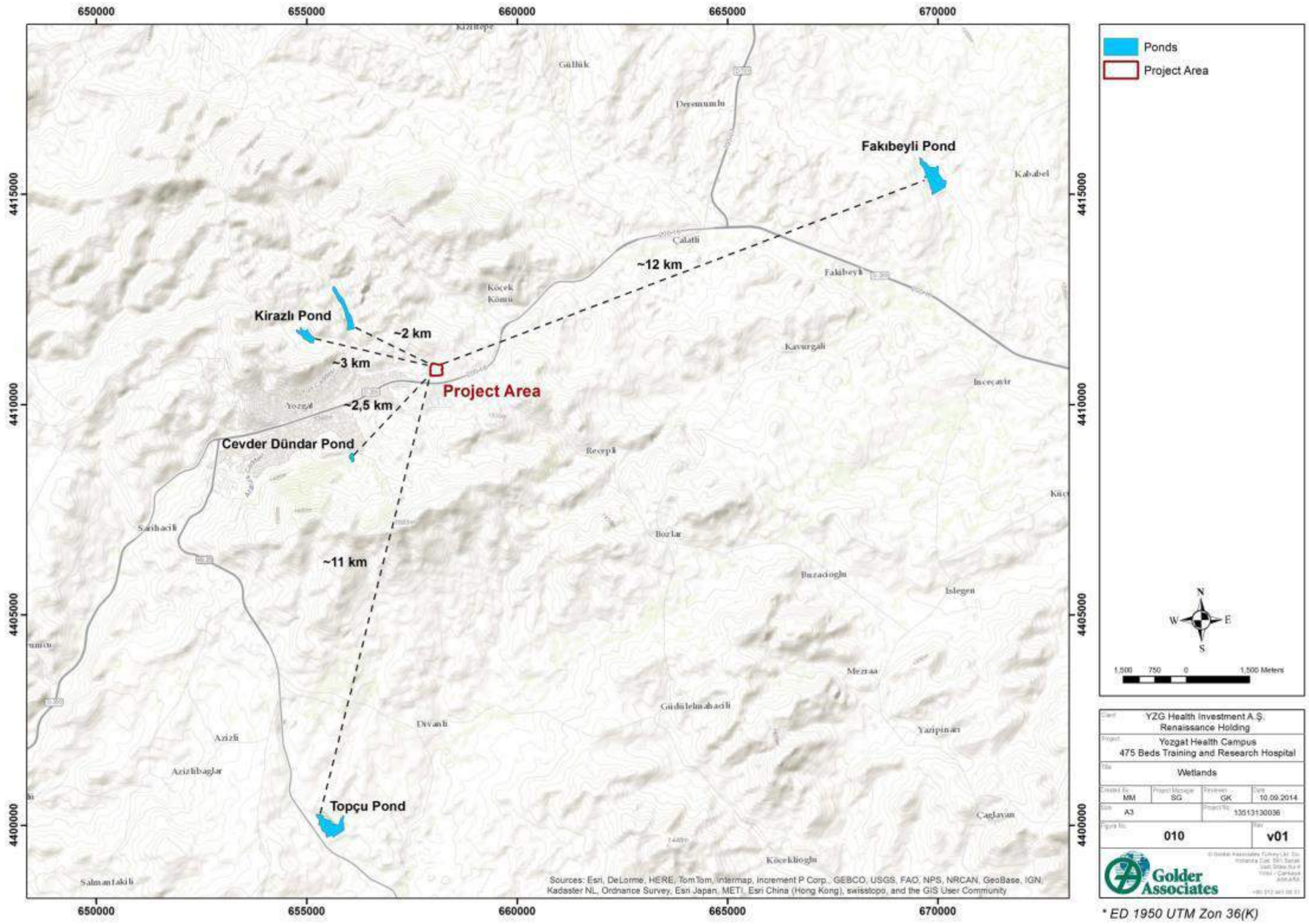


*Figure 10: Surface Bodies close to the Project Area*

### 5.3.2 Impact Analysis results

During the construction phase no interference is predictable with rivers or streams; drinking and potable water for the usage by workers would be provided from the city water network. Addition to these there will be water needs for the construction activities such as dust suppression and concrete preparation. There is no planning activity related to construct a groundwater. The needed water would be provided from outsources.

During construction phase, domestic wastewater would be collected in impermeable septic holes and disposed according to Water Pollution Control Regulation (WPCR, Issued on 31.12.2004 in the Official Gazette No: 25687) Article 32 and other relevant regulations. Domestic wastewater would be collected in leak-proof septic holes and the septic holes would be emptied periodically by a vacuum truck and disposed of at wastewater sewage system. Impacts on hydrology will be due to the increase of water needs, wastewater generation and management during construction works and camps.

During the operational phase domestic wastewater would be discharged to the city sewerage system. There would be storm water (rain water) collection system at the Site separate to the domestic wastewater network of The Site. Storm water would be collected separately and used mostly for irrigation.

IFC requirements for Process Wastewater (Medical wastewater) from Healthcare Facilities are described below;

Process Wastewater from Healthcare Facilities often has a quality similar to urban wastewater. Contaminated wastewater may result from discharges from medical wards and operating theatres (e.g. body fluids and excreta, anatomical waste), laboratories (e.g. microbiological cultures, stocks of infectious agents), pharmaceutical and chemical stores; cleaning activities (e.g. waste storage rooms), and x-ray development facilities. Wastewater may also result from treatment disposal technologies and techniques, including autoclaving, microwave irradiation, chemical disinfection, and incineration (e.g. treatment of flue gas using wet scrubbers which may contain suspended solids, mercury, other heavy metals, chlorides, and sulphates).

If wastewater decided to discharge to sanitary sewage treatment systems, the HCF would ensure that wastewater characteristics are in compliance with all applicable permits (Water Pollution Control Regulation, Hazardous Waste Control Regulation and etc.) and that the municipal facility is capable of handling the type of effluent discharged, as discussed in the General EHS Guidelines of IFC.

Drilling at a depth below the water table or dewatering or increase of water demand during construction and operational phase could have potential impacts on the local hydrology. The impact related to artificial drainage systems has also been considered, as well as the potential pollution due to an inefficient management of water and wastewater.

Surface runoff patterns in the project area would be impacted by the project with the changes in the characteristics of the surface. The artificial surface in the project area will increase with the construction and operation of the hospital and associated buildings.

Impacts during the construction phase on the surface water component are related to the following impact factors:

- hydrological changes based on increase of water demand
- changes in surface run-off patterns

The impact factor that could potentially affect surface water component during the operational phase is:

- hydrological changes based on increase of water demand
- changes in surface run-off patterns
- leakages during handling of medical wastes into water bodies

### 5.3.2.1 Construction phase

Wastewater generation during the construction phase will consist of the domestic wastewater from construction camp and wastewater from the construction works. Wastewater generation and water needs during construction are not quantifiable at this stage.

Main liquid waste originated from the Project operations will consist of process wastewater and domestic wastewater. The wastewater during construction and operation phases will be discharged according to the provisions of the Regulation on Water Pollution Control.

In addition, an increase of water supply is expected during construction of facilities to answer to civil construction, for camp and workers necessities. There is a possibility to construct a groundwater well for water usage for construction activities.

These actions could determinate changes in surface run-off patterns and hydrological changes; both of them are estimated to be Negligible.

**Table 33: impact evaluation matrix for hydrology component during construction phase before mitigation**

| IMPACT EVALUATION MARTIX - SURFACE WATER HYDROLOGY CONSTRUCTION PHASE | | Surface run-off | Hydrological changes |
|---|---|---|---|
| Duration (D) | Short | | |
| | medium-short | | |
| | Medium | | |
| | medium-long | | |
| | Long | | |
| Frequency (F) | Concentrate | | |
| | Discontinuous | | |
| | Continuous | | |
| Geographic extent (G) | Local | | |
| | Regional | | |
| | beyond regional | | |
| Intensity (I) | Negligible | | |
| | Low | | |
| | Medium | | |
| | High | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | İrreversible | | |
| Probability of occurrence (P) | Low | | |
| | Medium | | |
| | High | | |
| | Certain | | |
| Sensitivity (S) | Negligible | | |
| | low | | |

| IMPACT EVALUATION MARTIX - SURFACE WATER HYDROLOGY CONSTRUCTION PHASE | | Surface run-off | Hydrological changes |
|---|---|---|---|
| | medium | | |
| | high | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1.57 | 0.52 |
| | | **Negligible** | **Negligible** |

### 5.3.2.2 Operational phase

During the operational phase an increase of water needs can be estimated, together with an increase of volumes of wastewater discharged. Surface runoff patterns in the project area would be impacted by the project with the changes in the characteristics of the surface.

During the operational phase domestic water would be supplied from city network and domestic wastewater would be discharged to the city sewerage system

Leakages during handling of medical wastes into water bodies will pose a pollution risk to the hydrological features.

**Table 34: impact evaluation matrix for hydrology component during operational phase before mitigation**

| IMPACT EVALUATION MARTIX - SURFACE WATER HYDROLOGY OPERATIONAL PHASE | | Surface run-off | Hydrological changes | Leakage from waste operations |
|---|---|---|---|---|
| Duration (D) | short | | | |
| | medium-short | | | |
| | medium | | | |
| | medium-long | | | |
| | long | | | |
| Frequency (F) | concentrate | | | |
| | discontinuous | | | |
| | continuous | | | |
| Geographic extent (G) | local | | | |
| | regional | | | |
| | beyond regional | | | |
| Intensity (I) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | irreversible | | | |

| | | | | |
|---|---|---|---|---|
| Probability of occurrence (P) | low | | | |
| | medium | | | |
| | high | | | |
| | certain | | | |
| Sensitivity (S) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1.57 | 2.60 | 1.84 |
| | | **Negligible** | **Low** | **Low** |

#### 5.3.2.3 Decommissioning phase

Since natural water drainage is not present in SA, decommissioning activities are not estimated to have an impact on surface water, except for water consumption and wastewater for dismantling actions.

Absence of infrastructures could have a positive impact, if the natural state of the land is recovered; however this is not likely as the area will probably continue to be used for other purposes.

### 5.3.3 Mitigation measures

The Study Area is unlikely to be subject to risk of flooding, however, rain water interceptor sewers and grids should be placed within the scope of construction practices. The grids should be checked and cleaned on a periodical basis in order to prevent possible blockages during the operation phase.

It could be necessary to plan monitoring actions to verify compliance of wastewater with regulatory requirements during construction and operation.

To prevent impacts on water and wastewater in terms of additional production and needs, it could be useful to apply a water resource management plan directed at optimizing the use of water and in minimizing the environmental impact of water use on the natural environment (Appendix A).

~~Production of medical wastes will be a significant result of the operation of the facility. Medical wastes will create significant environmental risks in terms of water pollution if not handled in line with industry practices and regulatory requirements. There will be a waste management plan prepared for the project where the details of the waste collection, segregation and disposal will be detailed. The minimum requirements of the waste management plan is detailed in Waste Management Plan (Appendix A)~~

### 5.3.4 Residual impacts

#### 5.3.4.1 Construction phase

Mitigation measures can be applied to reduce potential impact; in construction phase mitigation measures are likely to have a low effect on surface run-off and to hydrological changes.

Impact on surface run-off and hydrological changes after mitigation is expected to be negligible.

**Table 35: impact evaluation matrix for hydrology component during construction phase after mitigation**

| IMPACT EVALUATION MARTIX - SURFACE WATER HYDROLOGY CONSTRUCTION PHASE | | Surface run-off | Hydrological changes |
|---|---|---|---|
| Duration (D) | Short | | |
| | medium-short | | |
| | Medium | | |
| | medium-long | | |
| | Long | | |
| Frequency (F) | Concentrate | | |
| | Discontinuous | | |
| | Continuous | | |
| Geographic extent (G) | Local | | |
| | Regional | | |
| | beyond regional | | |
| Intensity (I) | Negligible | | |
| | Low | | |
| | Medium | | |
| | High | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | İrreversible | | |
| Probability of occurrence (P) | Low | | |
| | Medium | | |
| | High | | |
| | Certain | | |
| Mitigation (M) | High | | |
| | Medium | | |
| | Low | | |
| | None | | |
| Sensitivity (S) | Negligible | | |
| | Low | | |
| | Medium | | |
| | High | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1.18 | 0.39 |
| | | **Negligible** | **Negligible** |

### 5.3.4.2 Operational phase

During the operational phase, mitigation measures can only have a low effect on hydrological changes; impact on hydrological changes after mitigation is expected to be negligible.

**Table 36: impact evaluation matrix for hydrology component during operational phase after mitigation**

| IMPACT EVALUATION MARTIX - SURFACE WATER HYDROLOGY OPERATIONAL PHASE | | Surface run-off | Hydrological changes | Leakage from waste operations |
|---|---|---|---|---|
| Duration (D) | short | | | |
| | medium-short | | | |
| | medium | | | |
| | medium-long | | | |
| | long | | | |
| Frequency (F) | concentrate | | | |
| | discontinuous | | | |
| | continuous | | | |
| Geographic extent (G) | local | | | |
| | regional | | | |
| | beyond regional | | | |
| Intensity (I) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | irreversible | | | |
| Probability of occurrence (P) | low | | | |
| | medium | | | |
| | high | | | |
| | certain | | | |
| Mitigation (M) | high | | | |
| | medium | | | |
| | low | | | |
| | none | | | |
| Sensitivity (S) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.78 | 0.98 | 0.11 |

| IMPACT EVALUATION MARTIX - SURFACE WATER HYDROLOGY OPERATIONAL PHASE | Surface run-off | Hydrological changes | Leakage from waste operations |
|---|---|---|---|
| | Negligible | Negligible | Negligible |

### 5.3.5 Monitoring

Wastewater should be collected and discharged according to relevant regulations.

It is necessary to plan monitoring actions to verify compliance of wastewater with regulatory requirements. A monitoring plan should be performed to verify contents of wastewater; samples should be taken to avoid environmental risk of pollution.

The project must meet the requirements of "Regulation on Permits and Licenses to be Secured According to the Environmental Law (No: 27214 on 29.04.2009)", in operation phase.

To prevent impacts on water and wastewater in terms of additional production and needs, it could be useful to apply water consumption and monitoring plan resource management plan directed at minimizing the use of water during operation and in minimizing the natural resource consumption.

Monitoring of the application of the waste management plan will be required through inspections and audits as necessary in order to ensure that the disposal of medical wastes are in line with the industry practices and regulatory requirements.

## 5.4 Hydrogeology

### 5.4.1 Baseline

#### *5.4.1.1 Study area*

The study area for the groundwater covers the Study Area and immediate surroundings, in order to have a better definition of the hydrogeological settings. There is no detailed information available regarding the hydrogeology of the Study Area and no detailed hydrogeological investigation has been carried out. It is not possible to precisely identify hydrogeological impacts without the understanding of the Project Site hydrogeology.

#### *5.4.1.2 Methodology*

A hydrogeological overview has been retrieved from desktop analysis and geotechnical assessment report. There is no SA specific hydrogeological data available.

#### *5.4.1.3 Baseline results*

Total groundwater reserves in the province of Yozgat, which has an altitude of 1298 m, and the average annual precipitation is 408.2 mm, are 92 $hm^3$/year. Total of 30.51 $hm^3$ of groundwater is allocated for use (3.68 $hm^3$ for irrigation and 26.83 $hm^3$ for drinking water). Drinking water and mestic water sources are given in below table[9].

**Table 37: Sources of Drinking and Domestic Water**

| Source | Purpose of Usage | Status | Starting Date of Operation | Name of the River | Name of Settlement | Distance (km) |
|---|---|---|---|---|---|---|
| Well and Drilling | Drinking and | Operation | 1994 | Arapseyfi | Yozgat | 33 km |

[9] Environmental Status Report of Yozgat Province, 2008

| Source | Purpose of Usage | Status | Starting Date of Operation | Name of the River | Name of Settlement | Distance (km) |
|---|---|---|---|---|---|---|
| | Domestic Water | | | | | |
| Ponds | Drinking and Domestic Water | Operation | 1980 | Kirazlı | Yozgat | 2 km |

**Source:** Environmental Status Report of Yozgat Province, 2008

Because of the geological characterizes of Yozgat province, groundwater comes to the surface as a spring in lots of places. Therefore, Yozgat city is very rich in terms of groundwater. Source of the groundwater is usually limestone formations of the region.

The geotechnical investigation was conducted by Kilci Mühendislik Müşavirlik Proje İnş. Taah.. San. ve Tic. Ltd. Şti (June 2013). According to the report, a total of 16 borings were drilled for investigation purposes.

According to the geotechnical report, perched groundwater was encountered in the borings drilled down to varying depths from 15 m to 30 m during the geotechnical investigation. It is expected that the regional groundwater level is deeper than 30 m. However, perched groundwater was encountered as the investigations were carried out during the rainy season. It is planned that the entire area would be excavated with varying depths between 5 m to 30 m during the construction.

### 5.4.2 Impact Analysis results

During the construction phase impacts on hydrogeology could be due to activities of civil construction, as excavation operation for buildings. Contact with groundwater is not expected where groundwater level is estimated to be below 30 m from ground level due to the information from geotechnical report. It is planned that the entire area would be excavated with varying depths between 5 m to 30 m during the construction

During the construction phase no interference is predictable with rivers or streams; drinking and potable water for the usage by workers would be provided from the city water network. Addition to these there will be water needs for the construction activities such as dust suppression and concrete preparation. There is a possibility to construct a groundwater well for water usage for construction activities. Before the drilling activities, STW (State Hydraulic Work) will be informed, and drilling will be start after all permissions taken from the relative authorities. Impacts of a new well to be drilled on the existing hydrogeology would be discussed with DSI.

In case of interaction, groundwater should be extracted to remove it from working area; treatment, storage and disposal should be done according to regulation requirements after necessary analyses have been performed.

During the construction phase, domestic wastewater would be collected in impermeable septic holes and disposed according to Water Pollution Control Regulation (WPCR, Issued on 31.12.2004 in the Official Gazette No: 25687) Article 32 and other relevant regulations. Domestic wastewater would be collected in leak-proof septic holes and the septic holes would be emptied periodically by a vacuum truck and disposed of at wastewater sewage system.

Groundwater pollution is a potential impact based on hazardous materials (oil, chemicals etc.) spill from vehicles or leakage from septic hole. Since groundwater levels are not close to the surface and the perched water was encountered at 7.5 to 10.8 m below ground water, no major contamination risk is foreseen.

Impacts on groundwater could be also due to increase of water needs and wastewater generation during construction works and camps. An increase of water demand in operational phase can also be expected and impacts could affect the water network providing water in the Yozgat region, thus involving regional resources. During the operational phase domestic water would be supplied from city network and domestic wastewater would be discharged to the city sewerage system.

Regarding water supply, no groundwater would be extracted by wells during the operational phase. Potential impacts are estimated to be on municipal water resources due to increased demand.

~~Production of medical wastes will be a significant result of the operation of the facility. Medical wastes will create significant environmental risks in terms of soil pollution if not handled in line with industry practices and regulatory requirements.~~

Impacts in construction phase on groundwater component are related to the following impact factors:

- groundwater pollution;
- hydrogeological changes based on increase of water demand.

Impact factors that could potentially affect the groundwater component during the operational phase is:

- hydrogeological changes based on increase of water demand;
- groundwater pollution.

### 5.4.2.1 Construction phase

During the construction phase, groundwater pollution is a potential impact. Since groundwater levels are not close to the surface and the perched water was encountered at 7.5 to 10.8 m below ground water, no major contamination risk is foreseen. No particularly hazardous material is predicted to be used during construction; accidental spills of pollutants from machinery/vehicles would reach groundwater only if the spilled material is in large quantities. The impact is predicted to be negligible.

Impacts on groundwater could also be due to increase of water needs and wastewater generation during construction works and camps. Water needs will be satisfied from network in use in the Yozgat region. The impact related to hydrogeological change is expected to be negligible.

**Table 38: impact evaluation matrix for hydrogeology component during construction phase before mitigation**

| IMPACT EVALUATION MARTIX - GROUNDWATER HYDROGEOLOGY CONSTRUCTION PHASE | | Groundwater pollution | Hydrogeological change |
|---|---|---|---|
| Duration (D) | Short | | |
| | medium-short | | |
| | Medium | | |
| | medium-long | | |
| | Long | | |
| Frequency (F) | Concentrate | | |
| | Discontinuous | | |
| | Continuous | | |
| Geographic extent (G) | Local | | |
| | Regional | | |

| IMPACT EVALUATION MARTIX - GROUNDWATER HYDROGEOLOGY CONSTRUCTION PHASE | | Groundwater pollution | Hydrogeological change |
|---|---|---|---|
| | beyond regional | | |
| Intensity (I) | Negligible | | |
| | Low | | |
| | Medium | | |
| | High | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | İrreversible | | |
| Probability of occurrence (P) | Low | | |
| | Medium | | |
| | High | | |
| | Certain | | |
| Sensitivity (S) | Negligible | | |
| | Low | | |
| | Medium | | |
| | High | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.45 | 1.02 |
| | | **Negligible** | **Negligible** |

### 5.4.2.2 Operational phase

The impact factor that could potentially affect groundwater component during the operational phase is hydrogeological change based on additional water needs related to presence of new buildings. An increase of water demand in operational phase can also be expected and impacts could affect the water network providing water in the Yozgat region, thus involving regional resources. On the base of general assumptions impact, it is expected to be negligible.

During the operation phase, groundwater pollution is a potential impact. During the operation phase accidental spills of pollutants from machinery/vehicles/wastes would cause an impact. Because the groundwater level is not close to the surface, the impact is predicted to be negligible.

**Table 39: impact evaluation matrix for hydrogeology component during operational phase before mitigation**

| IMPACT EVALUATION MARTIX - GROUNDWATER HYDROGEOLOGY OPERATIONAL PHASE | | Groundwater pollution | Hydrogeological change |
|---|---|---|---|
| Duration (D) | Short | | |
| | medium-short | | |
| | Medium | | |
| | medium-long | | |
| | Long | | |
| Frequency (F) | Concentrate | | |
| | Discontinuous | | |
| | Continuous | | |
| Geographic extent (G) | Local | | |
| | Regional | | |
| | beyond regional | | |
| Intensity (I) | Negligible | | |
| | Low | | |
| | Medium | | |
| | High | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | İrreversible | | |
| Probability of occurrence (P) | Low | | |
| | Medium | | |
| | High | | |
| | Certain | | |
| Sensitivity (S) | Negligible | | |
| | Low | | |
| | Medium | | |
| | High | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.59 | 1.30 |
| | | **Negligible** | **Negligible** |

### 5.4.2.3 Decommissioning phase

Decommissioning activities could have an impact on ground water; dismantling of structures and facilities could have a negative impact of component. Since the water table in main areas is not close to ground surface, a significant impact is not expected. Impact could be also related to water consumption during decommissioning as discussed for construction phase of project.

The removal of infrastructure could have a positive impact because land would be brought back to its natural state; however it is assumed that the area will continue to be used for other purposes.

### 5.4.3 Mitigation measures

Mitigations should be applied by using best practices during construction activities, to reduce accidental pollutant emission in groundwater. Groundwater pollution is also related to soil quality assessment; in case of contamination, soil storage will follow standards and best practice (see paragraph 5.2.1) and will be located in areas with low soil and groundwater vulnerability.

During construction the measures to mitigate the possible contamination of groundwater through the operation of the vehicles and construction equipment should be taken. The measures will include:

- Routine maintenance of the vehicles and equipment to prevent oil leaks
- Proper storage of the chemicals
- Clean-up of spills as it occurs

Also potential contamination from septic hole might also contaminate the soil. During construction phase, domestic wastewater would be collected in impermeable septic holes and disposed according to Water Pollution Control Regulation (WPCR, Issued on 31.12.2004 in the Official Gazette No: 25687) Article 32 and other relevant regulations. The measures will include;

- Domestic wastewater would be collected in leak-proof septic holes
- The septic holes would be emptied periodically by a vacuum truck
- and disposed of at wastewater sewage system.

To prevent or reduce impacts on groundwater in terms of additional needs, it could be useful to apply a water resource management plan, including surface water and wastewater in order to optimize water needs and minimize environmental impact (Appendix A).

~~Production of medical wastes will be a significant result of the operation of the facility. Medical wastes will create significant environmental risks in terms of soil pollution if not handled in line with industry practices and regulatory requirements. There will be a waste management plan prepared for the project where the details of the waste collection, segregation and disposal will be detailed. The minimum requirements of the waste management plan is detailed in Waste Management Plan (Appendix A)~~

### 5.4.4 Residual impacts

#### *5.4.4.1 Construction phase*

During the construction phase, groundwater pollution is a potential impact; impact is related to accidental events and leakage from septic hole that could be reduced applying best practice. If mitigation measures are applied, impacts will be reduced and will be expected to be negligible.

Impacts on groundwater could be also due to increase of water needs and wastewater generation during construction works and camps; the impact related to hydrogeological changes after mitigation is expected to be negligible.

**Table 40: impact evaluation matrix for hydrogeology component during construction phase after mitigation**

| IMPACT EVALUATION MARTIX - GROUNDWATER HYDROGEOLOGY CONSTRUCTION PHASE | | Groundwater pollution | Hydrogeological change |
|---|---|---|---|
| Duration (D) | Short | | |
| | medium-short | | |

| IMPACT EVALUATION MARTIX - GROUNDWATER HYDROGEOLOGY CONSTRUCTION PHASE | | Groundwater pollution | Hydrogeological change |
|---|---|---|---|
| | Medium | | |
| | medium-long | | |
| | long | | |
| Frequency (F) | concentrate | | |
| | discontinuous | | |
| | continuous | | |
| Geographic extent (G) | local | | |
| | regional | | |
| | beyond regional | | |
| Intensity (I) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | irreversible | | |
| Probability of occurrence (P) | low | | |
| | medium | | |
| | high | | |
| | certain | | |
| Mitigation (M) | high | | |
| | medium | | |
| | low | | |
| | none | | |
| Sensitivity (S) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.34 | 0.77 |
| | | **Negligible** | **Negligible** |

### 5.4.4.2 Operational phase

Impact on groundwater could be also due to increase of water needs, after applying mitigation measures during operational phase is expected to be negligible.

During the operation phase, groundwater pollution is a potential impact; impact is related to accidental events and leakage from septic hole that could be reduced applying best practice. If mitigation measures are applied, impacts will be reduced and will be expected to be negligible.

**Table 41: impact evaluation matrix for hydrogeology component during operational phase after mitigation**

| **IMPACT EVALUATION MARTIX - GROUNDWATER HYDROGEOLOGY OPERATIONAL PHASE** | | **Groundwater pollution** | **Hydrogeological change** |
|---|---|---|---|
| Duration (D) | short | | |
| | medium-short | | |
| | medium | | |
| | medium-long | | |
| | long | | |
| Frequency (F) | concentrate | | |
| | discontinuous | | |
| | continuous | | |
| Geographic extent (G) | local | | |
| | regional | | |
| | beyond regional | | |
| Intensity (I) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | irreversible | | |
| Probability of occurrence (P) | low | | |
| | medium | | |
| | high | | |
| | certain | | |
| Mitigation (M) | high | | |
| | medium | | |
| | low | | |
| | none | | |
| Sensitivity (S) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.44 | 0.98 |
| | | **Negligible** | **Negligible** |

### 5.4.5 Monitoring

Monitoring is not required, because no groundwater abstraction wells are drilled and used for water supply at the Site.

Monitoring of the application of the waste management plan will be required through inspections and audits as necessary in order to ensure that the disposal of medical wastes are in line with the industry practices and regulatory requirements.

## 5.5 Atmosphere (air quality, climate and meteorology)

### 5.5.1 Climate and meteorology

This section presents the baseline data collection methods and summary of the Meteorological and Climatic Features of the local study area. No impact assessment is conducted in this section; however the data are used for the assessments in other disciplines, especially air quality, in their impact assessments.

#### *5.5.1.1 Baseline*

**Study area**

As part of the evaluation of the climatic condition: the study area comprises the Project Site and 100 km x 100 km surrounding area including Yozgat Province located to the south of the Project Site.

**Methodology**

Data concerning wind, temperature and rainfall recorded by Yozgat Meteorological Station, for the 1960-2012 periods, were used for determining general meteorological and climatic conditions. The Yozgat Meteorological Station, a body of General Directorate of Meteorology (MGM), is situated in Nevşehir Province which is approximately 100 km away from the Project Site. The locations of Yozgat Meteorological Station and the Project Site are given in the figure below.

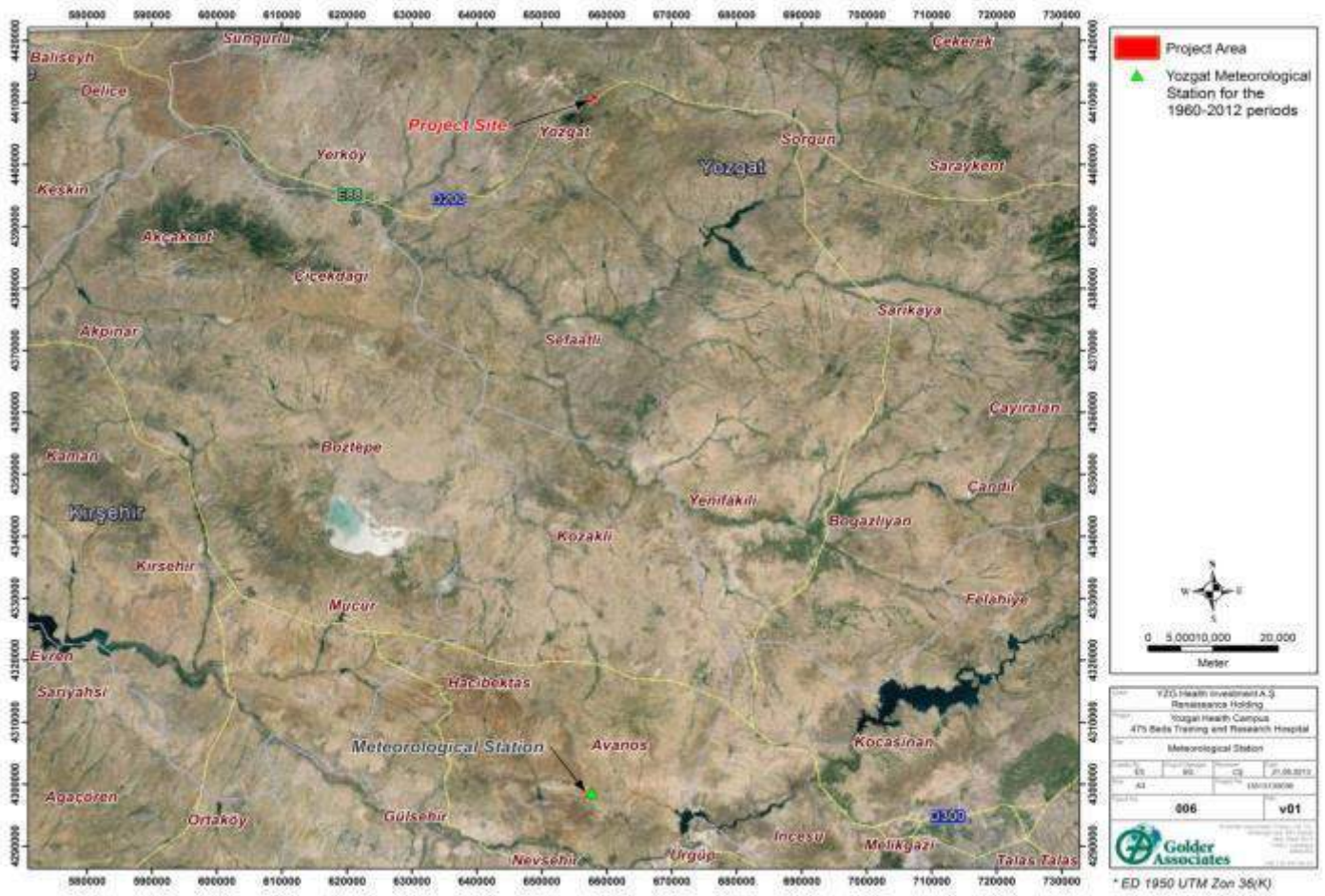


*Figure 11: Location of the Project Site and Meteorological Station*

## Baseline results

### *General Climatic Conditions*

The subject area is classified as a low-precipitation area in the Anatolian Basin. The Anatolian climate is characterized by arid, dry summers and, wet winters.

Anatolian climate slightly vary in areas. Average temperature in Anatolian climate is below 10ºC in winters. Precipitations results show that the sites away from rocky spaces do not remain green throughout the year. Annual precipitation value is 50 mm.

The precipitation regime in the area is central Anatolian precipitation regime. In this type of precipitation regime, an area receives rainfall mostly in fall and winter while summer is the driest season. The information concerning precipitation regime is of critical importance in the biology of the area. As a matter of fact, natural vegetation is directly affected by the distribution of rainfalls by seasons.

In Yozgat Province, the lowest temperature was recorded as -24,4ºC in February and the highest temperature was recorded as 38.8ºC in July. Annual average temperature is 10ºC. It increases from March to August and decreases from August to December. The coldest months are December, January and February while the hottest ones are July and August (MGM, Yozgat Meteorological Station Records).

Monthly minimum, average and maximum temperature values obtained from data recorded in 1960-2012 period in Yozgat Meteorological Station are presented in below table.

**Table 42: Yozgat Meteorological Station - Normal Temperature Values (1960-2012)**

| Months | Maximum(*C) | Average (*C) | Minimum (*C) |
|---|---|---|---|
| January | 2,2 | -1,9 | -5,4 |
| February | 3,5 | -1 | -4,7 |
| March | 8,1 | 2,9 | -1,4 |
| April | 13,8 | 8,3 | 3,3 |
| May | 18,6 | 13 | 7,2 |
| June | 22,6 | 16,8 | 10,4 |
| July | 26,1 | 19,7 | 12,9 |
| August | 26,3 | 19,6 | 13 |
| September | 22,7 | 15,5 | 9,4 |
| October | 16,9 | 10,3 | 5,4 |
| November | 10,2 | 4,6 | 0,6 |
| December | 4,5 | 0,5 | -2,7 |

As indicated in the table above, average temperature varies between -1,9ºC (January) and 19,7ºC (July). Annual average temperature is 10ºC. Temperature increases from March to August and decreases from August to December. The coldest months are December, January and February while the hottest one is August (26.3ºC).

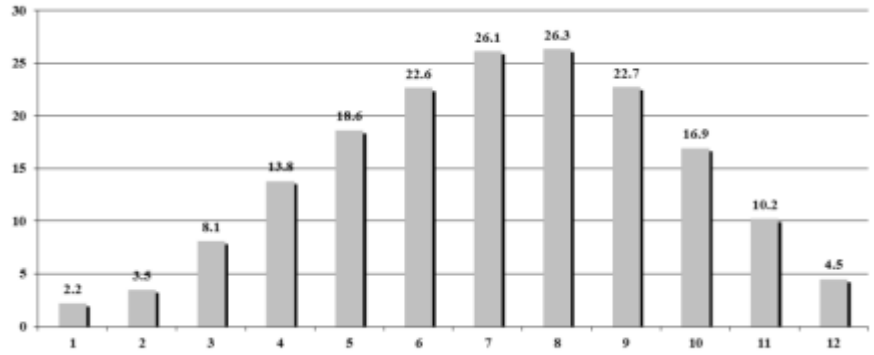


*Figure 12:* : Maximum Temperature Recorded at Yozgat Meteorological Station

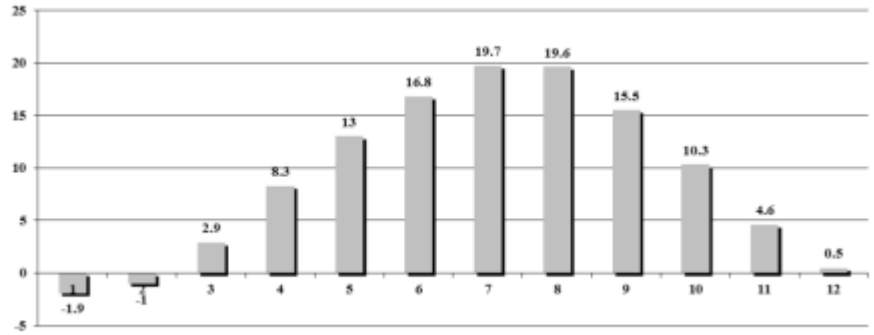


*Figure 13:* Average Temperature Recorded at Yozgat Meteorological Station

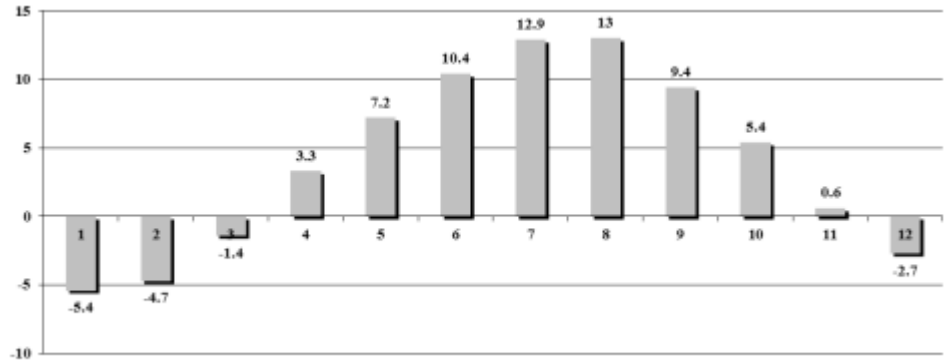


*Figure 14:* Minimum Temperature Recorded at Yozgat Meteorological Station

### *Precipitation and Evaporation Regime*

Distribution, quantity and type of precipitation are important since these factors affect pollutants' wet deposit quantities. In the assessments, precipitation data recorded by Yozgat Meteorological Station between 1960 and 2012 was used. Precipitation normals, precipitation changes and average and daily maximum precipitation values by seasons are presented below.

As indicated in the table below, annual average amount of precipitation at the area is 589,4 mm. Maximum amount of precipitation was observed on December (81,1 mm) while minimum amount was observed on August (8,9 mm). Maximum amount of daily precipitation was recorded in February (68 mm).

**Table 43: Yozgat Meteorological Station Precipitation Normals (1960-2012)**

| Months | Average Total Precipitation (mm) | Daily Maximum Precipitation (mm) |
|---|---|---|
| January | 69 | 42,3 |
| February | 64,5 | 68 |
| March | 64,5 | 52,3 |
| April | 67 | 41,3 |
| May | 62,7 | 34,3 |
| June | 41,7 | 48,4 |
| July | 13,3 | 44,6 |
| August | 8,9 | 35,8 |
| September | 18,1 | 54 |
| October | 38,5 | 41 |
| November | 60,1 | 55,4 |
| December | 81,1 | 51,6 |
| **Annual** | **589,4** | **68** |

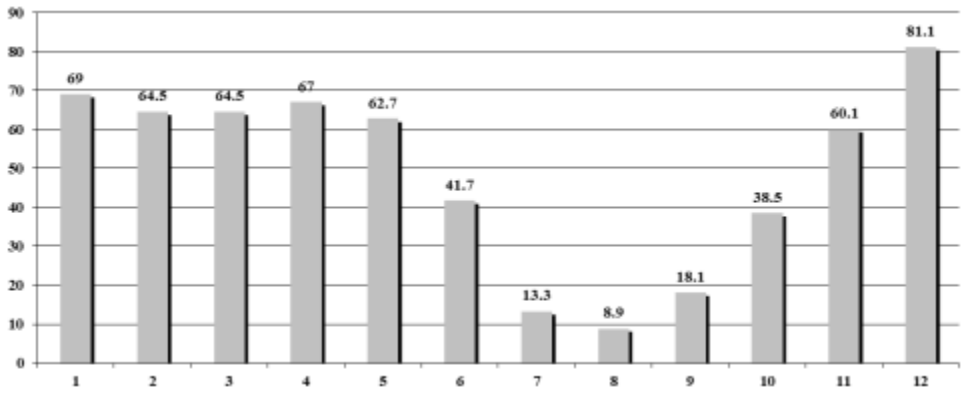


*Figure 15: Total Average Precipitation recorded at Yozgat Meteorological Station*

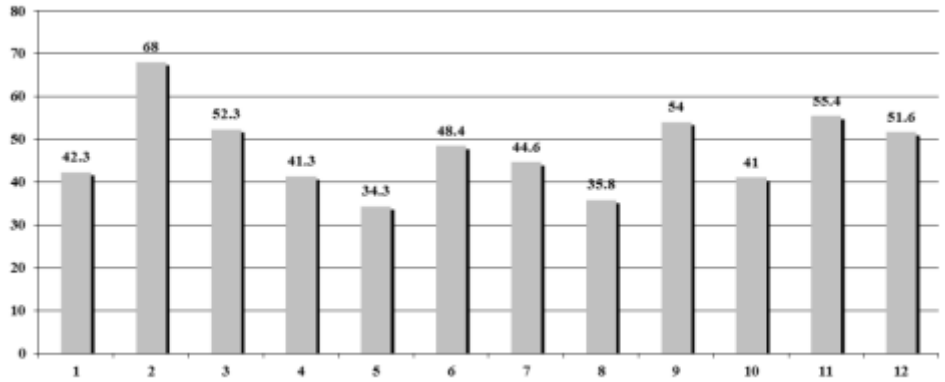


*Figure 16: Daily Maximum Precipitation recorded at Yozgat Meteorological Station*

## Relative Humidity

Average relative humidity values recorded at Yozgat Meteorological Station between 1960 and 2012 are presented in the table below. According to the information, annual average relative humidity is 66,8 %, for the Yozgat Meteorological Station.

**Table 44: Yozgat Meteorological Station Relative Humidity Values**

| Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Relative Humidity | 77,5 | 75,8 | 71 | 66,6 | 64,2 | 60,5 | 56,8 | 55,7 | 58,1 | 65,9 | 72,5 | 77,3 |

## Local Pressure

Annual average pressure recorded at Yozgat Meteorological Station in between 1960 and 2012 is 868 hPa. The highest pressure was observed on January with 887,2 hPa, and the lowest pressure value was observed on March with 834,8 hPa. Average, highest and lowest values are presented in the table and figure below.

**Table 45: Local Pressure Values measured at Yozgat Meteorological Station (hPa) (1960-2012)**

| Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Local Pressure | 867.9 | 866.3 | 866.1 | 865.7 | 867.3 | 867.6 | 867 | 867.9 | 869.9 | 871.3 | 870.7 | 868.8 | **868** |
| Maximum Local Pressure | 887.2 | 883.1 | 885.1 | 878.9 | 879 | 878 | 876 | 875.6 | 879.2 | 881.7 | 882.5 | 883.9 | **887,2** |
| Minimum Local Pressure | 845.7 | 837.9 | 834.8 | 836 | 837.5 | 837.8 | 838.2 | 838.9 | 841.8 | 841.5 | 837.6 | 836.7 | **834,8** |

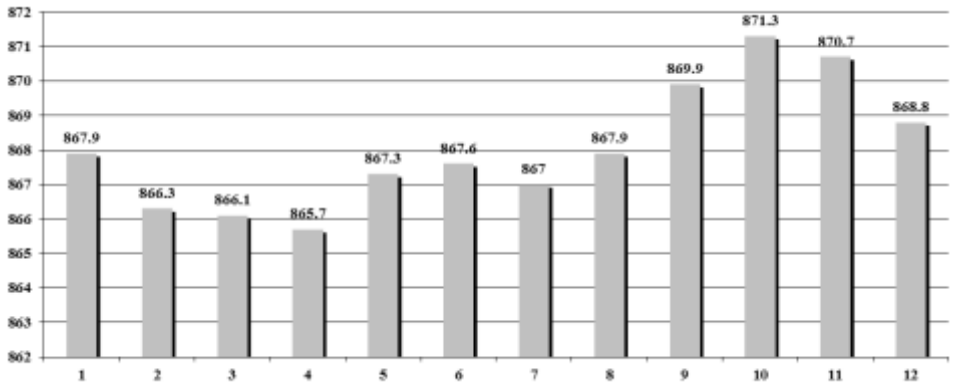


*Figure 17: Yozgat Meteorological Station Local Average Pressure Changes by Months*

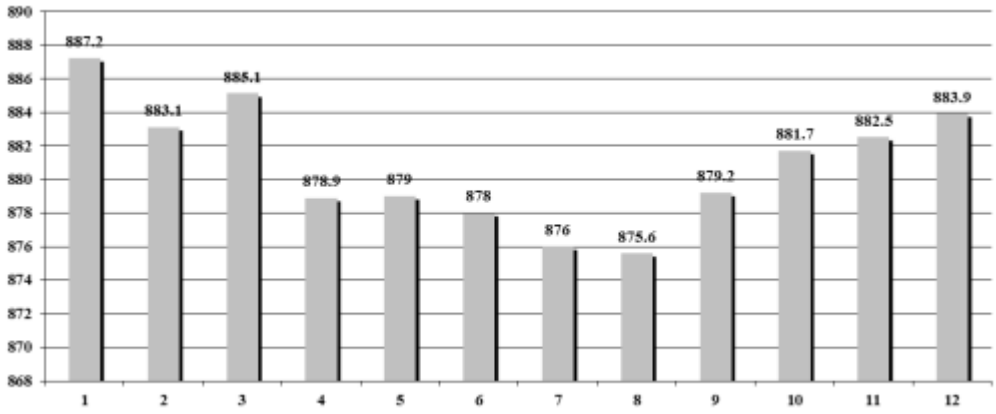


*Figure 18: Yozgat Meteorological Station Local Maximum Pressure Changes by Months*

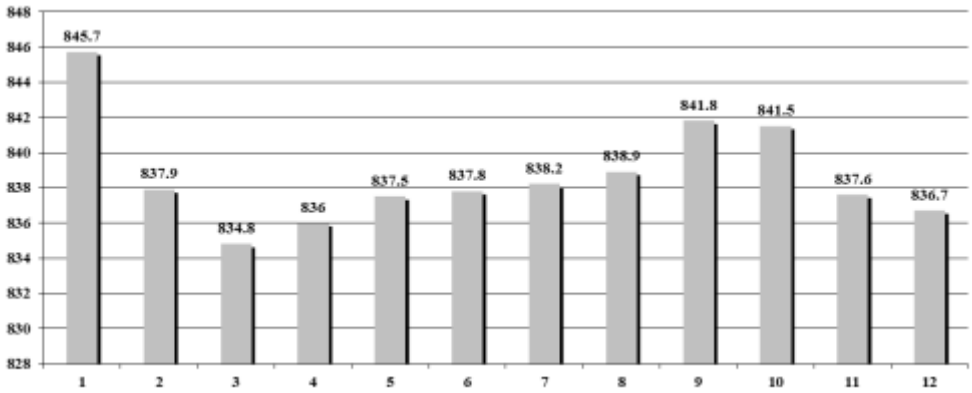


*Figure 19: Yozgat Meteorological Station Local Minimum Pressure Changes by Months*

### *Distribution of the Counted Days in the Area*

Counted day distribution values for additional weather parameters of the region are also obtained from data recorded between 1960 and 2012. Average number of snowy days is 5 and maximum snow depth is 79 cm and it was observed on February.

Maximum foggy days are observed on December with an 4 average days; maximum hails was recorded on April with an 0.9 average days, maximum frosty days was observed on November with an 8,1 average days and maximum amount of thunderstorm was observed on May with a 4,7 average days.

**Table 46: Counted Days and Annual Average Values (1960-2012)**

| Months | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of Snow Days | 11.4 | 11 | 8.2 | 2.9 | 0.3 | | | | 0 | 0.4 | 3.5 | 8 | **45,7** |
| Number of Snow Cover Days | 18.5 | 16.4 | 8.5 | 1.2 | 0 | | | | | 0.2 | 3.5 | 11.5 | **59,8** |
| Maximum Snow Depth | 60 | 79 | 56 | 25 | 4 | | | | | 9 | 37 | 53 | **79** |
| Number of Foggy Days | 3.1 | 2.2 | 1.2 | 0.6 | 0.3 | 0.1 | | | 0.2 | 0.8 | 1.2 | 4 | **13,7** |
| Number of Hail Days | 0.1 | 0.2 | 0.4 | 0.9 | 0.9 | 0.5 | 0.1 | 0.1 | 0 | 0.1 | 0.1 | 0.1 | **3,5** |
| Number of Frosty Days | 5.9 | 5.2 | 5.4 | 2.5 | 0.3 | | | | 0.2 | 2.8 | 8.1 | 7.3 | **37,7** |
| Number of Thunder Stormy Days | 0.1 | 0.1 | 0.4 | 2.1 | 4.7 | 3.9 | 1.3 | 0.9 | 1 | 0.7 | 0.2 | 0.1 | **15,5** |

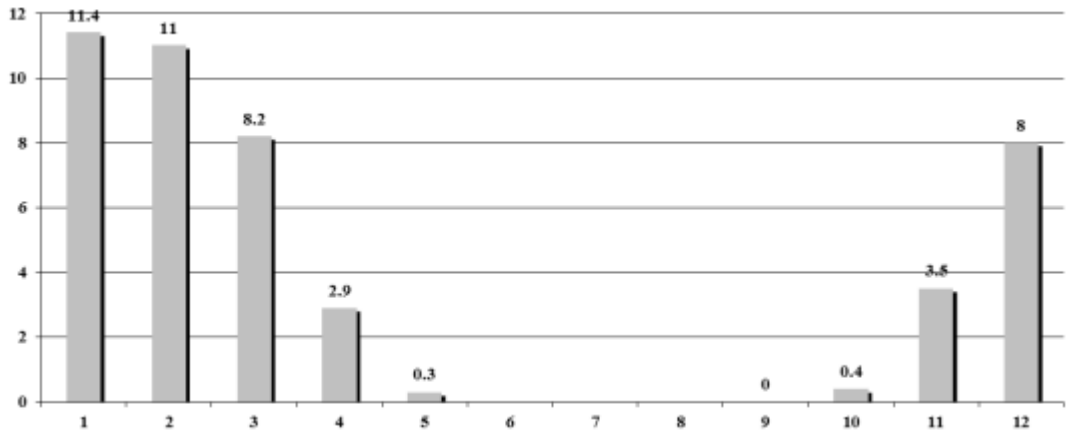


*Figure 20: Yozgat Meteorological Station, Distribution of Monthly Snow Days (1960-2012)*

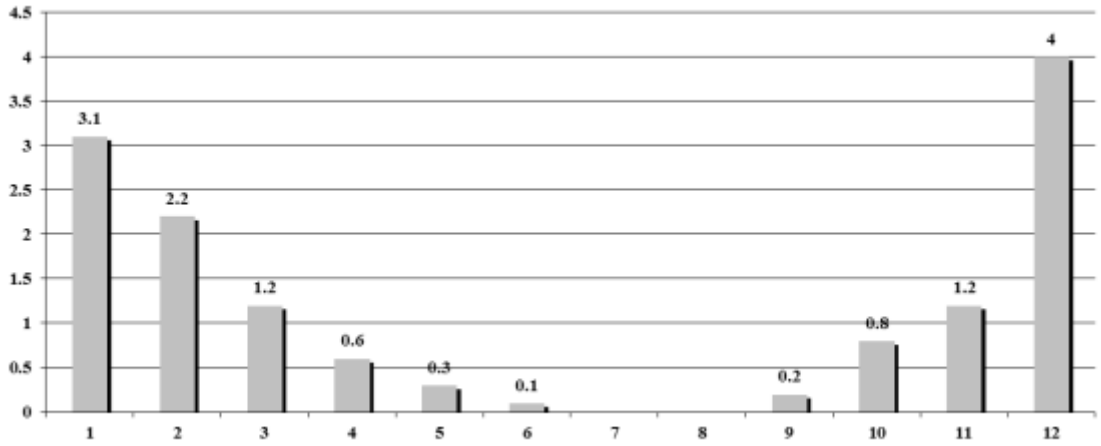


*Figure 21: Yozgat Meteorological Station, Distribution of Monthly Foggy Days (1960-2012)*

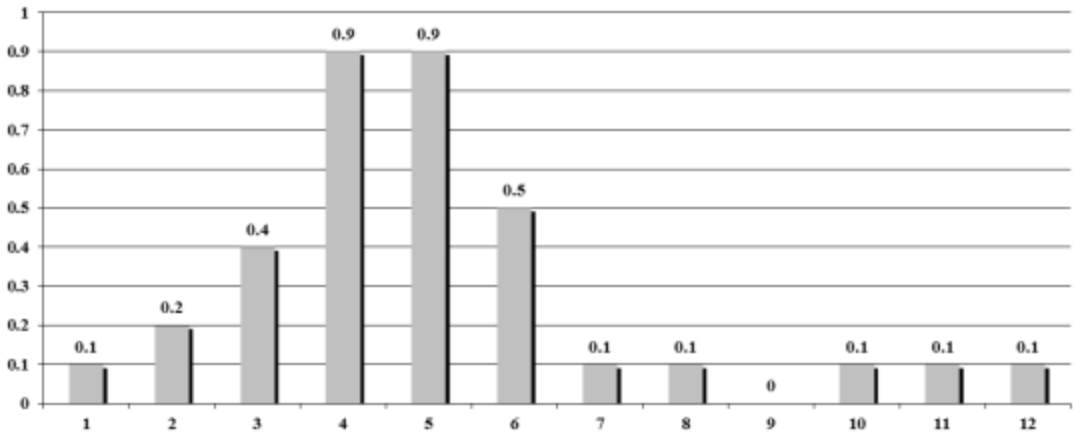


*Figure 22: Yozgat Meteorological Station, Distribution of Monthly Hail Days (1960-2012)*

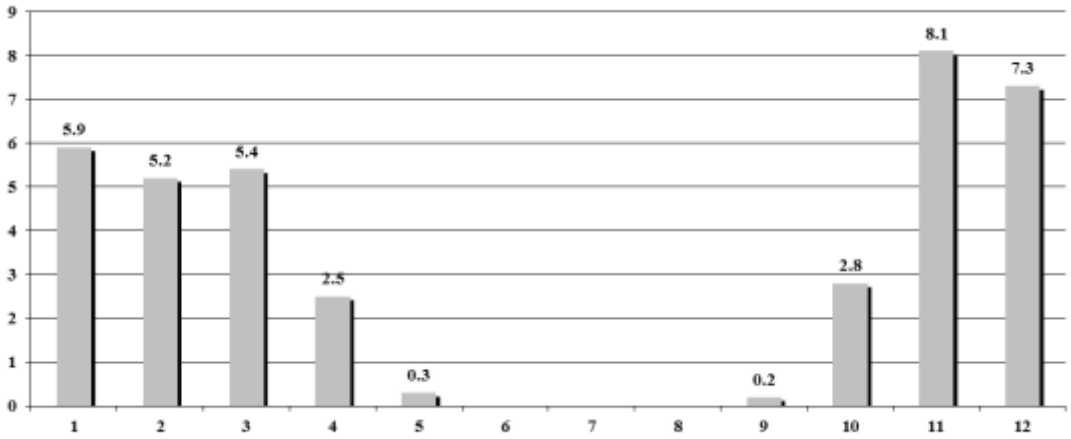


*Figure 23: Yozgat Meteorological Station, Distribution of Monthly Frosty Days (1960-2012)*

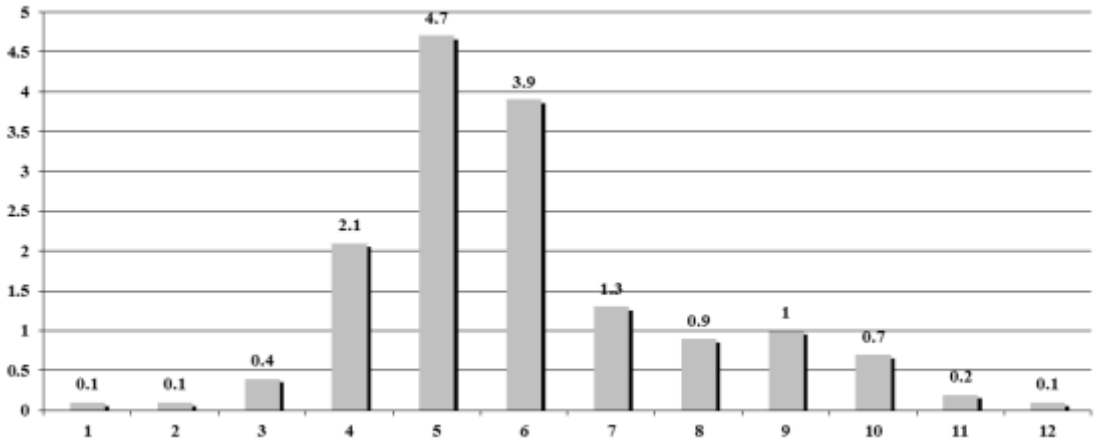


*Figure 24: Yozgat Meteorological Station, Distribution of Monthly Thunder-stormy Days (1960-2012)*

## Wind

In order to determine the meteorological and climatic characteristics of the Project area, data representing the annual, seasonal and monthly wind direction are presented in the following sections.

## Wind Directions: Annual, Seasonal and Monthly

According to the Yozgat Meteorological Station 1960-2012 data, numbers of wind directions (monthly) were used to determine seasonal and annual numbers corresponding to wind directions. The monthly wind roses, the seasonal wind roses and the annual wind rose are shown in the figures below. According to these data, ENE (east of northeast) is the dominant wind direction at Yozgat Station in the year.

**Table 47: Monthly number of winds at Yozgat Meteorological Station**

| Number of Winds (Monthly) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Direction | January | February | March | April | May | June | July | August | September | October | November | December |
| N | 504 | 563 | 685 | 657 | 1012 | 881 | 796 | 789 | 920 | 667 | 477 | 514 |
| NNE | 1662 | 1868 | 2347 | 2576 | 2869 | 3852 | 4756 | 4512 | 3314 | 2531 | 1860 | 1678 |
| NE | 3158 | 3263 | 3473 | 3333 | 4159 | 5478 | 6906 | 6524 | 4847 | 3681 | 2995 | 2991 |
| ENE | 8652 | 7801 | 8606 | 8516 | 11313 | 13377 | 17155 | 17026 | 13894 | 13361 | 10228 | 8454 |
| E | 1441 | 1099 | 1421 | 1279 | 1467 | 1689 | 2264 | 1922 | 2366 | 2144 | 1882 | 1456 |
| ESE | 940 | 1152 | 1295 | 1076 | 892 | 737 | 449 | 515 | 1054 | 1466 | 1174 | 1180 |
| SE | 836 | 710 | 669 | 731 | 504 | 442 | 336 | 285 | 371 | 564 | 541 | 760 |
| SSE | 1866 | 1563 | 1546 | 1176 | 1104 | 751 | 605 | 480 | 374 | 651 | 992 | 1639 |
| S | 1310 | 1193 | 881 | 961 | 724 | 306 | 204 | 257 | 293 | 467 | 803 | 1302 |
| SSW | 3043 | 2864 | 2658 | 2417 | 1667 | 1400 | 581 | 768 | 1366 | 1784 | 2601 | 3258 |
| SW | 4319 | 4067 | 4171 | 4140 | 3414 | 1586 | 760 | 874 | 1883 | 2888 | 3859 | 4611 |
| WSW | 6279 | 5441 | 5992 | 6247 | 4861 | 3157 | 1644 | 1888 | 3305 | 4694 | 5160 | 6327 |
| W | 1523 | 1127 | 1216 | 1278 | 1110 | 793 | 479 | 611 | 693 | 724 | 1172 | 1266 |
| WNW | 744 | 624 | 1162 | 939 | 864 | 812 | 459 | 500 | 529 | 659 | 985 | 973 |
| NW | 432 | 381 | 661 | 496 | 520 | 440 | 306 | 429 | 356 | 348 | 530 | 560 |
| NNW | 656 | 466 | 684 | 697 | 870 | 1064 | 697 | 819 | 810 | 509 | 543 | 585 |

**Table 48: Seasonal and Annual numbers of wind in Yozgat Meteorological Station**

| Number of Winds (Seasonal and Annual) | | | | | |
|---|---|---|---|---|---|
| **Direction** | **Winter** | **Spring** | **Summer** | **Fall** | **Annual** |
| N | 1581 | 2354 | 2466 | 2064 | 8465 |
| NNE | 5208 | 7792 | 13120 | 7705 | 33825 |
| NE | 9412 | 10965 | 18908 | 11523 | 50808 |
| ENE | 24907 | 28435 | 47558 | 37483 | 138383 |
| E | 3996 | 4167 | 5875 | 6392 | 20430 |
| ESE | 3272 | 3263 | 1701 | 3694 | 11930 |
| SE | 2306 | 1904 | 1063 | 1476 | 6749 |
| SSE | 5068 | 3826 | 1836 | 2017 | 12747 |
| S | 3805 | 2566 | 767 | 1563 | 8701 |
| SSW | 9165 | 6742 | 2749 | 5751 | 24407 |
| SW | 12997 | 11725 | 3220 | 8630 | 36572 |
| WSW | 18047 | 17100 | 6689 | 13159 | 54995 |
| W | 3916 | 3604 | 1883 | 2589 | 11992 |
| WNW | 2341 | 2965 | 1771 | 2173 | 9250 |
| NW | 1373 | 1677 | 1175 | 1234 | 5459 |
| NNW | 1707 | 2251 | 2580 | 1862 | 8400 |

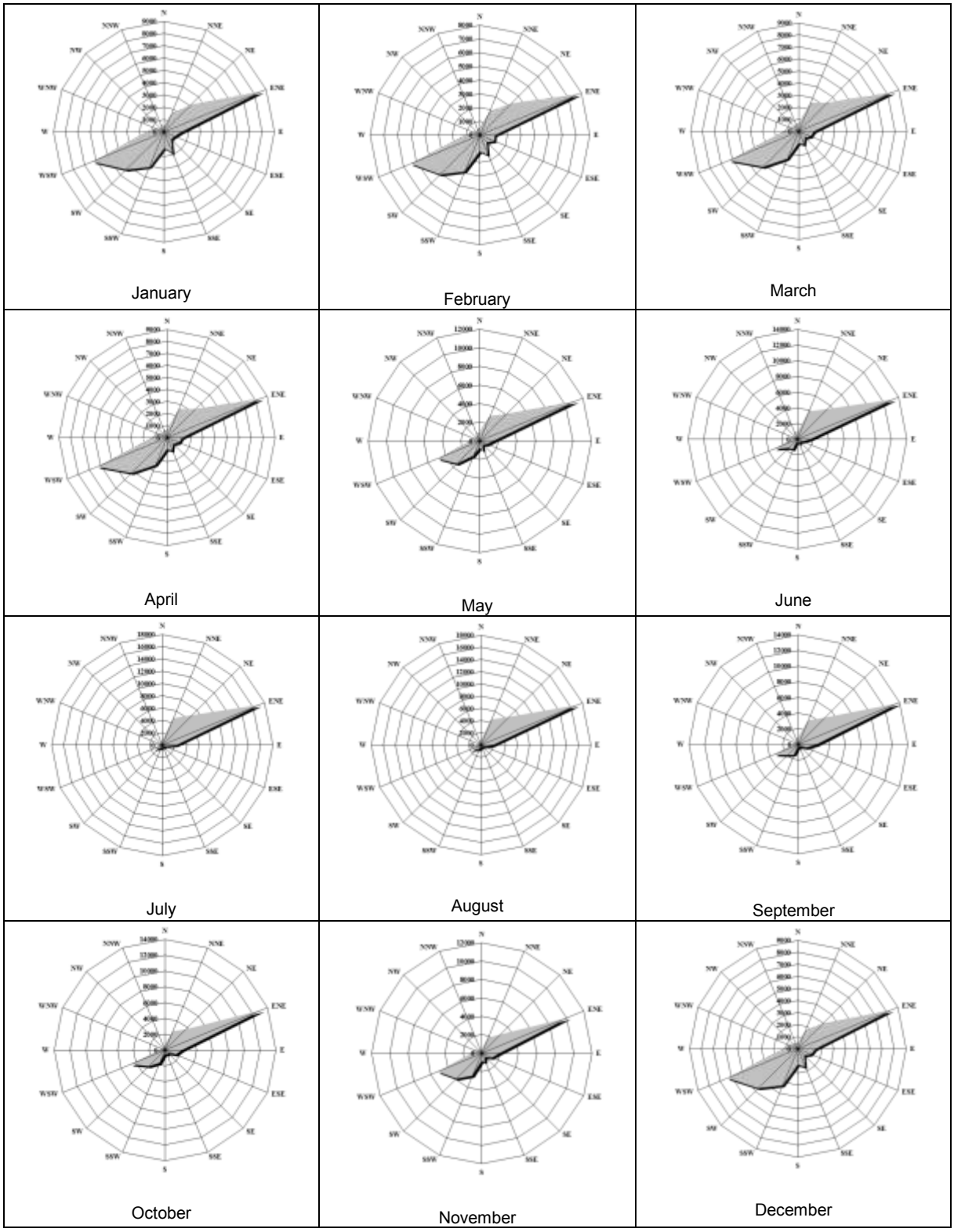


*Figure 25: Monthly number of winds in Yozgat Meteorological Station*

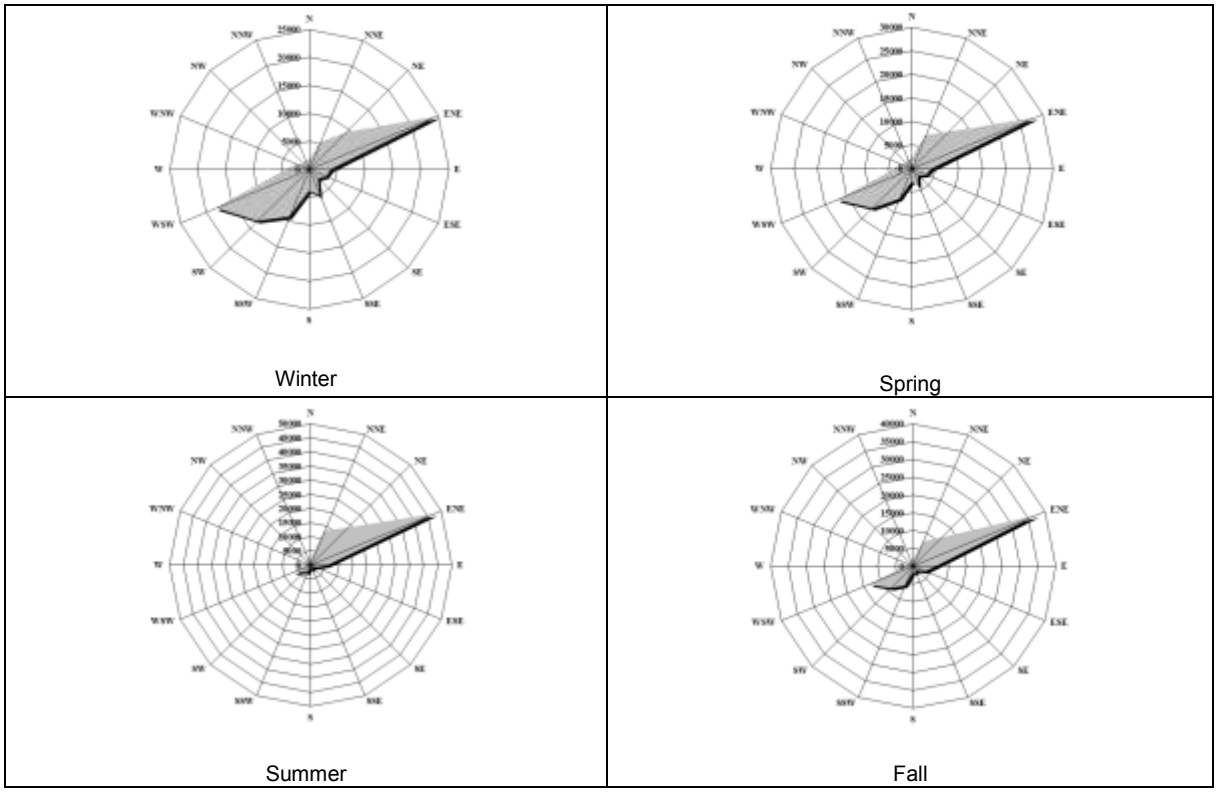


*Figure 26: Seasonal number of winds in Yozgat Meteorological Station*

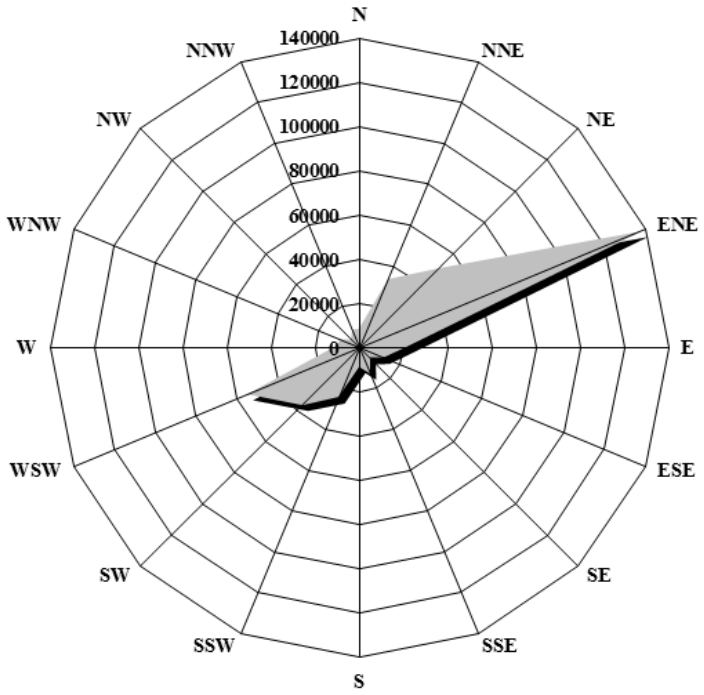


*Figure 27: Annual number of winds at Yozgat Meteorological Station*

### *Wind Speed Based on Directions*

According to the Yozgat Meteorological Station data, Mean Monthly Wind Speed and Annual Wind Speed parameters are shown in the table and figure below, respectively. The maximum mean annual wind speed is 11,8 m/sec towards NNW (north of northwest) at Yozgat Station.

**Table 49: Monthly mean wind speed at Yozgat Meteorological Station**

| Monthly Mean Wind Speed (m/sec) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Direction** | **January** | **February** | **March** | **April** | **May** | **June** | **July** | **August** | **September** | **October** | **November** | **December** |
| N | 1.6 | 1.8 | 1.8 | 1.9 | 1.9 | 2 | 2.3 | 2.2 | 2 | 1.8 | 1.7 | 1.7 |
| NNE | 1.8 | 2 | 2.1 | 2 | 2 | 2.2 | 2.9 | 2.7 | 2.3 | 2 | 1.8 | 1.9 |
| NE | 1.8 | 2 | 2.1 | 2 | 1.9 | 2.3 | 3 | 2.9 | 2.3 | 1.8 | 1.7 | 1.7 |
| ENE | 1.6 | 1.8 | 1.8 | 1.8 | 1.8 | 2.1 | 2.8 | 2.6 | 1.9 | 1.7 | 1.5 | 1.6 |
| E | 1.2 | 1.3 | 1.5 | 1.4 | 1.5 | 1.6 | 2.1 | 1.9 | 1.6 | 1.3 | 1 | 1.1 |
| ESE | 1.4 | 1.6 | 1.9 | 1.8 | 1.8 | 1.7 | 1.6 | 1.6 | 1.5 | 1.5 | 1.3 | 1.5 |
| SE | 1.7 | 1.9 | 2 | 2 | 1.8 | 1.8 | 1.8 | 1.7 | 1.3 | 1.4 | 1.3 | 1.6 |
| SSE | 2.1 | 2.4 | 2.4 | 2.4 | 2.0 | 2.0 | 2.4 | 2.5 | 1.7 | 1.7 | 1.9 | 2.3 |
| S | 2.3 | 2.4 | 2.3 | 2.4 | 1.9 | 1.9 | 2.3 | 2.1 | 1.4 | 1.7 | 2.1 | 2.4 |
| SSW | 2.2 | 2.4 | 2.4 | 2.4 | 2.1 | 2 | 2.1 | 2 | 1.9 | 1.8 | 2.1 | 2.2 |
| SW | 2.1 | 2.3 | 2.4 | 2.5 | 2.3 | 2 | 2 | 2 | 1.9 | 1.9 | 2.1 | 2.1 |
| WSW | 2 | 2.1 | 2.2 | 2.3 | 2.2 | 2.1 | 2.1 | 2 | 2 | 1.9 | 1.9 | 1.9 |
| W | 1.8 | 1.8 | 1.9 | 2 | 2 | 1.9 | 1.9 | 1.9 | 1.8 | 1.5 | 1.7 | 1.6 |
| WNW | 1.7 | 1.7 | 1.9 | 2 | 2 | 2 | 2 | 2.1 | 1.8 | 1.6 | 1.7 | 1.6 |
| NW | 1.7 | 1.7 | 1.9 | 2 | 2 | 2 | 2.1 | 2.1 | 1.9 | 1.7 | 1.9 | 1.6 |
| NNW | 0.2 | 1 | 4.5 | 10.3 | 16.3 | 21.4 | 25.1 | 24.5 | 19.5 | 12.4 | 5.6 | 1.5 |

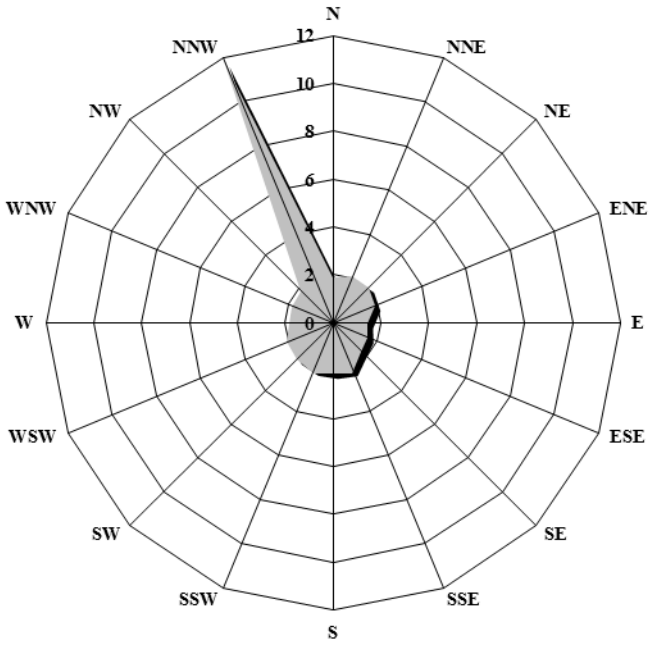


*Figure 28: Annual mean wind speed at Yozgat Meteorological Station*

## 5.5.2 Air quality

### *5.5.2.1 Baseline*

#### Study area

The Study Area for the air quality is defined as 1 km diameter buffer around the project site. The existing ambient air quality has been evaluated in the Study Area.

#### Methodology

Set of results of emission measurements, ambient air quality measurements and quality assessment studies, which were conducted by various parties in the region in the last 2 months, were summarized here for determination of the existing air quality.

As mentioned above, findings of the following studies were reviewed for the assessment of baseline ambient air quality in this document:

- Air measurements conducted by Golder at the Project Site for Yozgat Health Campus Project.

#### Baseline results

#### *Impact Definition*

There are two sources of potential impacts on air quality during the construction phase. These are:

- The excavation works and movement of vehicles and,
- The release of engine emissions from the construction equipment and vehicles.

Dust produced during the excavations could be important during the dry weather conditions and may cause negative effects to nearby settlements, public areas and institutions. The exhaust from construction equipment and vehicles may cause nitrogen oxides ($NO_X$), sulphur dioxide ($SO_2$) and carbon monoxide (CO).

## *Ambient Air Quality*

The existing ambient air quality has been evaluated around the Project Site.

The ambient air measurements were conducted by an accredited firm named Ekotest for Project. Settled dust measurement was conducted between July 17 and September 19, 2013 and PM10 measurements were conducted at August 19, 2013.

Within the ESIA studies, Golder conducted the field measurements listed below to support the baseline data:

- PM10 measurements at three locations,
- Settled dust measurements at three locations.

The coordinates and locations of the measurement points is shown in below figure.


*Figure 29: Measurement Locations*

Measurement results of the above mentioned studies with respect to the relevant Turkish and International standards limits for ambient air quality is summarized below table:

**Table 50: $PM_{10}$ Measurement Summary**

| Measurement No: | Measurement Date | Measurement Results (mg/Nm$^3$) | Limit Value* (mg/Nm$^3$) |
|---|---|---|---|
| T-1 | 19.08.2013 | 0,536 | 1,5 |
| T-2 | 19.08.2013 | 0,732 | |
| T-3 | 19.08.2013 | 0,700 | |

*Regulation on Control of Industrial Air Pollution (03.07.2009, OG No. 27277), App.1, Item 2.2

**Table 51: Settle Dust Measurement Summary**

| Measurement No: | Measurement Period | Measurement Results(mg/m$^2$-day) | Limit Value* (mg/m$^2$-day) |
|---|---|---|---|
| T-1 | 17.07.2013-19.09.2013 | 120 | 210 |
| T-2 | 17.07.2013-19.09.2013 | 110 | |
| T-3 | 17.07.2013-19.09.2013 | 130 | |

*Regulation on Control of Industrial Air Pollution (03.07.2009, OG No. 27277), App.1, Item 2.2

As seen from the measurement summary tables, PM10 and settled dust values are comply with limit values. As there is no any instant measurement parameters for IFC and EBRD standards, the comparison among the values could not be done. However, all measurement results stayed under the 1 mg/Nm3, based on the previous experiences there is not expected any adverse effect of ambient air quality.

## *Existing Traffic Load*

The existing and main traffic routes at the project area is shown in the following map:


*Figure 30: Main Traffic Routes at the Study Area*

In relation to this map the public roads that will be subject to this assessment are:

1. D200 Sivas – Yozgat Highway
2. Alpaslan Türkeş Huzurevi Street

Distance from Project site to the dumping site is 2,4 km. Dumping site is on Recepli Village road. The letter from the Municipality for dumping site is shown in Appendix C.

The literature data reviewed for the recorded vehicle movements at these roads. Turkish Highway Directorate records the traffic movement at the main roads shown in the following map.


*Figure 31: D200 Sivas-Yozgat Highway Sectioning*

As it is shown in this map the section 2 represents the part of the highway entering Yozgat and section 12 represents the highway leaving Yozgat.

The recorded traffic loads on these sections are shown in the following map.

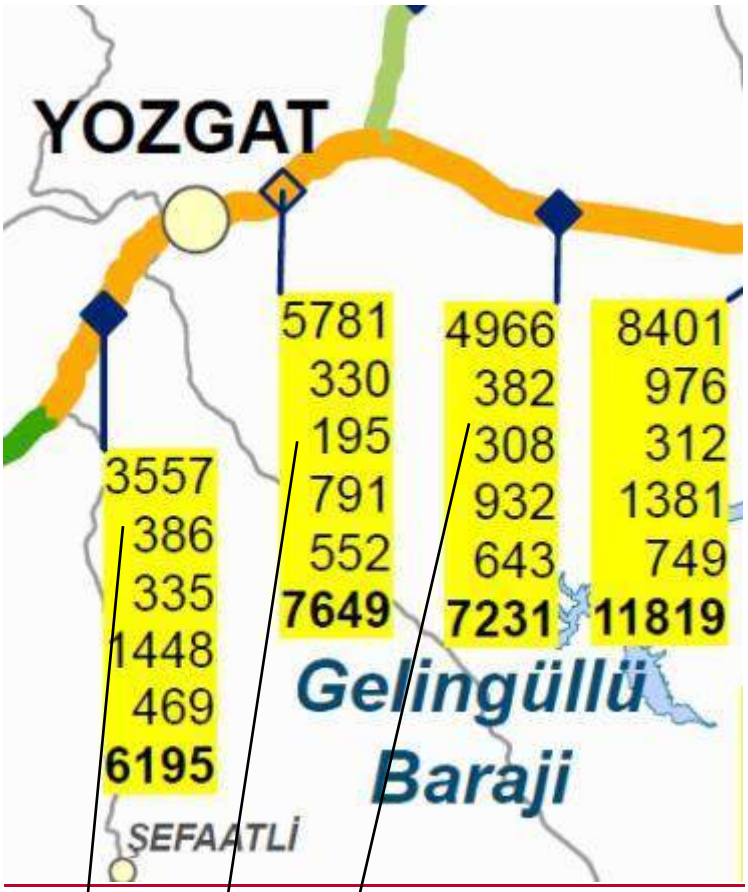


*Figure 32: Vehicle movement on D 200 Sivas Yozgat Highway, 2013, Turkish Highway Directorate*

Where:

| Average number of vehicles recorded per day | | | |
|---|---|---|---|
| 35557 | 5781 | 4966 | Cars |
| 386 | 330 | 382 | Medium weight commercial vehicle |
| 335 | 195 | 308 | Bus |
| 1448 | 791 | 932 | Truck |
| 469 | 552 | 643 | Truck, trailer and similar |
| 6195 | 7649 | 7231 | Total |

## 5.5.3 Impact Analysis Results

### *5.5.3.1 Construction phase*

#### *Exhaust Gases*

During the construction phase, equipment and vehicles will use diesel-fueled as an energy source. There will not be present any fuel tank in the project site. All vehicles will re-fill their tanks at the end of the working day with the mobile fuel truck. The properties of diesel fuel that will be used during the construction phase is shown below table:

**Table 52: specifications of diesel fuel**

| Specification | Unit | Value |
|---|---|---|
| Density (15 $^0$C'ta) | kg/m$^3$ | 820-845 |
| Polycyclic aromatic hydrocarbons | % weight | 11 |
| Flash point | $^0$C | 55 |
| Cold filter plugging point (CFPP) | $^0$C | |
| Winter (a) | | -15 |

| Specification | Unit | Value |
|---|---|---|
| Summer (b) | | 5 |
| Distillation | | |
| At 250 $^0$C | % volume | 65 |
| At 350 $^0$C | % volume | 85 |
| At % 95 (volume/volume) | $^0$C | 360 |
| Sulphur | mg/kg | 10 |
| Carbon residue (% 10 distillation) | % ağırlık | 0,3 |
| Viscosity (at 40 $^0$C) | cst | 2,0-4,5 |
| Copper strip corrosion (3 hours at 50 $^0$C) | | No.1 |
| Ash | % ağırlık | 0,01 |
| Cetane number | | 51 |
| Cetane arbitrary | hesapla | 46 |
| Water | mg/kg | 200 |
| Total contamination | mg/kg | 24 |
| Oxidation stability | g/m$^3$ | 25 |

(**Source**; TÜPRAŞ (Türkiye Petroleum Rafinery A.Ş.), 2009)

At the construction period approximately 10 vehicles will be used at the same time. The average diesel fuel requirement of one vehicle is 20 l/h, the density of the diesel fuel is 0.845kg/l and average consumption will be:

200 l/hour (10 vehicles x 20 L/hour) x 0,845 kg/l = 169 kg/hour (0,169 ton/hour)

Pollutant levels emitted from the construction vehicles is shown in the below table.

**Table 53: Emission Values Originating from Vehicles**

| Parameter | Emission Factor* (kg/t) | Emission (kg/hour) | Limit Values (kg/h) |
|---|---|---|---|
| Carbon monoxide (CO) | 9,7 | 1,6 (0,169 t/h*9,7 kg/t) | 50 |
| Nitrogen oxides (NOx) | 36 | 6,0 (0,169 t/h*36 kg/h) | 20 |
| Sulphur dioxide (SO2) | 6,5 | 1,0 (0,169 t/h*6,5 kg/h) | 60 |

**(*)** Fundamentals of Air Pollution and Control, Müezzinoğlu, 1991

Calculated emission values of vehicles will stay under the limit values of Turkish Industrial Air Pollution Control Regulation. Hence, there will not be any negative significant effect of exhaust gases on air quality. Control of exhaust of all vehicles is going to be checked periodically in order to compare the limit values.

### *Road Traffic*

Another potential source of emissions consists of exhaust gas generated by the vehicles to transport materials for construction works to the project area.

Considering the transportation practices that will be carried out within the scope of construction works (used vehicles per day, stabilized road to reach the asphalt road, short range between project site and

dumping area), the project is not expected to cause any significant effect on the traffic volume of the region.

Potential issues associated with air quality have been determined based on the ESIA outcomes and professional review of the potential effects of dumping areas on the traffic load at the study area.

The trucks carrying materials to the dumping site during construction will increase the traffic load at the rounds in the study area.

Given the above, the linkage of potential impacts to traffic load on air quality is therefore valid and assessed further below:

The estimated vehicle movement in relation to transportation of excavated soil to the dumping sites is given in the following figure:

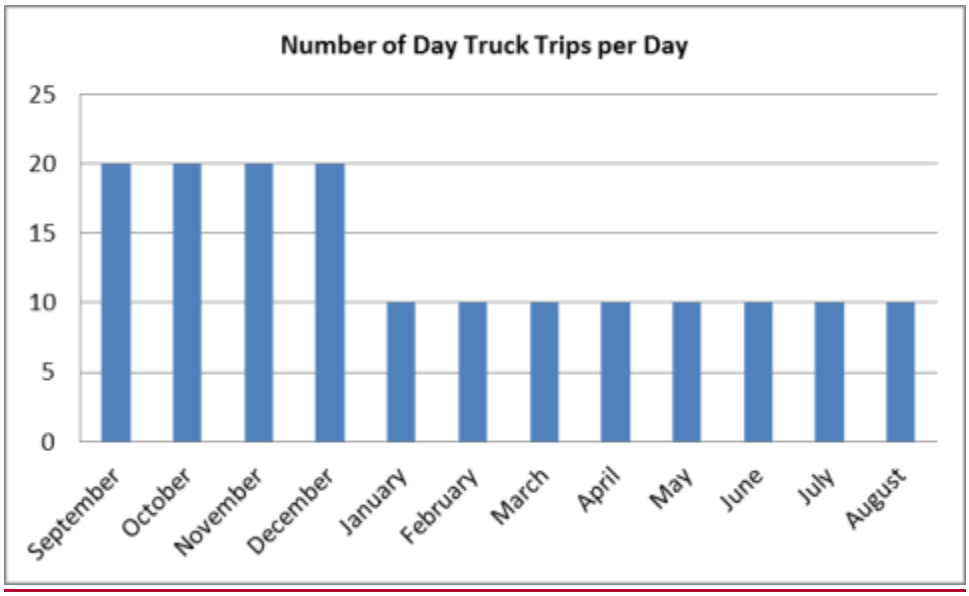


*Figure 33: Vehicle Movement Estimations*

When compared with the existing traffic load at the roads in the region the vehicle movements will not increase the traffic load in the region in 2014.

Considering the routes and the types of road to be used the major concerns would be;

- Increased traffic load in the Yozgat town center especially for the transportation on the Alpaslan Türkeş huzurevi Street.
- Disturbance in Yukarınohutlu town community in terms of air emissions and traffic safety.

Mitigation measures that will be in place for managemegent of air emssions created during vehicle movements are mentioned in Section 5.5.4.

### *Dust Emissions*

Dust emissions regarding to the construction works was simulated by AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model) model.

For the site preparation, 600.000 $m^3$ of excavation will be required. Even though there will be no overlap between Yozgat project and DSİ's water storage tank project, DSİ project was also taken into consideration while using the AERMOD model. 3.000 $m^3$ of excavation will be required during the DSİ project. The DSİ project is approximately at 200 m east of the project site.

There should be 3 major components for running the AERMOD model to simulate the distribution of dust. These are:

- Source (air pollutant),
- Surface data (topography)
- Meteorological data

## *Source*

During the excavation and filling operations within the scope of the project, dust emission shall be created. In dust emission calculations the soil density is assumed as 1,6 ton / m3. A total of 603.000 $m^3$ (603.000 m3 x 1,6 ton / m3 = 964.800 ton) material will be produced during the construction works in the project area.

Dust emission shall be resulting from dismantling, transferring and unloading the material during the excavation within the scope of the project. Emission factors specified in the Articles d.1 and d.2 of the Annex-12 of the Regulation on the Control of Industrial Air Pollution published on 03.07.2009 in Official Gazette No.27277, have been accepted in order to calculate the amount of dust emission. All measures given in the Annex 1 of the Regulation on the Control of Industrial Air Pollution shall be taken in order to minimize dust emission during the construction period.

Considering the working principles and emission factors below, hourly mass flow of dust emission to be released during the filling operations is calculated on the basis of this formula:

**Dust Emission Amount** = Production Amount x Emission Factor

| | **Uncontrolled** | **Controlled** |
|---|---|---|
| Dismantling Emission Factor (kg/ton) | 0.025 kg/ton | 0.0125 kg/ton |
| Loading Emission Factor (kg/ton) | 0.010 kg/ton | 0.005 kg/ton |
| Unloading Emission Factor (kg/ton) | 0.010 kg/ton | 0.005 kg/ton |
| Transporting Emission Factor (kg/km-trip) | 0.7 kg/km-trip | 0.35 kg/km-trip |

For Yozgat Project:

Amount of Filling Material : 600.000 $m^3$ (960.000 ton)

Duration of Filling Operation : 24 months

Daily Working Time : 10 hour/day

Amount of Hourly Excavation Material : ~133 tons/hour

For DSİ Project:

Amount of Excavation Material : 3.000 $m^3$ (4.800 ton)

Duration of Excavation Work : 10 days

Daily Working Duration : 10 hours/day

Amount of Hourly Excavation Material : ~ 48 tons/hour

Considering all of these:

The worst case scenario (possibility of overlapping the projects)

The total amount of hourly excavation material: 133 tons/hour + 48 tons/hour = 181 tons/hour

**Emission Values:**

**Dust Emission During Dismantling**

Dust emission (Uncontrolled) = 181 tons/hour x 0,025 kg/ton = 4,5 kg/hour

Dust emission (Controlled) = 181 tons/hour x 0,0125 kg/ton = 2,25 kg/hour

**Dust Emission During Loading**

Dust emission (Uncontrolled) = 181 tons/hour x 0,01 kg/ton = 1,81 kg/hour

Dust emission (Controlled) = 181 tons/hour x 0,005 kg/ton = 0,9 kg/hour

**Dust Emission During Unloading**

Dust emission (Uncontrolled) = 181 tons/hour x 0,01 kg/ton = 1,81 kg/hour

Dust emission (Controlled) = 181 tons/hour x 0,005 kg/ton = 0,9 kg/hour

**Dust Emission During Transportation**

The distance between project site and the excavation storage site is 1,8 km. However, only 150 m of the total of 1.800 m is stabilized road.

Dust emission (Uncontrolled) = (20 trip/day x 0,7 kg/km x 0,3 km) / 10 hour/day = 0,42 kg/hour

Dust emission (Controlled) = (20 trip/day x 0,35 kg/km x 0,3 km) / 10 hour/day = 0,21 kg/hour

**Table 54: Total Dust Emissions**

| | Controlled (kg/hour) | Uncontrolled (kg/hour) |
|---|---|---|
| Dust Emission During Dismantling | 2,25 | 4,5 |
| Dust Emission During Loading | 0,9 | 1,81 |
| Dust Emission During Unloading | 0,9 | 1,81 |
| Dust Emission During Transportation | 0,21 | 0,42 |
| **Total** | **4,26** | **8,54** |

In total, the amount of dust emission will be 4,26 kg/hour if it is controlled and 8,54 kg/hour if it is uncontrolled as it is described in the aforementioned regulation.

Total amount of dust emission to be released due to the operations to be performed during the excavation works are above the limit value (1kg/h) specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution. Therefore, AERMOD modeling was performed in order to calculate the values of contribution of dust emissions to the ambient air quality.

Surface data (topography)

Topographic values are crucial for the distribution of emission values. The sensitive points and topography was divided into grids by 50 m x 50 m cells within the 16.000.000 $m^2$ area (with the dimension of 4000 m x 4000 m).

Meteorological data

According to the Yozgat Meteorological Station 1960-2012 data, wind rose regarding to the long term wind numbers is shown below. Besides, the wind rose which is determined according to the 2003 Yozgat wind direction numbers is also shown below. It is obvious that wind roses of long term and year of 2003 are shown lots of similar characteristic with respect to dominant wind directions and distribution of wind. Therefore, 2003 year of meteorological data was determined to be representative for the wind characteristics of the area and used for AERMOD.

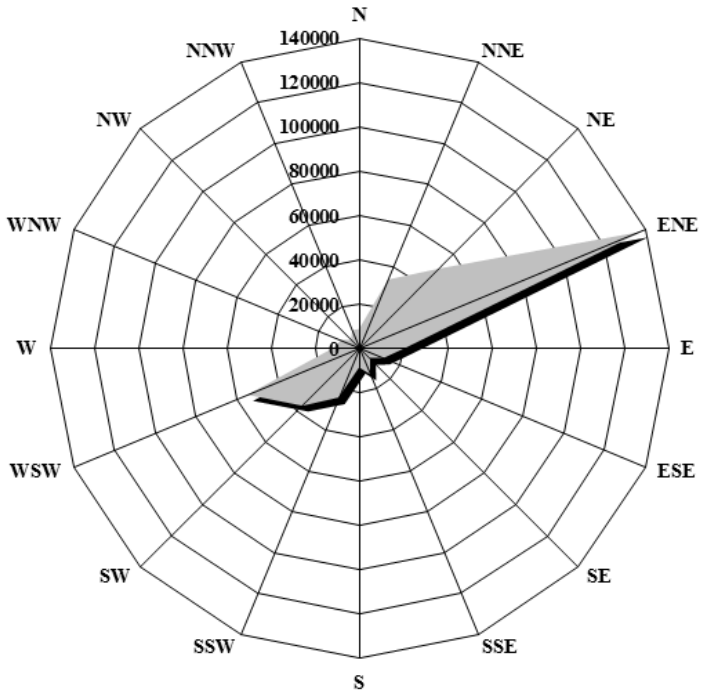


*Figure 34: Annual number of winds at Yozgat Meteorological Station*

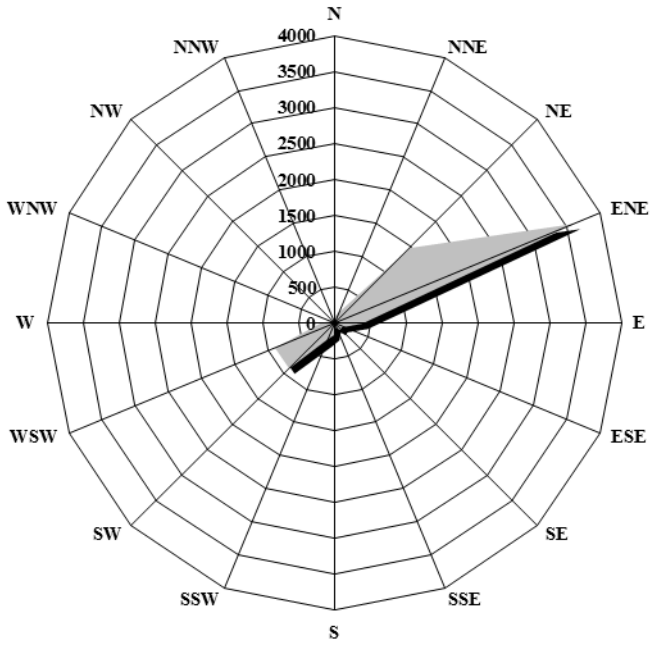


*Figure 35: Number of winds at year of 2003 Yozgat Wind Number*

Meteorological pre-processor software AERMET which is supported by USEPA (United States Environmental Protection Agency) was used in the preparation of the meteorological data for the AERMOD model.

While calculating the meteorological data input, the quality control of the hourly raw surface data and upper atmosphere data of the relevant year and the station is done, and height is calculated. Subsequently, data are combined under a single file and the hourly values are calculated through defining the parameters specific to the site (surface roughness, albedo rate and bowen rate). Finally, profile file would be prepared according to the arranged surface file and consisting of the standard deviation of wind speed, direction, temperature and wind components on numerous different levels.

In the AERMET meteorology pre-processor software:

For hourly surface observations, the values of hourly temperature, wind speed, wind direction, cloud base height and station pressure were produced according to the Yozgat Meteorological Station.

For upper atmosphere observations, the values of atmospheric pressure, elevation from ground level, dry thermometer temperature, wind direction (degree of deviation from N) and wind speed (m/sec) were also produced according to the Samsun Meteorological Station.

Model Results

*Dust Emissions*

The comparison of dust emission model results with the limit values of Regulation on the Control of Industrial Air Pollution is shown in the below table.

**Table 55: Modelling Results**

| Scenario | Maximum Annual Emission Value (µg/m³) and Location | Limit Value (µg/m³) | Maximum 24 Hours Average Emission Value (µg/m³) and Location | Limit Value (µg/m³) |
|---|---|---|---|---|
| Controlled | 14,8 (657871, 4410750) | 60 | 44,5 (657921, 4410750) | 100 |
| Uncontrolled | 29,4 (657871, 4410750) | | 88,9 (657921, 4410750) | |

As seen in the table above all emission values to be released due to the operations to be performed during the excavation works are below the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution.

*Settled Dust*

The comparison of settled dust concentration values to the limit values of Regulation on the Control of Industrial Air Pollution is shown in the below table.

**Table 56: Settled Dust**

| Parameter | Conc. (max) | | Limit Value |
|---|---|---|---|
| | Controlled | Uncontrolled | |
| Settled Dust | 100 µg/m³ | 125,34 µg/m³ | 198 µg/m³ |

As seen in the table above all emission values to be released due to the operations to be performed during the excavation works are below the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution.

In addition to this, all measures specified in the Annex 1 of the Regulation on the Control of Industrial Air Pollution shall be taken in order minimize the dust emission within the scope of the project. Dust distribution maps are shown below figures.

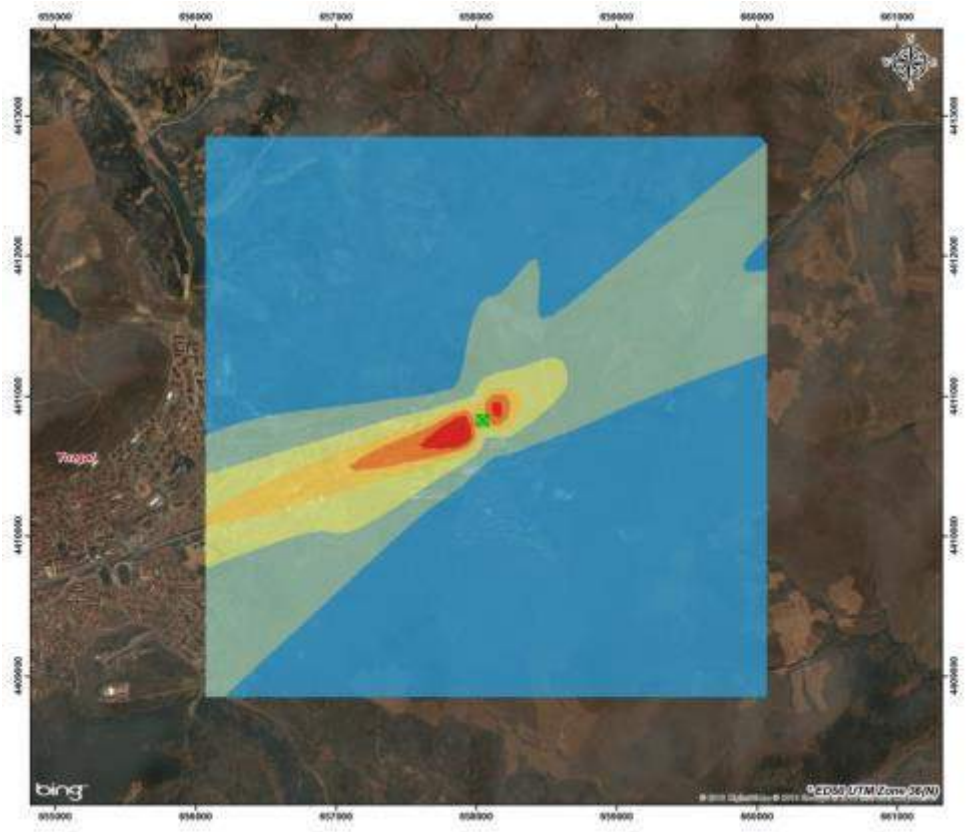


*Figure 36: Annual Distribution of PM10 (Controlled)*

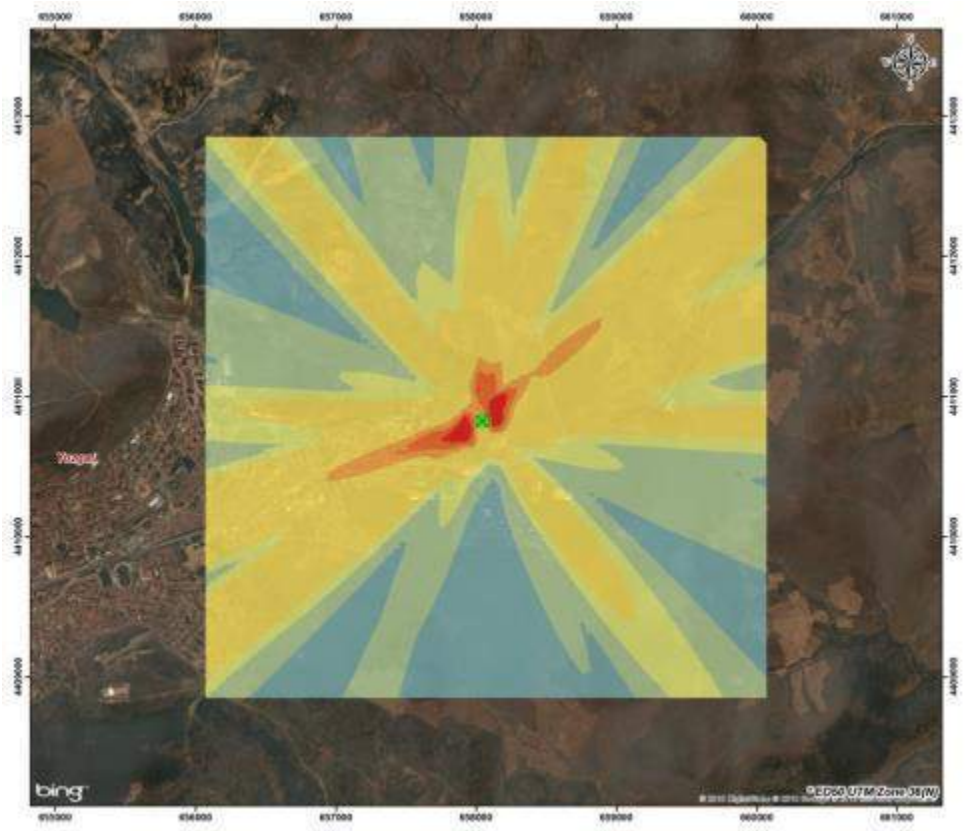


*Figure 37: Daily Distribution of PM10 (Controlled)*

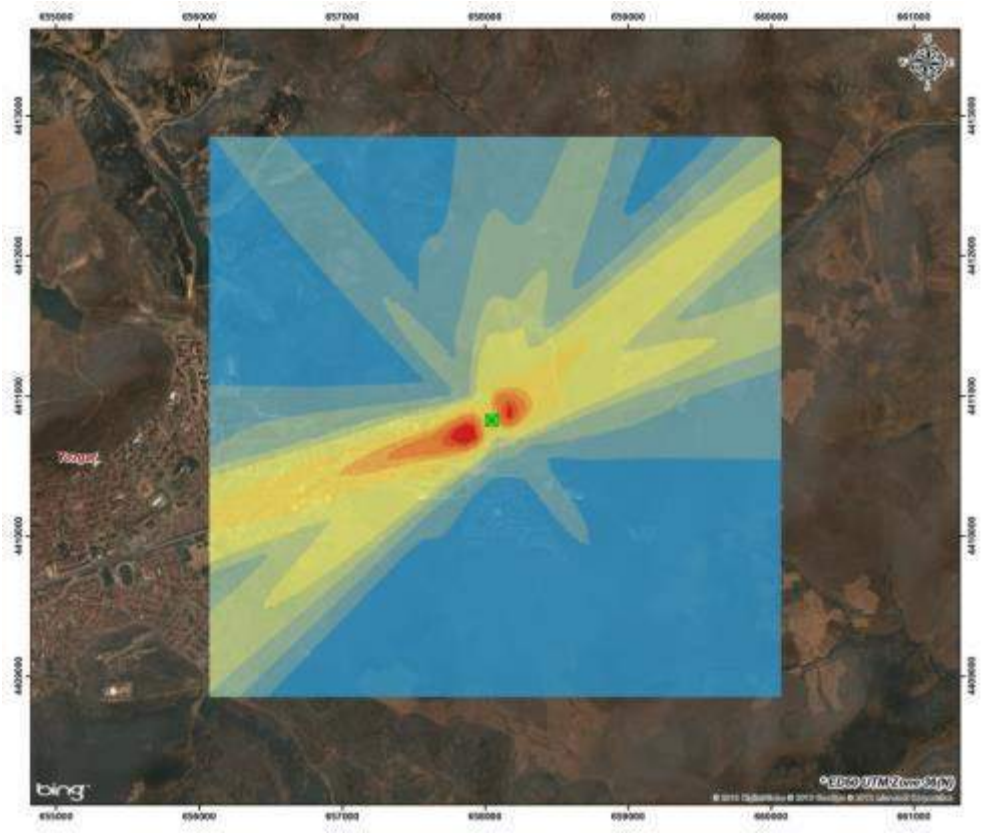


*Figure 38: Settled Dust Distribution (Controlled)*

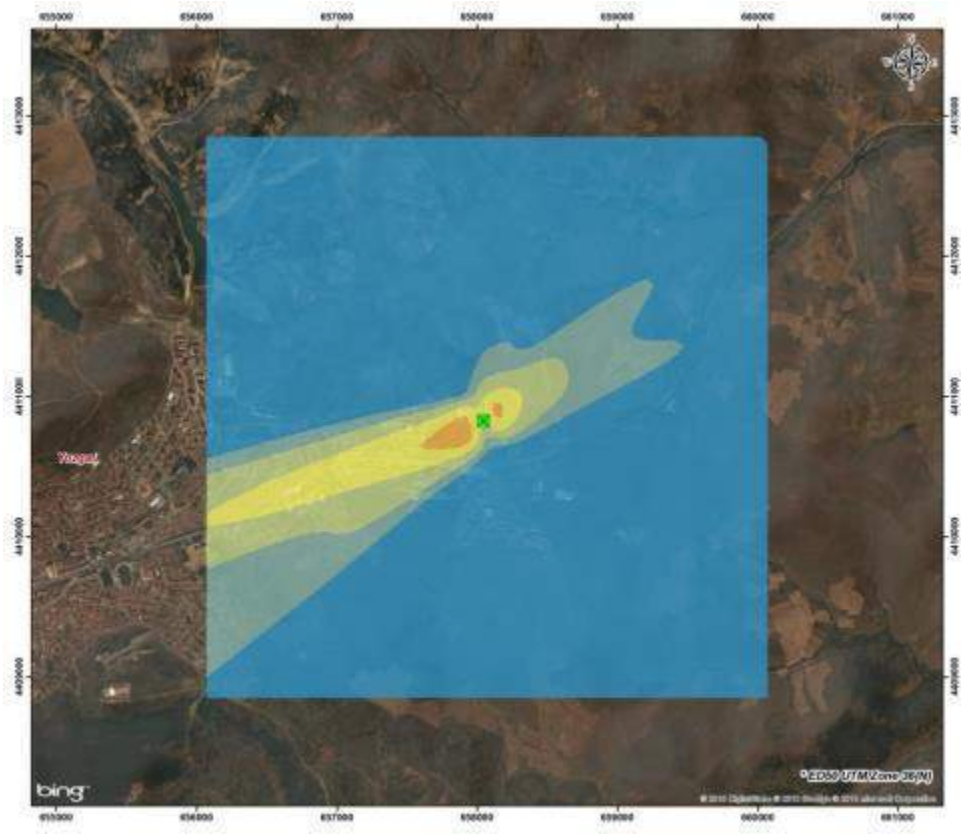


*Figure 39: Annual Distribution of PM10 (Uncontrolled)*

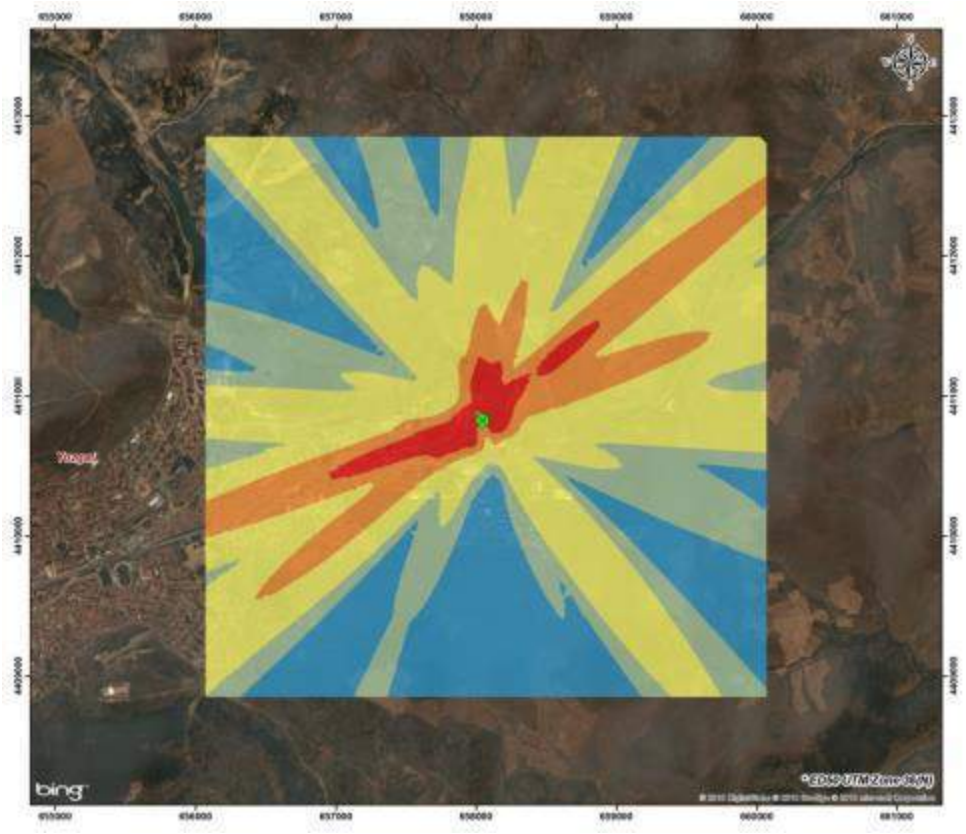


*Figure 40: Daily Distribution of PM10 (Uncontrolled)*

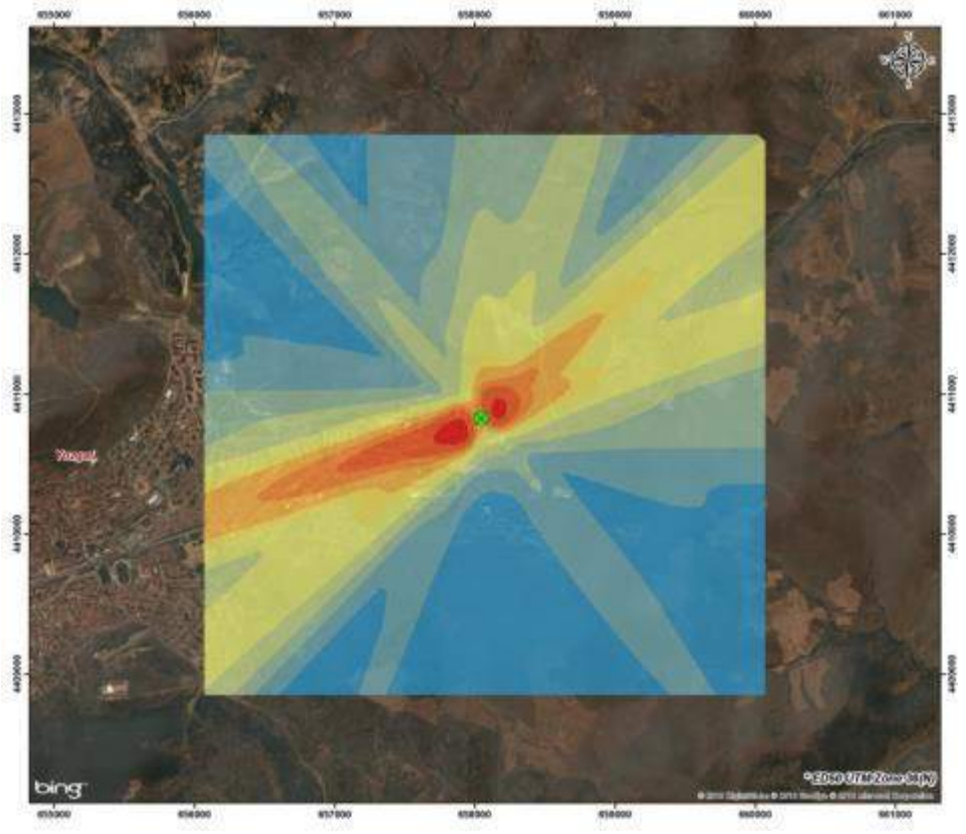


*Figure 41: Settled Dust Distribution (Uncontrolled)*

Considering baseline conditions in the study area, the impact of pollutant and dust emission in the atmosphere is expected to be negligible during the construction phase.

**Table 57: impact evaluation matrix for atmosphere component during construction phase before mitigation**

| IMPACT EVALUATION MARTIX - ATMOSPHERE CONSTRUCTION PHASE | | pollutant and dust emission in the atmosphere |
|---|---|---|
| Duration (D) | Short | |
| | medium-short | |
| | Medium | |
| | medium-long | |
| | Long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | Continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1.15 |
| | | **Negligible** |

### *5.5.3.2 Operational phase*

#### Project area

In the project area generation of emission is only expected from the natural gas during the heating purposes and exhaust gas emissions from the vehicles operating under the scope of the project.

Considering baseline conditions in the SA, the impact of pollutant and dust emission in the atmosphere is expected to be negligible during the operational phase.

**Table 58: impact evaluation matrix for atmosphere component during operational phase before mitigation**

| IMPACT EVALUATION MARTIX - ATMOSPHERE OPERATIONAL PHASE | | pollutant and dust emission in the atmosphere |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | Long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.79 |
| | | **Negligible** |

## 5.5.4 Mitigation measures

Mitigation techniques for the reduction and control of dust and exhaust emissions from construction activities will include:

- Construction sites, and transportation routes will be moisturized twice a day in hot-dry seasons;

- Trucks transporting fugitive material such as soil, sand, etc. will be covered to prevent dispersion during transportation;
- Periodic maintenance will be provided for construction machinery and equipment to control the exhaust emissions;
- Good condition construction equipment will be used;
- Scheduling of traffic to avoid peak hours on local roads;
- Site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction will be established;
- Vehicles will be maintained in good condition to ensure they are no louder than other, similar vehicles on the roadways.

Regarding the Project area, during the operational stage the only emission source is the exhaust gas from the vehicles and emissions from natural gas during operating phase under the scope of the project.

The following mitigations measures will be in place to minimize the impacts of the increased traffic on the community and environment:

- Traffic will be reduced routing through community areas wherever possible.

The fuel system of the vehicles shall be controlled permanently and it shall be complied with the provision of the Regulation on the Control of Exhaust Gas Emission published on 04.04.2009 in Official Gazette No. 27190. Beside, during the operation phase, the emissions related to heating purposes would be controlled periodically and it would be complied with the provision of the Regulations on Air Pollution Control. Therefore, it is not anticipated that the emissions will affect the air quality in a negative way within the scope of the project

The fuel system of the vehicles shall be controlled permanently and it shall be complied with the provision of the Regulation on the Control of Exhaust Gas Emission published on 04.04.2009 in Official Gazette No. 27190.

All measures given in the Regulations on the Control of Industrial Air Pollution, published on 03.07.2009 in Official Gazette No.27277, shall be taken in order to minimize dust emission during the construction period.

## 5.5.5 Residual impacts

### *5.5.5.1 Construction phase*

According to the calculations during Local EIA, contribution of dust emissions from construction activities is expected to be below the ambient quality limits defined in Turkish regulations. Total exhaust emissions from construction machinery and equipment is not expected to be over the exhaust on a motorway. Thus, overall a low magnitude air impact is predicted, with low environmental consequence.

Considering mitigation measures, the impact of pollutant and dust emission in the atmosphere is expected to be negligible during the construction phase.

**Table 59: impact evaluation matrix for atmosphere component during construction phase after mitigation**

| IMPACT EVALUATION MARTIX - ATMOSPHERE CONSTRUCTION PHASE | | Pollutant, dust emission in the atmosphere and traffic load |
|---|---|---|
| Duration (D) | Short | |
| | medium-short | |
| | Medium | |
| | medium-long | |
| | Long | |
| Frequency (F) | Concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Mitigation (M) | high | |
| | medium | |
| | low | |
| | none | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.58 |
| | | **Negligible** |

### 5.5.5.2 Operational phase

During the operational stage of the project the only emission source is the exhaust gas emissions from the vehicles operating under the scope of the project. Concerning this issue, the fuel system of the vehicles shall be controlled permanently. Thus, overall a low magnitude air impact is predicted, with low environmental consequence.

Considering mitigation measures, the impact of pollutant and dust emission in the atmosphere is expected to be negligible during the operational phase.

**Table 60: impact evaluation matrix for atmosphere component during operational phase after mitigation**

| IMPACT EVALUATION MARTIX - ATMOSPHERE OPERATIONAL PHASE | | Pollutant, dust emission in the atmosphere and traffic load |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Mitigation (M) | high | |
| | medium | |
| | low | |
| | none | |
| Sensitivity (S) | negligible | |
| | low | |

| | | |
|---|---|---|
| **IMPACT EVALUATION MARTIX - ATMOSPHERE OPERATIONAL PHASE** | | **Pollutant, dust emission in the atmosphere and traffic load** |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.59 |
| | | **Negligible** |

### 5.5.6 Monitoring

Periodic dust (PM10 and settled dust) monitoring should be conducted at the closest settlement, during construction stage and will be compared with the Regulation on the Control of Industrial Air Pollution. Exhaust emissions from construction and transportation vehicles should be periodically monitored along with the requirements in the Regulation on Control of Exhaust Gas Emission both in construction and operation period of the project.

## 5.6 Noise and vibration

### 5.6.1 Baseline

During the baseline studies, day time, evening time and night time baseline noise measurements were conducted at 3 points at the Project Site on July 11, 2013.

#### *5.6.1.1 Study area*

During the baseline studies, day time, evening time and night time baseline noise measurements were conducted at 3 points at the Project Site. The project area is near the State Hydraulic Works (DSİ) and the nearest residential area is at 500 m distance. Information about the measurement points is given in the table below and the location map of the measurement points are given in the figure below.

**Table 61: Location of the Noise Measurement Points**

| Point | Location (x.y UTM ED50) |
|---|---|
| G-1 | 658240 – 4410740 |
| G-2 | 657920 – 4410750 |
| G-3 | 657960 – 4411000 |

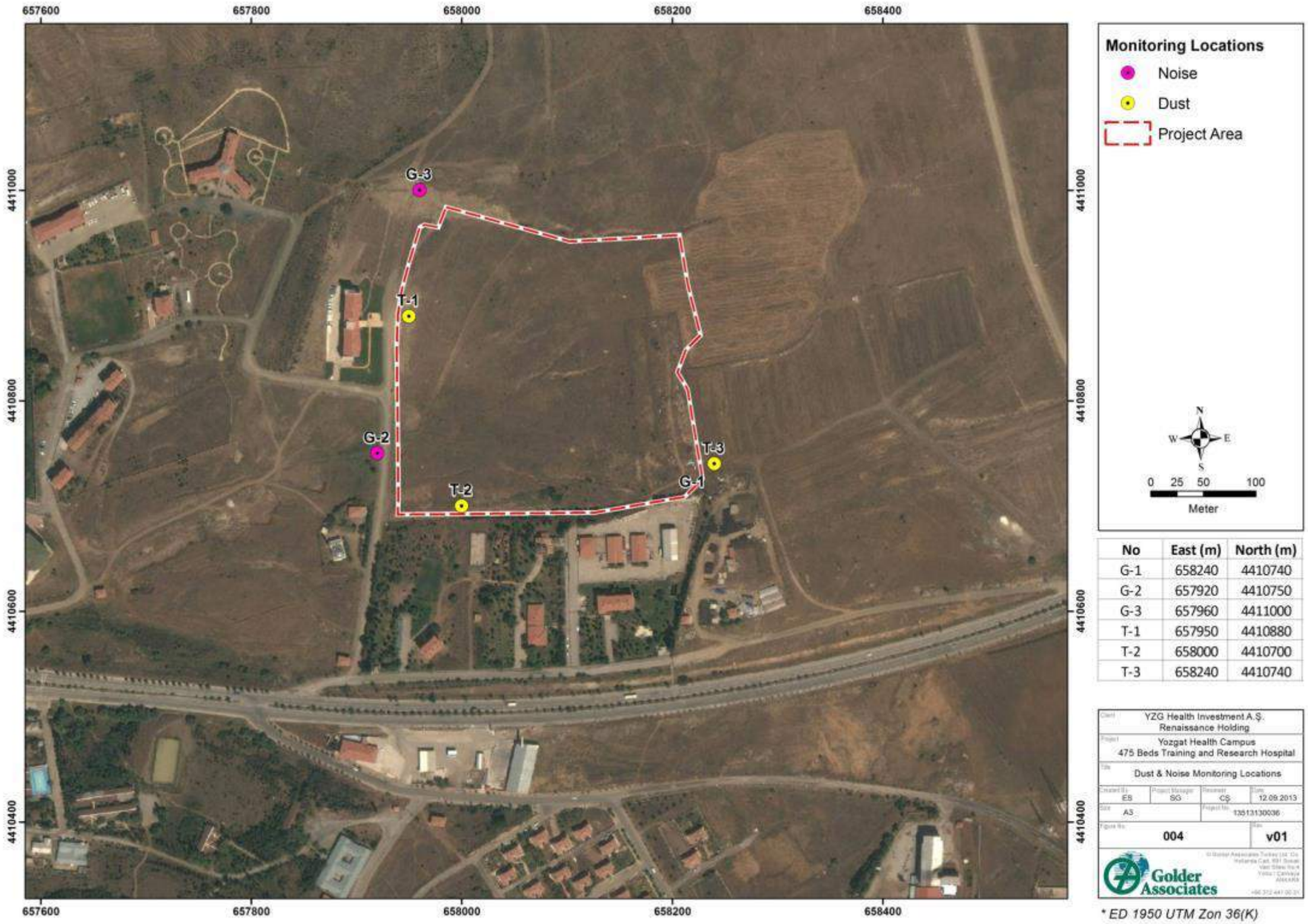


*Figure 42: Locations of Noise Measurements*

### 5.6.1.2 Methodology

The following methodology was applied:

- all measurements are independent from each other and all of them are in the direction of project area.
- all measurements were done according to national standards.
- The standards used are TS 9315 ISO1996-1 Definition of Acoustic-Environmental Noise, Measurement and Assessment Section 1: Standard of Basic Quantities and Assessment Procedures
- The measurements are done at 1/3 octave band. The frequency values between 63 Hz and 8.000 Hz are recorded.

The measurements were done in front of the receptor with minimum 3,5 m distance, in the direction of project area and at 1,5 m height from the ground with 90 degree angle.

### 5.6.1.3 Baseline Results

Day time, evening time and night time noise measurements within baseline studies were carried out at the Project Site. The measurement points and the results of the measurements are presented in the tables below. Noise measurements were conducted by Svan 957 type of device with HP filter.

**Table 62: Background Noise Level Determined at Measurement Points**

| Point No. | Time and Duration | Day Time | Evening Time | Night Time |
|---|---|---|---|---|
| | | Leq (Total A) dB and Duration | Leq (Total A) dB and Duration | Leq (Total A) dB and Duration |
| G-1 | July 11, 2013 | 39,2<br>11:55 – 12:10 | 36,6<br>19:40 – 19:55 | 39<br>23:20 – 23:35 |
| G-2 | July 11, 2013 | 54,5<br>10:55 – 11:10 | 44,1<br>20:00 – 20:15 | 34,3<br>24:00 – 00:15(July, 12) |
| G-3 | July 11, 2013 | 36,2<br>11:25 – 11:40 | 35,4<br>19:15 – 19:30 | 34,8<br>23:40 – 23:55 |

According to the Regulation on Assessment and Management of Ambient Noise, Turkish ambient noise standards to be complied with by industrial facilities are presented in table below.

**Table 63: Turkish Ambient Noise Standards**

| Receptor Areas | $L_{day}$ (dBA) | $L_{evening}$ (dBA) | $L_{night}$ (dBA) |
|---|---|---|---|
| Noise sensitive areas where education, culture and health facilities and construction camp are densely located | 60 | 55 | 50 |
| Areas where commercial buildings and noise sensitive areas are located but residential houses are densely located | 65 | 60 | 55 |

| Receptor Areas | $L_{day}$ (dBA) | $L_{evening}$ (dBA) | $L_{night}$ (dBA) |
|---|---|---|---|
| Areas where commercial buildings and noise sensitive areas are located but business buildings are densely located | 68 | 63 | 58 |
| Industrial areas | 70 | 65 | 60 |

Ambient noise limit values provided by IFC General EHS Guidelines - Environmental Noise Management are presented in the table below.

**Table 64: Ambient Noise Standards in IFC General EHS Guidelines**

| Receptor | One Hour LAeq (dBA) | |
|---|---|---|
| | Day time 07:00 - 22:00 | Night time 22:00 - 07:00 |
| Residential; institutional; educational | 55 | 45 |
| Industrial; commercial | 70 | **70** |

The Project Site is classified as a receptor within "Noise sensitive areas where education, culture and health facilities and construction camp are densely located" in Turkish limits and within "Industrial; commercial areas" in IFC limits.

The baseline measurements indicated that **day time** existing noise levels at the **Project Site** varied between **36 and 55 dBA** that complied with the Turkish and IFC limits of 70 dBA for industrial sites.

The existing **evening time** noise levels at **Project Site** were **36,6, 44,1,** and **35,4**. The existing night time noise levels at Project Site were **39**, **34,3** , and **34,8.** The measured levels complied with the Turkish night limit of 50 **dBA.** Also, all of the measured values complied with the IFC limit of **45 dBA** for night time hours.

The baseline measurements indicated that day time noise level at the G2 point is close to the limit value of the IFC Ambient Noise Standards for day time residential; institutional; educational areas. This situation generated during the measurement period was expected to be caused by the car horn or some screamer besides the measurement equipment.

Considering the above mentioned data, the sensitivity of this component can be considered medium.

### 5.6.2 Impact Analysis Results

Noise to be generated during the construction stage of the Project is local and temporary and it will finish at the end of construction. The noise to be generated during Project operation may be expected to be caused by the emergency generators, helicopter movement and ambulance movement.

Effect of vibration is not expected to go beyond the construction site considering the machinery and equipment to be used in construction.

Impact factors that could possibly affect this component during the construction phase are:

- emission of noise (and vibrations).

Impact factors that could possibly affect this component during the operational phase are the following:

- emission of noise (and vibrations).

### 5.6.2.1 Construction phase

The Regulation on Assessment and Management of Ambient Noise provides noise emission limits for construction sites as presented in the tables below. Accordingly, level of the noise generated by the construction of the Project should not exceed 70 dBA.

Accordingly, all noise levels generated at the Project Site were calculated by the assumption of the worst case, in which all machines are operated simultaneously in the same place.

**Table 65: Ambient Noise Limits of Turkish Legislation for Construction Sites**

| Type of Activity | L-day (dBA) |
|---|---|
| Building | 70 |
| Road | 75 |
| Other Sources | 70 |

Estimated number and types of the machinery and equipment to be used at the Project Site during construction and the corresponding sound levels are provided in the table below.

**Table 66: Expected Sound Levels of Machinery and Equipment to be used During Construction**

| Machinery / Equipment | Number | Expected Sound Level dB ($L_W$) (*) |
|---|---|---|
| Excavator | 5 | 105 |
| Dozer | 1 | 105,4 |
| Mobile Crane | 2 | 105 |
| Tower Crane | 3 | 100 |
| Grader | 1 | 105 |
| Loader | 1 | 100 |
| Concrete Mixer | 1 | 108 |
| JCB | 1 | 100 |
| Concrete Pump | 1 | 108 |
| Truck | 15 | 110 |

(*) Sound levels were determined according to the standards provided in Regulation on Ambient Noise Emissions Generated by the Equipment Used in Outdoor Places published in the Official Gazette no: 26392 on December 30, 2006.

The sound power levels of the construction equipment would be at the octave bands of 500Hz, 1000Hz, 2000Hz and 4000Hz. The sound power levels are calculated according to the below formula and shown in the below table:

$$L_w = 10x\log(\sum_{i=1}^{n} 10^{\frac{L_w(i)}{10}})$$

$$L_w(i) = 10\log(\frac{10^{\frac{L_w}{10}}}{4})$$

**Table 67: The sound Power Levels for Different Octave Bands**

| Noise Sources | Number | Sound Power Level (dB) | | | | |
|---|---|---|---|---|---|---|
| | | Total | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
| Excavator | 5 | 105 | 99,0 | 99,0 | 99,0 | 99,0 |
| Dozer | 1 | 105,4 | 99,4 | 99,4 | 99,4 | 99,4 |
| Mobile Crane | 2 | 105 | 99,0 | 99,0 | 99,0 | 99,0 |
| Tower Crane | 3 | 100 | 94,0 | 94,0 | 94,0 | 94,0 |
| Grader | 1 | 105 | 99,0 | 99,0 | 99,0 | 99,0 |
| Loader | 1 | 100 | 94,0 | 94,0 | 94,0 | 94,0 |
| Concrete Mixer | 1 | 108,0 | 102,0 | 102,0 | 102,0 | 102,0 |
| JCB | 1 | 100,0 | 94,0 | 94,0 | 94,0 | 94,0 |
| Concrete Pump | 1 | 108,0 | 102,0 | 102,0 | 102,0 | 102,0 |
| Truck | 15 | 110,0 | 104,0 | 104,0 | 104,0 | 104,0 |

**Sound Pressure Levels**

Sound pressure levels were calculated at 4 different octave bands in accordance with the below formula and shown in the below table:

$$L_p = L_w + 10\log(\frac{Q}{4\pi r^2})_I$$

$L_p$ ..... sound pressure level at x distance
Q ..... sound level coeficient (1 for mobile sources)
r .....distance to the source (m)

**Table 68: Sound Pressure Levels**

| Noise Sources | Distance | Sound Pressure Level (dB) | | | |
|---|---|---|---|---|---|
| | | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
| Excavator | 50 | 54,03 | 54,03 | 54,03 | 54,03 |
| | 250 | 40,05 | 40,05 | 40,05 | 40,05 |
| | 500 | 34,03 | 34,03 | 34,03 | 34,03 |
| | 1.000 | 28,01 | 28,01 | 28,01 | 28,01 |
| | 1.500 | 24,49 | 24,49 | 24,49 | 24,49 |
| | 2.000 | 21,99 | 21,99 | 21,99 | 21,99 |
| | 3.000 | 18,47 | 18,47 | 18,47 | 18,47 |

| Noise Sources | Distance | Sound Pressure Level (dB) | | | |
|---|---|---|---|---|---|
| | | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
| Dozer | 50 | 54,43 | 54,43 | 54,43 | 54,43 |
| | 250 | 40,45 | 40,45 | 40,45 | 40,45 |
| | 500 | 34,43 | 34,43 | 34,43 | 34,43 |
| | 1.000 | 28,41 | 28,41 | 28,41 | 28,41 |
| | 1.500 | 24,89 | 24,89 | 24,89 | 24,89 |
| | 2.000 | 22,39 | 22,39 | 22,39 | 22,39 |
| | 3.000 | 18,87 | 18,87 | 18,87 | 18,87 |
| Mobile Crane | 50 | 54,03 | 54,03 | 54,03 | 54,03 |
| | 250 | 40,05 | 40,05 | 40,05 | 40,05 |
| | 500 | 34,03 | 34,03 | 34,03 | 34,03 |
| | 1.000 | 28,01 | 28,01 | 28,01 | 28,01 |
| | 1.500 | 24,49 | 24,49 | 24,49 | 24,49 |
| | 2.000 | 21,99 | 21,99 | 21,99 | 21,99 |
| | 3.000 | 18,47 | 18,47 | 18,47 | 18,47 |
| Tower Crane | 50 | 49,03 | 49,03 | 49,03 | 49,03 |
| | 250 | 35,05 | 35,05 | 35,05 | 35,05 |
| | 500 | 29,03 | 29,03 | 29,03 | 29,03 |
| | 1.000 | 23,01 | 23,01 | 23,01 | 23,01 |
| | 1.500 | 19,49 | 19,49 | 19,49 | 19,49 |
| | 2.000 | 16,99 | 16,99 | 16,99 | 16,99 |
| | 3.000 | 13,47 | 13,47 | 13,47 | 13,47 |
| Grader | 50 | 54,03 | 54,03 | 54,03 | 54,03 |
| | 250 | 40,05 | 40,05 | 40,05 | 40,05 |
| | 500 | 34,03 | 34,03 | 34,03 | 34,03 |
| | 1.000 | 28,01 | 28,01 | 28,01 | 28,01 |
| | 1.500 | 24,49 | 24,49 | 24,49 | 24,49 |
| | 2.000 | 21,99 | 21,99 | 21,99 | 21,99 |
| | 3.000 | 18,47 | 18,47 | 18,47 | 18,47 |
| Loader | 50 | 52,04 | 52,04 | 52,04 | 52,04 |
| | 250 | 38,06 | 38,06 | 38,06 | 38,06 |
| | 500 | 32,04 | 32,04 | 32,04 | 32,04 |
| | 1.000 | 26,02 | 26,02 | 26,02 | 26,02 |
| | 1.500 | 22,50 | 22,50 | 22,50 | 22,50 |
| | 2.000 | 20,00 | 20,00 | 20,00 | 20,00 |
| | 3.000 | 16,48 | 16,48 | 16,48 | 16,48 |
| Concrete Mixer | 50 | 57,03 | 57,03 | 57,03 | 57,03 |
| | 250 | 43,05 | 43,05 | 43,05 | 43,05 |
| | 500 | 37,03 | 37,03 | 37,03 | 37,03 |
| | 1.000 | 31,01 | 31,01 | 31,01 | 31,01 |
| | 1.500 | 27,49 | 27,49 | 27,49 | 27,49 |
| | 2.000 | 24,99 | 24,99 | 24,99 | 24,99 |
| | 3.000 | 21,47 | 21,47 | 21,47 | 21,47 |

| Noise Sources | Distance | Sound Pressure Level (dB) | | | |
|---|---|---|---|---|---|
| | | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
| JCB | 50 | 49,03 | 49,03 | 49,03 | 49,03 |
| | 250 | 35,05 | 35,05 | 35,05 | 35,05 |
| | 500 | 29,03 | 29,03 | 29,03 | 29,03 |
| | 1.000 | 23,01 | 23,01 | 23,01 | 23,01 |
| | 1.500 | 19,49 | 19,49 | 19,49 | 19,49 |
| | 2.000 | 16,99 | 16,99 | 16,99 | 16,99 |
| | 3.000 | 13,47 | 13,47 | 13,47 | 13,47 |
| Concrete Pump | 50 | 57,03 | 57,03 | 57,03 | 57,03 |
| | 250 | 43,05 | 43,05 | 43,05 | 43,05 |
| | 500 | 37,03 | 37,03 | 37,03 | 37,03 |
| | 1.000 | 31,01 | 31,01 | 31,01 | 31,01 |
| | 1.500 | 27,49 | 27,49 | 27,49 | 27,49 |
| | 2.000 | 24,99 | 24,99 | 24,99 | 24,99 |
| | 3.000 | 21,47 | 21,47 | 21,47 | 21,47 |
| Truck | 50 | 62,04 | 62,04 | 62,04 | 62,04 |
| | 250 | 48,06 | 48,06 | 48,06 | 48,06 |
| | 500 | 42,04 | 42,04 | 42,04 | 42,04 |
| | 1.000 | 36,02 | 36,02 | 36,02 | 36,02 |
| | 1.500 | 32,50 | 32,50 | 32,50 | 32,50 |
| | 2.000 | 30,00 | 30,00 | 30,00 | 30,00 |
| | 3.000 | 26,48 | 26,48 | 26,48 | 26,48 |

**Atmospheric Adsorption**

Atmospheric adsorption values for each frequency was calculated according to the;

$$A_{atm} = 7.4x10^{-8}\left(\frac{f^2 x\, r}{Q}\right)$$ formula (relative humidity is %66,8).

**Table 69: Atmospheric Adsorption Levels**

| Frequency | Distance | Atmospheric Adsorption |
|---|---|---|
| 500 | 50 | 0,01 |
| | 250 | 0,07 |
| | 500 | 0,14 |
| | 1.000 | 0,28 |
| | 1.500 | 0,42 |
| | 2.000 | 0,55 |
| | 3.000 | 0,83 |
| 1000 | 50 | 0,06 |
| | 250 | 0,28 |
| | 500 | 0,55 |
| | 1.000 | 1,11 |

| Frequency | Distance | Atmospheric Adsorption |
|---|---|---|
| | 1.500 | 1,66 |
| | 2.000 | 2,22 |
| | 3.000 | 3,32 |
| 2000 | 50 | 0,22 |
| | 250 | 1,11 |
| | 500 | 2,22 |
| | 1.000 | 4,43 |
| | 1.500 | 6,65 |
| | 2.000 | 8,86 |
| | 3.000 | 13,29 |
| 4000 | 50 | 0,89 |
| | 250 | 4,43 |
| | 500 | 8,86 |
| | 1.000 | 17,72 |
| | 1.500 | 26,59 |
| | 2.000 | 35,45 |
| | 3.000 | 53,17 |

**Final Sound Pressure Levels**

After the extraction of atmospheric adsorption values, final sound pressure levels were calculated for each noise sources at 4 octave bands according to the below formula:

$L_p = L_p - A_{atm}$

**Table 70: Final Sound Pressure Levels**

| Emission Sources | Distance | Final Sound Pressure Levels (dB) | | | |
|---|---|---|---|---|---|
| | | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
| Excavator | 50 | 54,01 | 53,97 | 53,81 | 53,14 |
| | 250 | 39,98 | 39,77 | 38,94 | 35,62 |
| | 500 | 33,89 | 33,47 | 31,81 | 25,17 |
| | 1.000 | 27,73 | 26,90 | 23,58 | 10,28 |
| | 1.500 | 24,07 | 22,82 | 17,84 | -2,10 |
| | 2.000 | 21,43 | 19,77 | 13,13 | -13,46 |
| | 3.000 | 17,63 | 15,14 | 5,17 | -34,71 |
| Dozer | 50 | 54,41 | 54,37 | 54,21 | 53,54 |
| | 250 | 40,38 | 40,17 | 39,34 | 36,02 |
| | 500 | 34,29 | 33,87 | 32,21 | 25,57 |
| | 1.000 | 28,13 | 27,30 | 23,98 | 10,68 |
| | 1.500 | 24,47 | 23,22 | 18,24 | -1,70 |
| | 2.000 | 21,83 | 20,17 | 13,53 | -13,06 |
| | 3.000 | 18,03 | 15,54 | 5,57 | -34,31 |
| Mobile Crane | 50 | 54,01 | 53,97 | 53,81 | 53,14 |
| | 250 | 39,98 | 39,77 | 38,94 | 35,62 |

| Emission Sources | Distance | Final Sound Pressure Levels (dB) | | | |
|---|---|---|---|---|---|
| | | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
| | 500 | 33,89 | 33,47 | 31,81 | 25,17 |
| | 1.000 | 27,73 | 26,90 | 23,58 | 10,28 |
| | 1.500 | 24,07 | 22,82 | 17,84 | -2,10 |
| | 2.000 | 21,43 | 19,77 | 13,13 | -13,46 |
| | 3.000 | 17,63 | 15,14 | 5,17 | -34,71 |
| Tower Crane | 50 | 49,01 | 48,97 | 48,81 | 48,14 |
| | 250 | 34,98 | 34,77 | 33,94 | 30,62 |
| | 500 | 28,89 | 28,47 | 26,81 | 20,17 |
| | 1.000 | 22,73 | 21,90 | 18,58 | 5,28 |
| | 1.500 | 19,07 | 17,82 | 12,84 | -7,10 |
| | 2.000 | 16,43 | 14,77 | 8,13 | -18,46 |
| | 3.000 | 12,63 | 10,14 | 0,17 | -39,71 |
| Grader | 50 | 54,01 | 53,97 | 53,81 | 53,14 |
| | 250 | 39,98 | 39,77 | 38,94 | 35,62 |
| | 500 | 33,89 | 33,47 | 31,81 | 25,17 |
| | 1.000 | 27,73 | 26,90 | 23,58 | 10,28 |
| | 1.500 | 24,07 | 22,82 | 17,84 | -2,10 |
| | 2.000 | 21,43 | 19,77 | 13,13 | -13,46 |
| | 3.000 | 17,63 | 15,14 | 5,17 | -34,71 |
| Loader | 50 | 52,02 | 51,98 | 51,82 | 51,15 |
| | 250 | 37,99 | 37,78 | 36,95 | 33,63 |
| | 500 | 31,90 | 31,48 | 29,82 | 23,18 |
| | 1.000 | 25,74 | 24,91 | 21,59 | 8,29 |
| | 1.500 | 22,08 | 20,83 | 15,85 | -4,09 |
| | 2.000 | 19,44 | 17,78 | 11,14 | -15,45 |
| | 3.000 | 15,64 | 13,15 | 3,18 | -36,70 |
| Concrete Mixer | 50 | 57,01 | 56,97 | 56,81 | 56,14 |
| | 250 | 42,98 | 42,77 | 41,94 | 38,62 |
| | 500 | 36,89 | 36,47 | 34,81 | 28,17 |
| | 1.000 | 30,73 | 29,90 | 26,58 | 13,28 |
| | 1.500 | 27,07 | 25,82 | 20,84 | 0,90 |
| | 2.000 | 24,43 | 22,77 | 16,13 | -10,46 |
| | 3.000 | 20,63 | 18,14 | 8,17 | -31,71 |
| JCB | 50 | 49,01 | 48,97 | 48,81 | 48,14 |
| | 250 | 34,98 | 34,77 | 33,94 | 30,62 |
| | 500 | 28,89 | 28,47 | 26,81 | 20,17 |
| | 1.000 | 22,73 | 21,90 | 18,58 | 5,28 |
| | 1.500 | 19,07 | 17,82 | 12,84 | -7,10 |
| | 2.000 | 16,43 | 14,77 | 8,13 | -18,46 |
| | 3.000 | 12,63 | 10,14 | 0,17 | -39,71 |
| Concrete Pump | 50 | 57,01 | 56,97 | 56,81 | 56,14 |
| | 250 | 42,98 | 42,77 | 41,94 | 38,62 |

| Emission Sources | Distance | Final Sound Pressure Levels (dB) | | | |
|---|---|---|---|---|---|
| | | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz |
| | 500 | 36,89 | 36,47 | 34,81 | 28,17 |
| | 1.000 | 30,73 | 29,90 | 26,58 | 13,28 |
| | 1.500 | 27,07 | 25,82 | 20,84 | 0,90 |
| | 2.000 | 24,43 | 22,77 | 16,13 | -10,46 |
| | 3.000 | 20,63 | 18,14 | 8,17 | -31,71 |
| Truck | 50 | 62,02 | 61,98 | 61,82 | 61,15 |
| | 250 | 47,99 | 47,78 | 46,95 | 43,63 |
| | 500 | 41,90 | 41,48 | 39,82 | 33,18 |
| | 1.000 | 35,74 | 34,91 | 31,59 | 18,29 |
| | 1.500 | 32,08 | 30,83 | 25,85 | 5,91 |
| | 2.000 | 29,44 | 27,78 | 21,14 | -5,45 |
| | 3.000 | 25,64 | 23,15 | 13,18 | -26,70 |

**Noise Levels**

For calculation of noise levels, below correction factors were used.

**Table 71: Correction Factor**

| Central Frequency (Hz) | Correction Factor |
|---|---|
| 500 | -3,2 |
| 1.000 | 0,0 |
| 2.000 | +1,2 |
| 4.000 | +1,0 |

The noise levels calculated for various distances from the Project Site are given in the table below.

**Table 72: Noise Levels Generated by the Construction Site by Distance (dB)**

| Source of Noise | Noise Levels ($L_p$ dB) | | | | | |
|---|---|---|---|---|---|---|
| | Distance | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | Total Noise Level |
| Excavator | 50 | 50,81 | 53,96 | 54,96 | 53,95 | 59,69 |
| | 250 | 36,76 | 39,71 | 39,90 | 35,66 | 44,40 |
| | 500 | 30,66 | 33,35 | 32,53 | 24,25 | 37,31 |
| | 1000 | 24,47 | 26,66 | 23,82 | 7,44 | 29,96 |
| | 1500 | 20,78 | 22,46 | 17,60 | | 25,49 |
| | 2000 | 18,11 | 19,29 | 12,40 | | 22,23 |
| | 3000 | 14,25 | 14,42 | 3,49 | | 17,52 |
| Dozer | 50 | 51,21 | 54,36 | 55,36 | 54,35 | 60,09 |
| | 250 | 37,16 | 40,11 | 40,30 | 36,06 | 44,80 |
| | 500 | 31,06 | 33,75 | 32,93 | 24,65 | 37,71 |
| | 1000 | 24,87 | 27,06 | 24,22 | 7,84 | 30,36 |
| | 1500 | 21,18 | 22,86 | 18,00 | | 25,89 |
| | 2000 | 18,51 | 19,69 | 12,80 | | 22,63 |
| | 3000 | 14,65 | 14,82 | 3,89 | | 17,92 |

| Source of Noise | Noise Levels ($L_p$ dB) | | | | | |
|---|---|---|---|---|---|---|
| | Distance | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | Total Noise Level |
| Mobile Crane | 50 | 50,81 | 53,96 | 54,96 | 53,95 | 59,69 |
| | 250 | 36,76 | 39,71 | 39,90 | 35,66 | 44,40 |
| | 500 | 30,66 | 33,35 | 32,53 | 24,25 | 37,31 |
| | 1000 | 24,47 | 26,66 | 23,82 | 7,44 | 29,96 |
| | 1500 | 20,78 | 22,46 | 17,60 | | 25,49 |
| | 2000 | 18,11 | 19,29 | 12,40 | | 22,23 |
| | 3000 | 14,25 | 14,42 | 3,49 | | 17,52 |
| Tower Crane | 50 | 45,81 | 48,96 | 49,96 | 48,95 | 54,69 |
| | 250 | 31,76 | 34,71 | 34,90 | 30,66 | 39,40 |
| | 500 | 25,66 | 28,35 | 27,53 | 19,25 | 32,31 |
| | 1000 | 19,47 | 21,66 | 18,82 | 2,44 | 24,96 |
| | 1500 | 15,78 | 17,46 | 12,60 | | 20,49 |
| | 2000 | 13,11 | 14,29 | 7,40 | | 17,23 |
| | 3000 | 9,25 | 9,42 | | | 12,52 |
| Grader | 50 | 50,81 | 53,96 | 54,96 | 53,95 | 59,69 |
| | 250 | 36,76 | 39,71 | 39,90 | 35,66 | 44,40 |
| | 500 | 30,66 | 33,35 | 32,53 | 24,25 | 37,31 |
| | 1000 | 24,47 | 26,66 | 23,82 | 7,44 | 29,96 |
| | 1500 | 20,78 | 22,46 | 17,60 | | 25,49 |
| | 2000 | 18,11 | 19,29 | 12,40 | | 22,23 |
| | 3000 | 14,25 | 14,42 | 3,49 | | 17,52 |
| Loader | 50 | 48,82 | 51,97 | 52,97 | 51,96 | 57,70 |
| | 250 | 34,78 | 37,72 | 37,91 | 33,67 | 42,41 |
| | 500 | 28,67 | 31,36 | 30,54 | 22,26 | 35,32 |
| | 1000 | 22,48 | 24,67 | 21,83 | 5,45 | 27,97 |
| | 1500 | 18,79 | 20,47 | 15,61 | | 23,50 |
| | 2000 | 16,12 | 17,30 | 10,41 | | 20,24 |
| | 3000 | 12,26 | 12,43 | 1,50 | | 15,53 |
| Concrete Mixer | 50 | 53,81 | 56,96 | 57,96 | 56,95 | 62,69 |
| | 250 | 39,76 | 42,71 | 42,90 | 38,66 | 47,40 |
| | 500 | 33,66 | 36,35 | 35,53 | 27,25 | 40,31 |
| | 1000 | 27,47 | 29,66 | 26,82 | 10,44 | 32,96 |
| | 1500 | 23,78 | 25,46 | 20,60 | | 28,49 |
| | 2000 | 21,11 | 22,29 | 15,40 | | 25,23 |
| | 3000 | 17,25 | 17,42 | 6,49 | | 20,52 |
| JCB | 50 | 45,81 | 48,96 | 49,96 | 48,95 | 54,69 |
| | 250 | 31,76 | 34,71 | 34,90 | 30,66 | 39,40 |
| | 500 | 25,66 | 28,35 | 27,53 | 19,25 | 32,31 |
| | 1000 | 19,47 | 21,66 | 18,82 | 2,44 | 24,96 |
| | 1500 | 15,78 | 17,46 | 12,60 | | 20,49 |
| | 2000 | 13,11 | 14,29 | 7,40 | | 17,23 |
| | 3000 | 9,25 | 9,42 | | | 12,52 |
| Concrete Pump | 50 | 53,81 | 56,96 | 57,96 | 56,95 | 62,69 |
| | 250 | 39,76 | 42,71 | 42,90 | 38,66 | 47,40 |

| Source of Noise | Noise Levels ($L_p$ dB) | | | | | |
|---|---|---|---|---|---|---|
| | Distance | 500 Hz | 1000 Hz | 2000 Hz | 4000 Hz | Total Noise Level |
| | 500 | 33,66 | 36,35 | 35,53 | 27,25 | 40,31 |
| | 1000 | 27,47 | 29,66 | 26,82 | 10,44 | 32,96 |
| | 1500 | 23,78 | 25,46 | 20,60 | | 28,49 |
| | 2000 | 21,11 | 22,29 | 15,40 | | 25,23 |
| | 3000 | 17,25 | 17,42 | 6,49 | | 20,52 |
| Truck | 50 | 58,82 | 61,97 | 62,97 | 61,96 | 67,70 |
| | 250 | 44,78 | 47,72 | 47,91 | 43,67 | 52,41 |
| | 500 | 38,67 | 41,36 | 40,54 | 32,26 | 45,32 |
| | 1000 | 32,48 | 34,67 | 31,83 | 15,45 | 37,97 |
| | 1500 | 28,79 | 30,47 | 25,61 | 1,15 | 33,50 |
| | 2000 | 26,12 | 27,30 | 20,41 | | 30,24 |
| | 3000 | 22,26 | 22,43 | 11,50 | | 25,53 |

**Equivalent Sound Level ($L_{eq}$)**

During the calculation of equivalent sound level at the Project Site the worst case scenario in which all machines are operated simultaneously in the same place, was considered. Below formula was used for calculation:

$$L_{eq} = 10 \text{ x } \log \left(\sum_{i=1}^{n} n.10^{\frac{L_{(i)}}{10}}\right)$$

$$L_{gunduz} = L_{eq}$$

(n = number of equipment and vehicles)

**Table 73: Equivalent Sound Level (Leq)**

| Distance | Equivilanr Noise Level (dBA) |
|---|---|
| 50 | 70,0 |
| 250 | 54,9 |
| 500 | 47,9 |
| 1.000 | 40,6 |
| 1.500 | 36,2 |
| 2.000 | 33,0 |
| 3.000 | 28,4 |

Equivalent noise levels with respect to distance from the Project Site during construction are given in the figure below.

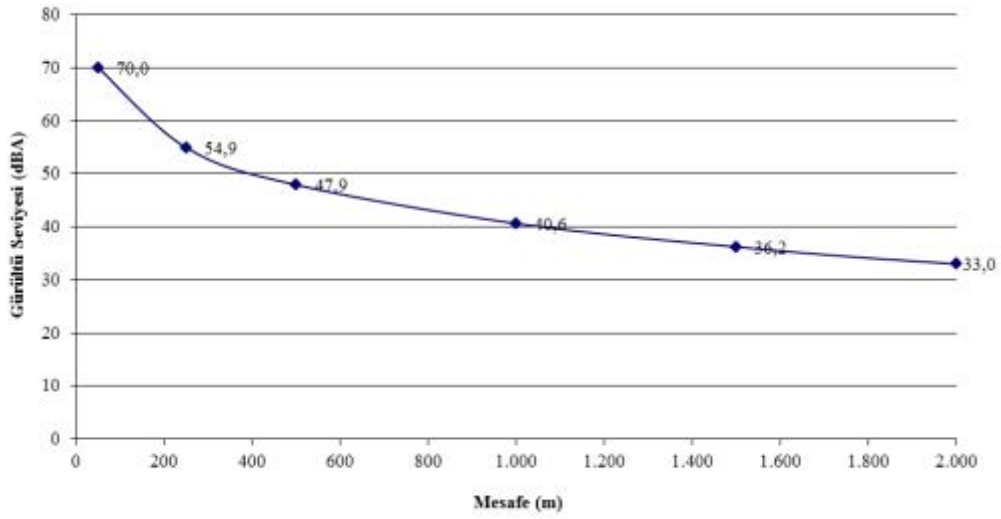


*Figure 43: Equivalent Noise Levels with respect to Distance from the Project Site during Construction. X= m; Y = dBA*

Based on the calculations, the noise level at 50 m from the Project Site is 70 dBA that complies with the 70 dBA limit. The estimated noise level at nearest location, located approximately 500 m from the Project Site, is approximately 47,9 dBA that is below the 70 dBA limit.

As described under the baseline results above, the baseline measurements indicated that day time existing noise levels at the Project Site varied between 36 and 55 dBA that complied with the Turkish and IFC limits of 70 dBA for industrial sites. The existing evening time noise levels at Project Site were 36,6, 44,1, and 35,4. The existing night time noise levels at Project Site were 39, 34,3 , and 34,8. The measured levels complied with the Turkish night limit of 50 dBA. Also, all of the measured values complied with the IFC limit of 45 dBA for night time hours.

The actual noise levels at Project Site is expected to be lower than the calculated value of 47,9 dBA.

Considering the component medium sensitivity, the emission of noise and vibrations during the construction phase is expected to have a negligible effect on the component.

**Table 74: impact evaluation matrix for noise and vibration component during construction phase before mitigation**

| IMPACT EVALUATION MARTIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE | | emission of noise and vibrations |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1.15 |
| | | **Negligible** |

### *5.6.2.2 Operational Phase*

The noise to be generated during Project operation is expected to be caused by the emergency generators, helicopter movement and ambulance movements.

The Regulation on Assessment and Management of Ambient Noise provides noise limits for industrial facilities as presented in the table below. Accordingly, level of the noise generated by the operation of

the Project should not exceed 70 dBA. During the public participation and disclosure meeting, there were no complaints raised on the possible helicopter sound. The other way round, lots of participants stated that there should be helicopter services during the operation phase.

**Table 75: Turkish Ambient Noise Limits for Industrial Facilities**

| Receptor | LAeq (dBA) Day-time | LAeq (dBA) Evening-time | LAeq (dBA) Night-time |
|---|---|---|---|
| Noise sensitive areas - with training, culture and health areas, summer houses and camps | 60 | 55 | 50 |
| Combination of commercial and noise sensitive areas - with dense residential buildings | 65 | 60 | 55 |
| Combination of commercial and noise sensitive areas with dense commercial buildings | 68 | 63 | 58 |
| Industrial areas | 70 | 65 | 60 |

Considering the component medium sensitivity, the emission of noise and vibrations during the operational phase is expected to have a negligible effect on the component.

**Table 76: impact evaluation matrix for noise and vibration component during operational phase before mitigation**

| IMPACT EVALUATION MARTIX - NOISE AND VIBRATIONS OPERATIONAL PHASE | | emission of noise and vibrations |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |

| IMPACT EVALUATION MARTIX - NOISE AND VIBRATIONS OPERATIONAL PHASE | | emission of noise and vibrations |
|---|---|---|
| | medium | |
| | high | |
| | certain | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.59 |
| | | **Negligible** |

### 5.6.3 Mitigation Measures

During the construction stage, provisions of the “Regulation on Assessment and Management of Environmental Noise” and “Regulations on Work Health and Safety" will be followed with the purpose of protecting health of employees with respect to noise. Accordingly:

- appropriate personal protective equipment and materials such as helmet, ear protector or ear plug will be provided to protect workers from noise.
- There would not be any construction activities during the night time.

The following control measures recommended by IFC will be applied where possible:

- selection of equipment with lower sound power levels;
- installing silencers for fans;
- installing suitable mufflers on engine exhausts and compressor components;
- installing acoustic enclosures for equipment casing radiating noise;
- installing vibration isolation for mechanical equipment;
- limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas;
- reducing project traffic routing through community areas wherever possible; and
- developing a mechanism to record and respond to complaints.

In addition, regular maintenance will be made for the construction equipment to ensure decreasing the possible high noise levels generated by the equipment.

During the construction stage, provisions of the Regulation on Assessment and Management of Ambient Noise and Regulations on Work Health and Safety will be followed with the purpose of protecting health of employees with respect to noise. Accordingly, appropriate personal protective materials such as helmet, ear protector or ear plug will be given to protect workers from noise. In addition, maintenance of the equipment will be made regularly to ensure high noise levels are minimized.

No additional mitigation measures are proposed during the operation phase.

## 5.6.4 Residual impacts

### *5.6.4.1 Construction phase*

If mitigation measures are effectively applied, emission of noise and vibrations during the construction phase will have negligible impacts on the component.

**Table 77: impact evaluation matrix for noise and vibration component during construction phase after mitigation**

| IMPACT EVALUATION MARTIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE | | emission of noise and vibrations |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Mitigation (M) | high | |
| | medium | |
| | low | |
| | none | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |

| IMPACT EVALUATION MARTIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE | emission of noise and vibrations |
|---|---|
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | 0.58 |
| | **Negligible** |

### 5.6.4.2 Operational phase

If mitigation measures are effectively applied, emission of noise and vibrations during the operational phase will have negligible impacts on the component.

**Table 78: impact evaluation matrix for noise and vibration component during operational phase after mitigation**

| IMPACT EVALUATION MARTIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE | | emission of noise and vibrations |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Mitigation (M) | high | |
| | medium | |
| | low | |

| | | |
|---|---|---|
| **IMPACT EVALUATION MARTIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE** | | **emission of noise and vibrations** |
| | none | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 0.29 |
| | | **Negligible** |

### 5.6.5 Monitoring

The effect of the Project on the closest settlement, Project Site would be low. No monitoring is required at the Project Site, except if complaints are received.

# 6.0 BIOLOGICAL COMPONENTS

## 6.1 Terrestrial Flora

### 6.1.1 Baseline

#### *6.1.1.1 Study Area*

Field studies were centred on the SA, however, a Regional Study Area (RSA) is considered during literature research in order to give an overview of the vegetation occurring in the area.

#### *6.1.1.2 Methods*

A literature research took place to document habitat types and species that are expected to be present, in the RSA. Scientific literature was considered in order to give an overview of the vegetation occurring in the area.

Field studies took place in August 2013 by Prof. Dr. Hayri Duman from Biology Department of Gazi University Faculty of Science. During the site visit photographic documentation was carried out.Although the timing of field studies was a little late in terms of vegetation, it was quite suitable to identify plant species inhabiting the project site. Therefore, the findings of terrestrial flora studies depend on on-site observations made at the project site and samples that were collected and taken to the herbarium to be identified.

Flora list was created in accordance with the phylogenetic order in Turkish flora; ferns, open seed plants (Gymnospermae) and closed-seeded plants (Angiospermae). Families under each group are also listed according to the phylogenetic order in the Turkish flora. Species are listed with their author names, English names (if available), phytogeographic regions, endemism, threat categories for endemic and rare species, and their relative abundance in the area. Samples collected at the project site were transformed into herbarium material and identified by using “Flora of Turkey and the East Aegean Islands” by Davis, 1965-1988. In addition, threat categories of plants have been specified in line with “The Red Data Book of Turkish Plants” (Ekim et. al., 2000) which was prepared in accordance with 1994 IUCN Red List Categories and Criteria.The IUCN Red List intends to draw attention to species whose populations are at risk or under threat. The IUCN places a species on the Red List only after studying its population and the reasons for its decline. Some countries pay greater attention to IUCN-listed species than Bern-listed species, since the Red List relies on more research. The 1994 (ver.2.3) and 2001 (ver.3.1) categories and criteria of the IUCN Red List are as follows:

| **IUCN Red List Categories and Criteria 1994 (ver. 2.3)** | | **IUCN Red List Categories and Criteria 2012 (ver. 4.0)** | |
|---|---|---|---|
| EX | Extinct | EX | Extinct |
| EW | Extinct in the Wild | EW | Extinct in the Wild |
| CR | Critically Endangered | CR | Critically Endangered |
| EN | Endangered | EN | Endangered |
| VU | Vulnerable | VU | Vulnerable |
| LR | Lower Risk | | |
| | cd : conservation dependent | NT | Near Threatened |
| | nt : near threatened | LC | Least Concern |
| | lc : least concern | | |
| DD | Data Deficient | DD | Data Deficient |
| NE | Not Evaluated | NE | Not Evaluated |

### 6.1.1.3 Baseline Results

The steppe vegetation of Central Anatolia, especially areas covered by provinces of Yozgat, Ankara, Nevsehir and Kayseri have remarkable floristic characteristics. Consequently, a number of studies have been conducted on flora and vegetation in areas where the natural characteristics have been preserved. However, since the project site has lost its natural flora and vegetation characteristics, it does not stand out as a good representation of the steppe habitat with interesting features.

During fieldwork in August, 2013, despite the fact that the site is extensively destructed, a total of 128 flora taxa that belong to 29 families were identified (see Table 6.1). Among these species, 8 of them are endemic to Turkey, all of which are widespread species of the Central Anatolian steppe habitats.

The endemic taxa can be listed as the following: *Astragalus barba-jovis*, *Astragalus anthylloides* (see Figure 6.1), *Crataegus tanacetifolia*, *Centaurea urvillei subsp. stepposa*, *Scorzonera eriophora*, *Veronica multifida*, *Digitalis lamarckii* and *Acanthus hirsutus*. Since these species are quite widespread in Turkey, their IUCN threat category is listed as “LC: Least Concern” (Ekim et al., 2000). It should also be considered that the rate of endemism in Turkey is about 34%. Therefore, 8 endemic plant species at the project site represents a pretty low rate of endemizm. Also because all of these species have large distribution areas, they are not considered to be threatened according to the IUCN criteria of evaluation.

*Figure 44: Endemic Species of Astragalus anthylloides*

**Table 79: Flora Species of the Project Site and Surroundings and Their Characteristics**

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| **SPERMATOPHYTA** | | | | | | | | | | | | | | | | |
| **GYMNOSPERMAE** | | | | | | | | | | | | | | | | |
| PINACEAE | 1 | *Cedrus libani* A. Rich. | Lebanon cedar | Plantation | | | | | | | | | **x** | | | |
| | 2 | *Pinus nigra* Arn. Subsp. *nigra* | Black pine | Plantation | | | | | | | | | **x** | | | |
| **ANGIOSPERMAE** | | | | | | | | | | | | | | | | |
| RANUNCULACEAE | 3 | *Ranunculus arvensis* L. | Corn Buttercup | Mediterranean | | | | | | | | x | | | | |
| | 4 | *Ceratocephalus falcatus* (L.) Pers. | – | Widespread | | | | | | | | | x | | | |
| | 5 | *Consolida regalis* S.F. Gray subsp. *paniculata* (Host) Soo | – | Widespread | | | | | | | | | x | | | |
| | 5 | *Nigella nigellastrum* (L.) Willk | - | Widespread | | | | | | | | | x | | | |
| PAPAVERACEAE | 6 | *Papaver rhoeas* L. | Corn poppy | Widespread | | | | | | | | | x | | | |
| CRUCIFERAE | 7 | *Descurainia sophia* (L.) | Flixweed | Widespread | | | | | | | | | x | | | |
| | 8 | *Sinapis arvensis* L. | Charlock mustard | Widespread | | | | | | | | | x | | | |
| | 9 | *Thlaspi perfoliatum* L. | Cotswold pennyress | Widespread | | | | | | | | x | | | | |
| | 10 | *Alyssum murale* Waldst. & Kit. Var. *murale* | Yellow tuft | Widespread | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| | 11 | *Alyssum minutum* (L.)Rothm.var. *minutum* | – | Widespread | | | | | | | | | x | | | |
| | 12 | *Arabis verna* (L.) DC. | – | Mediterranean | | | | | | | | | x | | | |
| | 13 | *Neslia apiculata* Fisch. | – | Widespread | | | | | | | | | x | | | |
| | 14 | *Capsella bursa-pastoris* (L.) Medik. | Shepherd's purse | Widespread | | | | | | | | | x | | | |
| | 15 | *Camelina rumelica* Vel. | Graceful false flax | Widespread | | | | | | | | | x | | | |
| | 16 | *Erysimum crassipes* Fisch. & Mey. | – | Widespread | | | | | | | | x | | | | |
| RESEDACEAE | 17 | *Reseda lutea* L. var. *lutea* | Wild mignonette | Widespread | | | | | | | | | x | | | |
| CISTACEAE | 18 | *Helianthemum salicifolium* (L.) Miller | – | Widespread | | | | | | | | | x | | | |
| CARYOPHYLLACEAE | 19 | *Minuartia hamata* (Hausskn.) Mattf. | – | Widespread | | | | | | | | x | | | | |
| CARYOPHYLLACEAE | 20 | *Holosteum umbellatum* L. var. *Umbellatum* | – | Widespread | | | | | | | | | x | | | |
| | 21 | *Dianthus zonatus* Fenzl var. *zonatus* | - | Widespread | | | | | | | | | x | | | |
| | 22 | *Agrostemma githago* L. | Common corncockle | Widespread | | | | | | | | | x | | | |
| | 23 | *Velezia rigida* L. | – | Mediterranean | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| GUTTIFERAE | 24 | *Hypericum triquetrifolium* Turra | Peter's wort | Widespread | | | | | | | | | x | | | |
| | 25 | *Hypericum hyssopifolium* Chaix subsp. *elongatum* (Ledeb.) Woron var. *elongatum* | - | Iran-Turan | | | | | | | | | x | | | |
| GERANIACEAE | 26 | *Erodium cicutarium* (L.) L. Herit subsp. *cicutarium* | Redstem fliaree | Widespread | | | | | | | | x | | | | |
| MALVACEAE | 27 | *Malva neglecta* Wallr. | Common mallow | Widespread | | | | | | | | | x | | | |
| CHENOPODIACEAE | 28 | *Chenopodium botrys* L. | – | Widespread | | | | | | | | | x | | | |
| | 29 | *Noaea mucronata* (Forssk.) Aschers. & Schweinf.subsp. *mucronata* | – | Widespread | | | | | | | | | x | | | |
| POLYGONACEAE | 30 | *Rumex scutatus* L. | – | Widespread | | | | | | | | x | | | | |
| | 31 | *Rumex crispus* L. | – | Widespread | | | | | | | | x | | | | |
| LEGUMINOSAE | 32 | *Astragalus barba-jovis* DC. Var. *candicans* Sirj. | - | Iran-Turan | | x | LC | | | | | | x | | | |
| | 33 | *Astragalus anthylloides* Lam. | - | Iran-Turan | | x | LC | | | | | | x | | | |
| | 34 | *Dorycnium graecum* (L.) Ser. | – | European-Siberian | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| | 35 | *Lotus corniculatus* L. var. *tenuifolius* L. | Bird's-foot trefoil | Widespread | | | | | | | | | x | | | |
| | 36 | *Onobrychis armena* Boiss. & Huet | - | Mediterranean | | | | | | | | | x | | | |
| | 37 | *Vicia cracca* L. subsp. *stenophylla* Vel. | Tufted vetch | Widespread | | | | | | | | | x | | | |
| | 38 | *Trigonella monantha* C.A.Meyer subsp. *monantha* | – | Iran-Turan | | | | | | | | x | | | | |
| LEGUMINOSAE | 39 | *Trifolium arvense* L. subsp. *arvense* | Haresfoot clover | Widespread | | | | | | | | | x | | | |
| | 40 | *Ononis spinosa* L. subsp. *leiosperma* (Boiss. ) Sirj. | Spiny rest harrow | Widespread | | | | | | | | | x | | | |
| | 41 | *Coronilla varia* L. subsp. *varia* | Crown vetch | Widespread | | | | | | | | | x | | | |
| | 42 | *Medicago sativa* L. | Alfalfa | Widespread | | | | | | | | | x | | | |
| ROSACEAE | 43 | *Potentilla recta* L. | Sulfur cinquefoil | Widespread | | | | | | | | x | | | | |
| | 44 | *Sanguisorba minor Scop. Subsp. muricata (Spach)Brig* | Garden burnet | Widespread | | | | | | | | x | | | | |
| | 45 | *Prunus spinosa* L. subsp. *dasyphylla* (Schur) Domin | Blackthorn | European-Siberian | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| | 46 | *Pyrus elaeagnifolia* Pallas subsp. *elaeagnifolia* | Oleaster-leaf pear | Widespread | | | | | | | | | x | | | |
| | 47 | *Crataegus tanacetifolia* (Lam.) Pers. | Tansy-leaved thorn | Iran-Turan | | x | LC | | | | | x | | | | |
| | 48 | *Rosa foetida* J. Herrm. | Austrian briar | Iran-Turan | | | | | | | | | x | | | |
| | 49 | *Rosa canina* L. | Dog rose | Widespread | | | | | | | | x | | | | |
| UMBELLIFERAE | 50 | *Torilis leptophylla* (L.) Reichb. | Bristlefruit hedge parsley | Widespread | | | | | | | | x | | | | |
| | 51 | *Eryngium campestre* L. var. *campestre* | Field eryngo | Widespread | | | | | | | | x | | | | |
| | 52 | *Falcaria vulgaris* Bernh. | – | Widespread | | | | | | | | | x | | | |
| | 53 | *Bifora radians* Bieb. | - | Widespread | | | | | | | | | x | | | |
| | 54 | *Scandix iberica* Bieb. | – | Widespread | | | | | | | | x | | | | |
| | 55 | *Daucus carota* L. | Wild carrot | Widespread | | | | | | | | | x | | | |
| | 56 | *Turgenia latifolia* (L.) Hoffm. | – | Widespread | | | | | | | | | x | | | |
| DIPSACACEAE | 57 | *Pterocephalus plumosus* L. | – | Widespread | | | | | | | | x | | | | |
| | 58 | *Scabiosa argentea* L. | – | Widespread | | | | | | | | | x | | | |
| | 59 | *Scabiosa rotata* Bieb. | | Iran-Turan | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| COMPOSITAE | 60 | *Senecio vernalis* Waldst. et Kit | – | Widespread | | | | | | | | | x | | | |
| | 61 | *Helichrysum plicatum* DC. Subsp. *plicatum* | – | Widespread | | | | | | | | | x | | | |
| COMPOSITAE | 62 | *Centaurea solstitialis* L. subsp. *solstitialis* | Yellow star-thistle | Widespread | | | | | | | | | x | | | |
| | 63 | *Centaurea virgata* Lam. | Squarrose knapweed | Widespread | | | | | | | | x | | | | |
| | 64 | *Centaurea urvillei* DC. Subsp. *stepposa* Wagenitz | - | Iran-Turan | | X | LC | | | | | | x | | | |
| | 65 | *Cnicus benedictus* L. | – | Widespread | | | | | | | | | x | | | |
| | 66 | *Anthemis tinctoria* L. var. *tinctoria* | Golden marguerite | Widespread | | | | | | | | | x | | | |
| | 67 | *Cichorium intybus* L. | Common chicory | Widespread | | | | | | | | x | | | | |
| | 68 | *Picnomon acarna* (L.) Cass. | – | Mediterranean | | | | | | | | | x | | | |
| | 69 | *Pilosella hoppeana* (Schultes) C.H. & F.W. Schultz | – | Widespread | | | | | | | | | x | | | |
| | 70 | *Carlina oligocephala* Boiss. & Kotschy subsp. *oligocephala* | – | Widespread | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| | 71 | *Xeranthemum annuum* (L.) Miller | Everlasting | Widespread | | | | | | | | x | | | | |
| | 72 | *Achillea setacea* Waldst. & Kit | – | European-Siberian | | | | | | | | | x | | | |
| | 73 | *Tanacetum armenum* (DC.) Schultz Bip. | – | Widespread | | | | | | | | | x | | | |
| | 74 | *Xanthium strumarium* L. subsp. *strumarium* | Rough cocklebur | Widespread | | | | | | | | | x | | | |
| | 75 | *Carduus nutans* L. sensu lato | Musk thistle | Widespread | | | | | | | | | x | | | |
| | 76 | *Logfia arvensis* (L.) Holub. | – | Widespread | | | | | | | | x | | | | |
| | 77 | *Cirsium lappaceum* (Bieb.) Fischer subsp. anatolicum Petrak | – | Iran-Turan | | | | | | | | | x | | | |
| | 78 | *Chondrilla juncea* L . var. *juncea* | – | Widespread | | | | | | | | x | | | | |
| | 79 | *Tragopogon latifolius* Boiss. var. *latifolius* | Tragopogon | Iran-Turan | | | | | | | | | x | | | |
| | 80 | *Lactuca serriola* L. | – | Widespread | | | | | | | | x | | | | |
| COMPOSITAE | 81 | *Scariola viminea* (L.) F.W.Schmidt. | – | Widespread | | | | | | | | | x | | | |
| | 82 | *Crepis foetida* L. Subsp. *rhoeadifolia* (Bieb.) Celak | – | Widespread | | | | | | | | x | | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| | 83 | *Crepis alpina* L. | | Widespread | | | | | | | | | x | | | |
| | 84 | *Crepis sancta* (L.) Babcock | – | Widespread | | | | | | | | x | | | | |
| | 85 | *Picris strigosa* Boiss. | – | Iran-Turan | | | | | | | | x | | | | |
| | 86 | *Picris hieracioides* L. | – | European-Siberian | | | | | | | | | x | | | |
| | 87 | *Crupina crupinastrum* (Moris) Vis. | – | Widespread | | | | | | | | x | | | | |
| | 88 | *Scorzonera eriophora* DC. | – | Widespread | | x | LC | | | | | | x | | | |
| | 89 | *Taraxacum serotinum* (Waldst. & Kit.) Poiret | - | Widespread | | | | | | | | | x | | | |
| CAMPANULACEAE | 90 | *Asyneuma limonifolium* (L.) Janchen subsp. *limonifolium* | – | Widespread | | | | | | | | | x | | | |
| BORAGINACEAE | 91 | *Echium italicum L.* | – | Mediterranean | | | | | | | | | x | | | |
| | 92 | *Heliotropium europaeum* L. | – | Widespread | | | | | | | | | x | | | |
| | 93 | *Anchusa azurea* Miller var. *azurea* | – | Widespread | | | | | | | | x | | | | |
| | 94 | *Rochelia disperma* (L. fil.) C. Koch var. *disperma* | – | Widespread | | | | | | | | | x | | | |
| SCROPHULARIACEAE | 95 | *Veronica multifida* L. | – | Iran-Turan | | x | LC | | | | | x | | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| | 96 | *Digitalis lamarckii* Ivan | - | Iran-Turan | | x | LC | | | | | | x | | | |
| CONVOLVULACEAE | 97 | *Convolvulus arvensis L.* | Tarla sarmaşığı | Widespread | | | | | | | | | x | | | |
| ACANTHACEAE | 98 | *Acanthus hirsutus* Boiss. | – | Widespread | | x | LC | | | | | x | | | | |
| LABIATAE | 99 | *Lamium amplexicaule* L. | Henbit deadnettle | Widespread | | | | | | | | | x | | | |
| | 100 | *Ziziphora tenuior L.* | – | Iran-Turan | | | | | | | | | x | | | |
| | 101 | *Sideritis montana L. subsp. subsp. montana* | – | Widespread | | | | | | | | | x | | | |
| LABIATAE | 102 | *Teucrium chamaedrys* L. subsp. *chamaedrys* | Wall garmander | European-Siberian | | | | | | | | | x | | | |
| | 103 | *Teucrium polium* L. | Felty garmander | Widespread | | | | | | | | | x | | | |
| | 104 | *Salvia virgata* Jacq. | Wand sage | Iran-Turan | | | | | | | | | x | | | |
| | 105 | *Salvia verticillata* L. subsp. *amasiaca* (Freyn. & Bornm.)Bornm. | Purple rain | Iran-Turan | | | | | | | | | x | | | |
| | 106 | *Thymus sipyleus* Boiss. Supsp. *rosulans* (Borbas) Jalas | - | Widespread | | | | | | | | | x | | | |
| EUPHORBIACEAE | 107 | *Euphorbia macroclada* Boiss. | - | Iran-Turan | | | | | | | | | x | | | |
| PLANTAGINACEAE | 108 | *Plantago lanceolata* L. | Ribwort plantain | Widespread | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| RUBIACEAE | 109 | *Galium incanum* Sm. subsp. *elatius* (Boiss.) Ehrend. | – | Iran-Turan | | | | | | | | x | | | | |
| | 110 | *Galium verum* L. subsp. *verum* | Lady's bedstraw | European-Siberian | | | | | | | | | x | | | |
| SALICACEAE | 111 | *Salix alba* L. | White willow | Plantation | | | | | | | | | x | | | |
| | 112 | *Populus nigra* L. subsp. *nigra* | Black poplar | Plantation | | | | | | | | | x | | | |
| LILIACEAE | 113 | *Allium scorodoprasum* L. subsp. *rotundum* (L.) Stearn | Sand leek | Mediterranean | | | | | | | | | x | | | |
| GRAMINEAE | 114 | *Poa bulbosa* L. | Bulbous bluegrass | Widespread | | | | | | | | | x | | | |
| | 115 | *Elymus hispidus* (Opiz) Melderis subsp. *barbulatus* (Schur) Melderis | Hairy couch | Widespread | | | | | | | | | x | | | |
| | 116 | *Bromus scoparius* L. | – | Widespread | | | | | | | | | x | | | |
| | 117 | *Bromus tomentellus* Boiss. | – | Iran-Turan | | | | | | | | x | | | | |
| | 118 | *Bromus japonicus* Thunb. subsp. *japonicus* | Field brome | Widespread | | | | | | | | | x | | | |
| | 119 | *Briza humilis* Bieb. | Quaking grass | Widespread | | | | | | | | | x | | | |
| | 120 | *Secale cereale* L. var. *cereale* | Cereal rye | Widespread | | | | | | | | | x | | | |

| FAMILY | NO | SPECIES NAME | ENGLISH NAME | PHYTOGEOG. REGION | ENDEMIZM | | TRDB | BERN | CITES | | | RELATIVE ABUNDANCE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R | W | | App1 | App1 | App2 | App3 | 1 | 2 | 3 | 4 | 5 |
| | 121 | *Aegilops biuncialis* Vis. | – | Iran-Turan | | | | | | | | | x | | | |
| | 122 | *Avena wiestii* Steudel. | - | Widespread | | | | | | | | | x | | | |
| GRAMINEAE | 123 | *Festuca callieri* (Hackel ex St.-Yves) F. Markgraf | – | Widespread | | | | | | | | | x | | | |
| | 124 | *Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman | Orchard grass | Mediterranean | | | | | | | | | x | | | |
| | 125 | *Hordeum bulbosum* L. | - | Widespread | | | | | | | | | x | | | |
| | 126 | *Cynodon dactylon* (L.) Pers. Var. *dactylon* | Bermuda grass | Widespread | | | | | | | | | | | | |
| | 127 | *Echinaria capitata* (L.) Desf. | – | Widespread | | | | | | | | | x | | | |
| | 128 | *Taeniatherum caput-medusae* Nevsk subsp. *crinitum* (Schreber) Melderis | – | Mediterranean | | | | | | | | | x | | | |

**LEGEND FOR THE FLORA TABLE**

**ENDEMIZM:**
R: Regional endemic
W: Widespread Endemic

**T.S. THREAT CATEGORIES:**
**BASED ON IUCN CATEGORIES (Ekim et al., 2000)**
EX : Extinct
EW : Extinct in nature
CR : Critically endangered7
EN : Endangered
VU : Vulnerable
LR : Lower risk
NT : Near threatened
LC : Least concern
DD : Data deficient

**BERN (BERN Convention):**
App1: Strictly protected flora species

**CITES:**
App1: Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.

App2: Species not necessarily threatened with extinction, but their trademust be controlled to avoid utilization incompatible with their survival.

App3: Species protected in at least one country, and their trading is under control by CITES.

**RELATIVE ABUNDANCE:**
1: Very rare
2: Rare
3: Medium
4: Abundant
5: Very abundant

### 6.1.2 Impact Analysis results

During the operational Phase of the Project portions of vegetation will be cleared for the construction of the facilities. The presence of the facilities will then cause a loss of potential habitat during operation. Moreover, dust and air pollution could impact terrestrial flora during the Project phases. Therefore, the following impact factors have been identified.

Impact factors that could possibly affect the presence of terrestrial flora species during the construction phase are:

- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere.

Impact factors that could possibly affect the presence of terrestrial flora species during the operational phase are:

- occupation of land;
- pollutant and dust emission in the atmosphere.

#### *6.1.2.1 Construction phase*

No endemic or protected species have been found in the project area. Direct impacts due to vegetation clearing and top soil disturbance will be important, but considering the species present the impact on the component will be low.

Emission of dust and pollutant (mainly NOx e CO2) in the air with the consequent fell to the ground are mainly due to construction trucks. The production of dust will be concentrated mainly during surface levelling and grading, temporary stockpiling of the material. The impact on terrestrial flora is expected to be low and reversible, therefore without any mitigation measures~~;~~, the impact on the component will be negligible (below table)

**Table 80: impact evaluation matrix for terrestrial flora component during construction phase before mitigation**

| **IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA CONSTRUCTION PHASE** | | **vegetation clearing and removal of terrestrial top soil** | **pollutant and dust emission in the atmosphere** |
|---|---|---|---|
| Duration (D) | short | | |
| | medium-short | | |
| | medium | | |
| | medium-long | | |
| | long | | |
| Frequency (F) | concentrate | | |
| | discontinuous | | |
| | continuous | | |
| Geographic extent (G) | local | | |
| | regional | | |
| | beyond regional | | |
| Intensity (I) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| Reversibility (R) | short-term | | |

| | | | |
|---|---|---|---|
| | long-term | | |
| | irreversible | | |
| Probability of occurrence (P) | low | | |
| | medium | | |
| | high | | |
| | certain | | |
| Sensitivity (S) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1,79 | 0,59 |
| | | **Low** | **Negligible** |

### 6.1.2.2 Operational phase

The presence of the facility will reduce the natural habitat for plant species. However, land occupied by the facility is already part of a disturbed area and the species present are not characterized by high biological values. The impact of this factor on terrestrial flora is expected to be low, therefore, mitigation measures will be evaluated (-below table)

**Table 81: impact evaluation matrix for terrestrial flora component during operational phase before mitigation**

| **IMPACT EVALUATION MARTIX - TERRESTRIAL FLORA OPERATIONAL PHASE** | | **occupation of land** |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |

| | | |
|---|---|---|
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Sensitivity (S) | negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 2,80 |
| | | **Low** |

### 6.1.2.3 Decommissioning phase

Decommissioning activities could have an impact on terrestrial flora. However, the impact is expected to be very limited depending on the future use of the area. Potentially, if the site will be restored to natural vegetation, this phase is expected to have an overall positive impact on terrestrial flora.

## 6.1.3 Mitigation measures

The mitigation measures here listed will be effective both for the construction and the operational phase:

- Study areas will be clearly defined before vegetation clearance where construction activities will be taking place and permanent structures will be built.
- Topsoil will be removed and stored before construction activities start. Upon completion of construction activities, topsoil will be used to cover landscape areas and natural plant species will be allowed to grow again in the area.
- Vegetation clearance will take place gradually, so fauna elements will be allowed to leave construction sites.
- During vegetation clearance, equipment will be selected so as not to harm plant roots.

## 6.1.4 Residual impacts

### 6.1.4.1 Construction phase

If mitigation measures are effectively applied, the two impact factors analysed for this phase will have a negligible impact on terrestrial vegetation (Table 82). Since the overall impact is at most the sum of the single impacts, for the construction phase the overall impact is expected to be negligible.

**Table 82: impact evaluation matrix for terrestrial flora component during construction phase after mitigation**

| **IMPACT EVALUATION MARTIX - TERRESTRIAL FLORA CONSTRUCTION PHASE** | | **vegetation clearing and removal of terrestrial top soil** | **pollutant and dust emission in the atmosphere** |
|---|---|---|---|
| Duration (D) | short | | |
| | medium-short | | |
| | medium | | |

| | | | |
|---|---|---|---|
| | medium-long | | |
| | long | | |
| Frequency (F) | concentrate | | |
| | discontinuous | | |
| | continuous | | |
| Geographic extent (G) | local | | |
| | regional | | |
| | beyond regional | | |
| Intensity (I) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | irreversible | | |
| Probability of occurrence (P) | low | | |
| | medium | | |
| | high | | |
| | certain | | |
| Mitigation (M) | high | | |
| | medium | | |
| | low | | |
| | none | | |
| Sensitivity (S) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 1,34 | 0,59 |
| | | **Negligible** | **Negligible** |

### 6.1.4.2 Operational phase

If mitigation measures are effectively applied, occupation of land will have a low impact, on terrestrial vegetation (Table 83). Since the overall impact is at most the sum of the single impacts, for the construction phase the overall impact is expected to be low.

**Table 83: impact evaluation matrix for terrestrial flora component during operational phase after mitigation**

| IMPACT EVALUATION MARTIX - TERRESTRIAL FLORA OPERATIONAL PHASE | | occupation of land |
|---|---|---|
| Duration (D) | short | |
| | medium-short | |
| | medium | |
| | medium-long | |
| | long | |
| Frequency (F) | concentrate | |
| | discontinuous | |
| | continuous | |
| Geographic extent (G) | local | |
| | regional | |
| | beyond regional | |
| Intensity (I) | negligible | |
| | low | |
| | medium | |
| | high | |
| Reversibility (R) | short-term | |
| | long-term | |
| | irreversible | |
| Probability of occurrence (P) | low | |
| | medium | |
| | high | |
| | certain | |
| Mitigation (M) | high | |
| | Medium | |
| | Low | |
| | None | |
| Sensitivity (S) | Negligible | |
| | low | |
| | medium | |
| | high | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 2,10 |
| | | **Low** |

### 6.1.5 Monitoring

No monitoring with respect to vegetation is required. Should any disturbance be noted, additional measures will be put in place to mark the boundary of the Project site and the vegetated area, construction staff should be better instructed in order to avoid damage to the natural vegetation.

## 6.2 Terrestrial Fauna

### 6.2.1 Baseline

#### *6.2.1.1 Study Area*

The terrestrial fauna study area (SA) is the same as for terrestrial flora. In addition, for the assessment of this component, a Regional Study Area (RSA) was considered during literature research in order to give an overview of the species potentially occurring in the area. Therefore, the study was not limited to species observed in SA, but includes also those species present in the in the region, that potentially might be living in the area, considering habitat features of the SA.

#### *6.2.1.2 Methods*

The primary objective of terrestrial fauna studies is to identify terrestrial fauna elements within the project site and its surroundings, as well as to define potential impacts of the project on these species. In parallel with flora studies, fauna species composition was identified within habitats, especially natural ones, within the project site and its surroundings. Potential impacts of the project and mitigation measures to be taken to minimize these impacts were also evaluated according to the sensitivity of identified fauna species.

The main principles and procedures adopted in terrestrial fauna studies, which was conducted by Assoc. Prof. Zafer Ayas from Department of Biology of Hacettepe University, Faculty of Science in August, 2013 (see Figure III.4) in line with terrestrial flora studies, are summarized below:

- Fauna field studies were conducted on an area including not only the planned project area, but also the surrounding areas in order identify the species composition of the entire area, including alternative sites that might be utilized by fauna species leaving the project site.
- Whenever a different fauna structure due to varying topographic conditions and/or vegetative structure is observed, the study area was further extended.
- In order to identify fauna elements of the study area, field observations and literature review were conducted. In addition to these, previous reports on fauna studies were also utilized.
- Presence of habitats suitable for fauna species, nests, nestlings, pellets and tracks of species (especially for the determination of birds and macro mammals), excrete and food wastes (especially for the determination of mammals), skin-horn, shield and bone remains were checked for during the fauna studies.
- Within the scope of fauna field surveys, hunting-collection-killing activities were not conducted for the identification of species.
- Fauna field surveys were performed on foot. The study area was investigated using maps and coordinates and elevations within the study area were determined by means of Global Positioning System (GPS) receivers.
- Data on endemic species, threatened species and wildlife habitats in the study area were also gathered during the field studies. Conservation statuses of fauna elements have been evaluated according to the international threat statuses of the BERN Convention, CITES and the IUCN Red List.
- Assessments on the threat status of amphibians, reptiles, and mammals are made according to the national threat categories defined by Demirsoy (2002). These categories include: Endangered (E),

Extinct (Ex), Indeterminate (I), Insufficient known (K), Widespread, abundant (nt), Out of Danger (O), Rare (R), and Vulnerable (V).

- Birds of the study area were also assessed according to national threat categories defined in Birds of Turkey (Kiziroglu, 2009) according to the categories defined in Table below.

**Table 84: National Threat Categories for Bird Species (Kiziroglu, 2009)**

| | | |
|---|---|---|
| **Category A** | | |
| A.1.2 | (CR) | Critically endangered and breeding species in Turkey |
| A.2 | (EN) | Endangered and breeding species in Turkey |
| A.3 | (VU) | Vulnerable and breeding species in Turkey |
| A.3.1 | (D) | Declining, vulnerable and breeding species in Turkey |
| A.4 | (NT) | Near threatened, breeding species do not face to risk now but are likely to qualify for threatened category in the near future in Turkey |
| A.5 | (LC) | Least concern, breeding species that are widespread in Turkey |
| A.6 | (DD) | Data deficient, breeding species on which there is deficient information in Turkey |
| A.7 | (NE) | Not evaluated, Breeding species which have not been evaluated in Turkey |
| **Category B** | | |
| B.1.2 | (CR) | Critically endangered and non-breeding species in Turkey |
| B.2 | (EN) | Endangered and non-breeding species in Turkey |
| B.3 | (VU) | Vulnerable and non-breeding species in Turkey |
| B.3.1 | (D) | Declining, vulnerable and non-breeding species in Turkey |
| B.4 | (NT) | Near threatened, non-breeding species do not face to risk now but are likely to qualify for threatened category in the near future in Turkey |
| B.5 | (LC) | Least Concern, non-breeding species that are widespread in Turkey |
| B.6 | (DD) | Data deficient, non-breeding species on which there is deficient information in Turkey |
| B.7 | (NE) | Not Evaluated, non-breeding species which have not been evaluated in Turkey |

- The hunting statuses of fauna species within the study area were determined based on 2013-2014 Resolutions of the Central Hunting Commission (CHC) of the General Directorate of Nature Conservation and National Parks, Directorate of Hunting and Wild Life.

### 6.2.1.3 Baseline Results

Based on field studies and literature review to determine species inhabiting the project area and its surroundings, a total of 22 terrestrial vertebrate species have been identified. The species identified within the project site, were also searched for within surrounding areas, and these areas were also evaluated considering the potential impacts of the project on fauna species. Detailed lists of terrestrial vertebrate fauna species, including systematic categories, species names, English names, national (Kiziroglu, 2009; Demirsoy, 2002 & 2013-2014 CHC Resolutions) and international threat statuses (IUCN Red List, Bern Convention and CITES), are presented in Table III.2 below. There is also a legend provided for abbreviations and symbols used in these lists.

#### *Amphibians (Class: Amphibia)*

There are no water resources within the project site and its surroundings. Consequently, the only amphibians species identified within the site is Pelophylax ridibundus (Eurasian marsh frog), which is a widespread species listed as “LC: Least Concern” by the IUCN and under “Appendix III: Protected Fauna Species” of the Bern Convention”. The project activities are not expected to cause any adverse impacts on this widespread species, which is also commonly found outside the project site.

### *Reptiles (Class: Reptilia)*

A total of three reptile species were identified inhabiting the project area and its surroundings namely; *Testudo graeca* (Spur-thighed tortoise; see Figure I.7), *Ophisops elegans* (Western snake-eyed lizard) and *Dolichopis jugularis* (Black whip snake). *Testudo graeca* is the only reptile species that has a conservation status according to the IUCN Red List, which categorizes it as "VU: Vulnerable" due to its declining population. However, the tortoise is quite widespread in Turkey, where the populations are higher than its European populations. The species is also listed under "Appendix II: Strictly Protected Fauna Species" of the Bern Convention, and Appendix II of CITES, which "includes species, which are not threatened with extinction, but trade in specimens is restricted in order to prevent utilization incompatible with their survival". The other two species are listed as "LC: Least Concern" by the IUCN Red List but are also included in Appendix II of the Bern Convention.

All of the reptile species identified at the project site are also protected by the Turkish legislation. CHC lists these species in Appendix I of its 2013-2014 Resolutions, which "includes wildlife species which are protected by the Ministry of Forestry and Water Affairs". All of the reptile species are found in alternative areas outside the project site, and they are quite widespread in Turkey. Therefore, it can be concluded that they would not be directly impacted by project activities. In the event that the impact on these species is higher than expected, there are alternative feeding, sheltering and breeding grounds for these species to inhabit.

*Figure 45: Testudo graeca (Spur-thighed tortoise)*

### *Birds (Class: Aves)*

Birds have a higher ranking on the food pyramid. When there is an unfavorable change in their environment, these species are the first to leave a particular area to inhabit alternative habitats. Since they are highly mobile, bird species are used in ecological variation and toxicology monitoring and research studies. Therefore, the focus of most fauna studies is birds. Their population densities, species diversity and habitat use patterns are researched thoroughly to define the basic conditions in a given area.

Studies carried out to identify bird species at the project site was conducted in a larger area, including similar habitats around the project site. Considering their ability to fly, hills around the project site and plains in between these hills were also studies. These areas were all searched for bird nests, eggs, offspring and adults. Bird species were observed using binoculars (Pentax 16x24) and recorded without being caught.

As a result, 13 bird species were identified within the project site and its surroundings. Out of these 13 bird species, 3 of them are listed under “Appendix II: Strictly protected fauna species” of the Bern Convention and another 6 are listed under Appendix III. The only species that is enlisted by CITES is Buteo rufinus (Long-legged buzzard; see Figure III.6), which is considered in Appendix II, which “includes species, which are not threatened with extinction, but trade in specimens is restricted in order to prevent utilization incompatible with their survival”. All of the bird species identified within the project site and its surroundings are considered as “LC: Least Concern” according to the IUCN Red List.

*Figure 46: Type picture title here.Buteo rufinus (Long-legged buzzard)*

According to the national threat categories defined by Kiziroglu (2009) as detailed in above Table of the bird species are considered within the category “A.3 (VU): Vulnerable and breeding species in Turkey”, while another 2 species are listed as “A.3.1 (D): Declining, vulnerable and breeding species in Turkey”.

Based on the 2013-2014 Central Hunting Commission (CHC) Resolutions, 5 bird species are in Appendix I; including wildlife species which are protected by the Ministry of Forestry and Water Affairs, 3 of them are in Appendix II; including game animals which are protected by the CHC, and 5 of them are in Appendix III; including game animals which are allowed to be hunted in seasons predefined by the CHC.

### *Mammals (Class: Mammalia)*

Mammal studies at the project site were carried out around existing stream bed at steppe habitats of the site, in order to identify mammal species inhabiting these areas. The sites were researched for suitable sheltering and breeding grounds for mammals. The tracks and signs of mammals were also followed.

A total of 5 mammal species were identified inhabiting the project site and its surroundings (see below Table). Of these mammal species, all mammals except for one, which is considered as “DD: Data Deficient”, are listed as “LC: Least Concern” according to the IUCN Red List. *Vulpes vulpes* (Red fox) is the only species that is included in Appendix III of CITES, which “includes species, for which other parties of CITES is applied for assistance in controlling trade and which are conserved at least in one country”.

According to the 2013-2014 Resolutions of the CHC, 3 of the 5 mammal species are listed in Appendix I, which “includes wildlife species that are protected by the Ministry of Forestry and Water Affairs”, and the other 2 are listed in Appendix III, “which includes game animals that are allowed to be hunted in seasons predefined by the CHC”.

All of the mammal species identified in the study area are widespread species, both within the region and the whole country. Therefore, they are not expected to be directly impacted by the proposed project activities.

**Table 85: Fauna Species Identified at the Project Site and its Surroundings, and Their Threat Categories**

| ORDER | FAMILY | SPECIES | ENGLISH NAME | INTERNATIONAL THREAT CATEGORIES | | | NATIONAL THREAT CATEGORIES | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | IUCN | BERN | CITES | CHC 2013-2014 | Demirsoy, 2002 | Kiziroglu, 2009 |
| **AMPHIBIANS** | | | | | | | | | |
| ANURA | Raniidae | *Peloplylax ridibundus* | Eurasian Marsh Frog | LC | APP-3 | - | - | nt | N/A |
| **REPTILES** | | | | | | | | | |
| TESTUDINES | Testudinidae | *Testudo graeca* | Spur-Thighed Tortoise | VU | APP-2 | APP-2 | | nt | |
| SQUAMATA | Lacertidae | *Ophisops elegans* | Western Snake-Eyed Lizard | LC | APP-2 | - | | nt | |
| SQUAMATA | Colubridae | *Dolichopis jugularis* | Black Whip Snake | LC | APP-2 | - | | nt | |
| **BIRDS** | | | | | | | | | |
| ACCIPITRIFORMES | Accipitridae | *Buteo rufinus* | Long-Legged Buzzard | | APP-3 | APP-2 | APP-1 | N/A | A.3 |
| COLUMBIFORMES | Columbidae | *Columba livia* | Rock Pigeon | | APP-3 | - | APP-3 | N/A | A.5 |
| COLUMBIFORMES | Columbidae | *Streptopelia decaocto* | Collared Dove | | APP-3 | - | APP-2 | N/A | A.5 |
| APODIFORMES | Apopidae | *Apus apus* | Swift | | APP-3 | - | APP-1 | N/A | A.3.1 |
| PASSERIFORMES | Alaudidae | *Galerida cristata* | Crested Lark | | APP-3 | - | APP-2 | N/A | A.3 |
| PASSERIFORMES | Hirundinidae | *Hirundo rustica* | Barn Swallow | | APP-2 | - | APP-1 | N/A | A.5 |

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| ORDER | FAMILY | SPECIES | ENGLISH NAME | INTERNATIONAL THREAT CATEGORIES | | | NATIONAL THREAT CATEGORIES | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | IUCN | BERN | CITES | CHC 2013-2014 | Demirsoy, 2002 | Kiziroglu, 2009 |
| PASSERIFORMES | Turdidae | *Oenanthe isabellina* | Isabelline Wheather | | APP-2 | - | APP-1 | N/A | A.3 |
| PASSERIFORMES | Corvidae | *Pica pica* | Magpie | | - | - | APP-3 | N/A | A.5 |
| PASSERIFORMES | Corvidae | *Corvus monedula* | Jackdaw | | - | - | APP-3 | N/A | A.5 |
| PASSERIFORMES | Corvidae | *Corvus corene* | Carrion Crow | | - | - | APP-3 | N/A | A.5 |
| PASSERIFORMES | Passeridae | *Passer domesticus* | House Sparrow | | - | - | APP-3 | N/A | A.5 |
| PASSERIFORMES | Fringillidae | *Carduelis carduelis* | Goldfinch | | APP-2 | - | APP-1 | N/A | A.3.1 |
| PASSERIFORMES | Emberizidae | *Miliaria calandra* | Corn Bunting | | APP-3 | - | APP-2 | N/A | A.4 |
| **MAMMALS** | | | | | | | | | |
| LAGOMORPHA | Leporidae | *Lepus europaeus* | European Hare | LC | - | | APP-3 | nt | N/A |
| RODENTIA | Cricetidae | *Microtus guentheri* | Günther's Vole | LC | - | | APP-1 | nt | N/A |
| RODENTIA | Spalacidae | *Spalax leucodon* | Lesser Mole Rat | DD | - | | APP-1 | nt | N/A |
| RODENTIA | Muridae | *Mus musculus* | House Mouse | LC | - | | APP-1 | nt | N/A |
| CARNIVORA | Canidae | *Vulpes vulpes* | Red Fox | LC | - | APP-3 | APP-3 | nt | N/A |

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**LEGEND FOR THE ABREVATIONS USED IN THE FLORA TABLE**

**BERN CONVENTION (European Commission Convention on Conservaton of European Wildlife and Natural Habitats)**

**Appendix 1.** Strictly Protected Plant Species
**Appendix 2:** Strictly Protected Animal Species
**Appendix 3 :** Protected Animal Species

**IUCN (International Union for Conservation of Nature) Red List of Threatened Species**
*(IUCN 2013. IUCN Red List of Threatened Species Version 2013.1)*

**2001 (version 3.1)**

**EX:** Extinct
**EW:** Extinct in the Wild
**CR:** Critically Endangered
**EN:** Endangered
**VU:** Vulnerable
**LR:** Lower Risk
**cd:** conservation dependent
**nt:** near threatened
**lc:** least concern
**DD:** Data Deficient
**NE:** Not Evaluated

**2012 (version 4.0)**

**EX:** Extinct
**EW:** Extinct in the Wild
**CR:** Critically Endangered
**EN:** Endangered
**VU:** Vulnerable
**NT:** Near Threatened
**LC:** Least Concern
**DD:** Data Deficient
**NE**: Not Evaluated

**CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora)**

**Appendix 1:** Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
**Appendix 2:** Species not necessarily threatened with extinction, but their trade must be controlled to avoid utilization incompatible with their survival.
**Appendix 3:** Species protected in at least one country, and their trading is under control by CITES.

**NATIONAL HUNTING STATUS (According to Central Hunting Commission, 2013-2014)**

**Appendix 1:** Wildlife species which are protected by Ministry of Forestry and Water Affairs
**Appendix 2:** Game animals which are protected by Central Hunting Commission
**Appendix 3:** Game animals which are allowed to be hunted in predefined seasons by Central Hunting Commission

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According to IFC 2012, no Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range specieswere observed or are expected to be present in the area.

Based on the characteristics described above, terrestrial fauna is a component with a low sensibility.

### 6.2.2 Impact Analysis results

During the operational Phase of the Project portions of vegetation will be cleared for the construction of the facilities and the enlargement of the road, vegetated area will be replaced by infrastructure, causing a loss of habitat for terrestrial fauna. Moreover, dust and air pollution, together with noise emission, could impact terrestrial fauna during the Project phases. Therefore, the following impact factors have been identified.

Impact factors that could possibly affect the presence of terrestrial fauna species during the construction phase are:

- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations.

Impact factors that could possibly affect the presence of terrestrial fauna species during the operational phase are:

- occupation of land;
- emission of noise and vibrations.

#### *6.2.2.1 Construction phase*

No endemic or protected species have been found in the area. Direct impacts due to vegetation clearing and top soil disturbance will be important. The impact of vegetation clearing and top soil disturbance on terrestrial fauna is expected to be low.

Emission of dust and pollutant (mainly NOx e CO2) in the air with the consequent fell to the ground are mainly due to construction trucks. The production of dust will be concentrated mainly surface levelling and grading and temporary stockpiling of the material. The impact of this factor on terrestrial fauna is expected to be negligible

The emission of noise could impact local fauna, in particular birds. However, the emission is expected to be discontinuous and limited. The impact of this factor on terrestrial fauna is expected to be negligible.

**Table 86: impact evaluation matrix for terrestrial fauna component during construction phase before mitigation**

| IMPACT EVALUATION MARTIX - TERRESTRIAL FAUNA CONSTRUCTION PHASE | | vegetation clearing and disturbance of terrestrial top soil | pollutant and dust emission in the atmosphere | emission of noise and vibrations. |
|---|---|---|---|---|
| Duration (D) | short | | | |
| | medium-short | | | |
| | medium | | | |
| | medium-long | | | |
| | long | | | |
| Frequency (F) | concentrate | | | |
| | discontinuous | | | |
| | continuous | | | |
| Geographic extent (G) | local | | | |
| | regional | | | |

| | | | | |
|---|---|---|---|---|
| | beyond regional | | | |
| Intensity (I) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | irreversible | | | |
| Probability of occurrence (P) | low | | | |
| | medium | | | |
| | high | | | |
| | certain | | | |
| Sensitivity (S) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*)*R*P*M*S** | | 1,79 | 0,78 | 0,78 |
| | | **Low** | **Negligible** | **Negligible** |

### 6.2.2.2 Operational phase

The land occupied by the facility was already part of a disturbed area. Therefore the impacts on fauna habitats and thus on fauna species are expected to be low (Table 87).

Emission of dust and pollutant (mainly NOx and CO2) in the air with the consequent fell to the ground are mainly due to vehicles. Considering the potential impacts and the sensibility of the component, the impact of this factor on terrestrial fauna will be negligible (Table 87).

Noise emission during operation of the facility could have an impact on terrestrial fauna. However, considering the current level of disturbance and the habitats present in the area, the impact is expected to be negligible (Table 87).

**Table 87: impact evaluation matrix for terrestrial fauna component during operational phase before mitigation**

| **IMPACT EVALUATION MARTIX - TERRESTRIAL FAUNA OPERATIONAL PHASE** | | **occupation of land** | **emission of noise and vibrations** |
|---|---|---|---|
| Duration (D) | short | | |
| | medium-short | | |
| | medium | | |
| | medium-long | | |
| | long | | |
| Frequency (F) | concentrate | | |

| | | | |
|---|---|---|---|
| | discontinuous | | |
| | continuous | | |
| Geographic extent (G) | local | | |
| | regional | | |
| | beyond regional | | |
| Intensity (I) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | irreversible | | |
| Probability of occurrence (P) | low | | |
| | medium | | |
| | high | | |
| | certain | | |
| Sensitivity (S) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 2,80 | 1,04 |
| | | **Low** | **Negligible** |

### *6.2.2.3 Decommissioning phase*

Decommissioning activities could have an impact on fauna. However this impact, considering the scarce presence of fauna in the SA, is expected to be very limited depending on the future use of the area. Potentially, if the site will be restored to natural vegetation, this phase is expected to have an overall positive impact on terrestrial fauna.

## 6.2.3 Mitigation measures

Potential impacts of construction on terrestrial fauna can be listed as the following:

- Habitat loss at the project site,
- Animals leaving the site due to dust and noise emissions during stripping of topsoil and excavation activities,
- Mortality of those species that have limited mobility during stripping of topsoil and excavation activities.

In line with IFC Performance Standard 6, mitigation measures outlined in this section are put forward with the primary goal of avoiding any potential impact especially during crucial periods like the breeding season of animals, which might impact not only individual species but an entire population. Whenever a potential impact was considered as unavoidable, such as generation of dust and noise, the most effective measures are suggested to be taken so that the impacts on fauna are minimized.

As the findings of the fauna studies indicate, the project site does not bear any important habitats significant for rare, endemic or threatened fauna species. Besides, most of the habitats that could be inhabited by fauna elements have lost their natural state due to grazing and urbanization. Yet, in order to conserve the populations of fauna species inhabiting the project site and its surroundings, construction activities should be carried out gradually so that these species would have enough time and energy to leave the construction sites. Construction activities should not be undertaken during the breeding months of March and April.

There will be habitat loss at project sites where there will be permanent structures and foundations during construction and operation phases of the project. Habitat loss will also cause permanent impacts on the terrestrial ecosystem. Project activities will also cause significant noise emissions that would impact fauna species. However, habitats inhabited by fauna species of the area are also found within the project site where there would be no permanent structures, as well as outside the project site. This indicates that the impact on fauna species would not be detrimental.

- It is inevitable for plant and animal species to be adversely impacted due to the project as a result of project activities and new facilities to be constructed within the scope of the project.
- Presence of alternative areas within the vicinity of the project site for fauna species, amphibian, reptile, bird and mammal species' being mostly highly mobile, and the limited number of fauna species inhabiting the project site, have been evaluated as factors that would lower the impacts of the project to a great extent.
- The project site is not located on a bird migration route and the birds found within the project site are widespread species that inhabit the entire region and most of Turkey.
- Animals at the project site are likely to leave the area due to anthropogenic impacts. In order to minimize impacts on especially ground-dwelling and burrowing species, during the first year of construction, related activities should be carried out gradually over the breeding period of these species (April, May and June). This would allow these species to have enough time and energy to leave the site avoiding any project-related mortality.
- Species of limited mobility, such as the Testudo graeca (Spur-thighed tortoise) should be collected before the onset of construction activities and transferred to similar alternative habitats to avoid any mortality. Besides, if individuals of these species are come across during different phases of the project, they should also be transferred to alternative areas. The site personnel should be informed of these species and how they should be acting on the matter.
- The presence of these species at the alternative terrestrial ecosystems outside project site was evaluated as an indication that the impact on these species due to the project would not be significant.

### 6.2.4 Residual impacts

#### *6.2.4.1 Construction phase*

Considering the application of mitigation measures, impact factors analysed for this phase will have a negligible impact on terrestrial flora (Table 88). Since the overall impact is at most the sum of the single impacts, for the construction phase the overall impact is expected to be low to negligible.

**Table 88: impact evaluation matrix for terrestrial fauna component during construction phase after mitigation**

| **IMPACT EVALUATION MARTIX - TERRESTRIAL FAUNA CONSTRUCTION PHASE** | | **vegetation clearing and disturbance of terrestrial top soil** | **pollutant and dust emission in the atmosphere** | **emission of noise and vibrations.** |
|---|---|---|---|---|
| Duration (D) | short | | | |

| | | | | |
|---|---|---|---|---|
| | medium-short | | | |
| | medium | | | |
| | medium-long | | | |
| | long | | | |
| Frequency (F) | concentrate | | | |
| | discontinuous | | | |
| | continuous | | | |
| Geographic extent (G) | local | | | |
| | regional | | | |
| | beyond regional | | | |
| Intensity (I) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| Reversibility (R) | short-term | | | |
| | long-term | | | |
| | irreversible | | | |
| Probability of occurrence (P) | low | | | |
| | medium | | | |
| | high | | | |
| | certain | | | |
| Mitigation (M) | high | | | |
| | medium | | | |
| | low | | | |
| | none | | | |
| Sensitivity (S) | negligible | | | |
| | low | | | |
| | medium | | | |
| | high | | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*)*R*P*M*S** | | 1,34 | 0,78 | 0,78 |
| | | **Negligible** | **Negligible** | **Negligible** |

### 6.2.4.2 Operational phase

Considering the application of mitigation measures, impact factors analysed for this phase occupation of land will have a low impact on terrestrial fauna, while the other impacts will be negligible (Table 89). Since the overall impact is at most the sum of the single impacts, for the construction phase the overall impact is expected to be low to negligible.

**Table 89: impact evaluation matrix for terrestrial fauna component during operational phase after mitigation**

| IMPACT EVALUATION MARTIX - TERRESTRIAL FAUNA OPERATIONAL PHASE | | occupation of land | emission of noise and vibrations |
|---|---|---|---|
| Duration (D) | short | | |
| | medium-short | | |
| | medium | | |
| | medium-long | | |
| | long | | |
| Frequency (F) | concentrate | | |
| | discontinuous | | |
| | continuous | | |
| Geographic extent (G) | local | | |
| | regional | | |
| | beyond regional | | |
| Intensity (I) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| Reversibility (R) | short-term | | |
| | long-term | | |
| | irreversible | | |
| Probability of occurrence (P) | low | | |
| | medium | | |
| | high | | |
| | certain | | |
| Mitigation (M) | high | | |
| | medium | | |
| | low | | |
| | none | | |
| Sensitivity (S) | negligible | | |
| | low | | |
| | medium | | |
| | high | | |
| **Negative impact = (2,6*D+2,2*F+2,4*G+2,8*I)*R*P*M*S** | | 2,10 | 1,04 |
| | | **Low** | **Negligible** |

### 6.2.5 Monitoring

No specific monitoring activity is considered necessary for terrestrial fauna.

## 6.3 Habitats

### 6.3.1 Baseline

#### *6.3.1.1 Study Area*

The terrestrial habitat study area (SA) is the same as for terrestrial flora.

#### *6.3.1.2 Methods*

An desktop analysis was performed based on field survey and literature research.

#### *6.3.1.3 Baseline Results*

#### *Vegetation Characteristics*

The only vegetation type of the project site is degraded steppe habitat. Although the habitats of the project site are under the pressure of grazing and other anthropogenic impacts, there still are a few endemic species inhabiting the site. The plant community representing the steppe habitat at the site is *Astragalus barba-jovis-Festuca callieri community* (see FigureIII.3), which is represented by dominant species of *Astragalus barba-jovis*, *Festuca callieri*, *Euphorbia macroclada*, *Eryngium campestre*, *Cirsium lappaceum,Teucrium chamaedrys*, *Teucrium polium*, *Dactylis glomerata*, *Poa bulbosa* and *Thymus sipyleus*. The steppe habitat vegetation covered in green during spring, tends to dry out completely in summer.

Figure 47: Endemic Species of Astragalus barba-jovis

### *Landscape Characteristics*

The project site that is to be utilized to build a hospital complex is rather small in its area, which makes plantation a feasible option at areas outside the construction site. One of the most appropriate species to be used for landscaping at the project site and its surroundings is *Crataegus tanacetifolia*, being a native species to the site and also endemic. Besides, *Pinus nigra* (Black pine) and *Cedrus libani* (Lebanon cedar) would also well adapt to the existing habitat if used in landscaping. It is therefore suggested that these three species are used in landscaping and rehabilitation activities within the scope of the project to have a successful outcome.

#### *6.3.1.4 Impact Analysis results*

During the operational Phase of the Project, part of the vegetation will be cleared for the construction of the facilities and the enlargement of the road, therefore directly impacting the habitat types present. The presence of the facilities will cause a loss of potential habitat during operation. Dust and air pollution could impact terrestrial habitats during the Project phases. Moreover, noise and vibrations could affect habitat suitability for terrestrial fauna during the construction and the operational phases.

Impact factors that could possibly affect the presence of terrestrial habitat types during the construction phase are:

- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations.

Impact factors that could possibly affect the presence of terrestrial habitat types during the operational phase are:

- occupation of land;
- emission of noise and vibrations.

#### *6.3.1.5 Mitigation measures*

No specific mitigation measures are described for this component. However, all mitigations measures described in the previous assessments for terrestrial flora and fauna will contribute to mitigate the impacts on onshore habitats as well.

### 6.3.2 Monitoring

No specific monitoring measures are described for this component. However, the monthly checks during construction proposed for terrestrial flora will help monitoring also the state of onshore habitat.

## 6.4 Protected areas

### 6.4.1 Baseline

#### *6.4.1.1 Study Area*

For this component, a Regional Study Area (RSA) was considered extending up to the borders of Yozgat Province.

#### *6.4.1.2 Methods*

With respect to terrestrial protected areas, the natural parks, wetland areas, natural monuments, natural reserve areas, wildlife protection areas, areas for raising wild animal, cultural properties, natural properties, archeological and protected areas, bio-genetic reserve areas, biosphere reserves, specially protected environment areas, specially protected areas, protected areas concerning drinking and use water, tourism areas and centres, and other protected spaces have beentaken into consideration.

#### 6.4.1.3 Baseline Results

There are no protected areas within the SA. However, protected areas are present in the RSA extending up to the borders of Yozgat Province.

There is Yozgat Piny National Park in Yozgat Province with 786 ha area. Average elevation is around 1500 m. This National Park is the first national park of Turkey. It is at 5 km north of the city center.

Larch, oak and juniper tree constitute the vegetation cover of the national park. besides the values of natural resources, this national park has a great importance to meet the recreational needs of the community.

The closest national parks to the Project Site are Yozgat Çamlığı National Park and Boğazköy Alacahöyük National Park. Distances from Yozgat Çamlığı National Park and Boğazköy Alacahöyük National Park to the Project site are 2,6 km and 25 km respectively.

Based on the information given above, protected areas are a component with medium/high sensitivity. However, since none of the protected areas are located within the SA, no impact is expected on the component as a result of the project.

## 6.5 Biodiversity

### 6.5.1 Baseline

#### 6.5.1.1 Study area

Field studies were centred on the SA, however, a Regional Study Area (RSA) is considered during literature research in order to give an overview of the vegetation occurring in the area.

#### 6.5.1.2 Methodology

All the studies performed for previous components were taken into consideration for the assessment of biodiversity. The following aspects were taken into consideration:

- areas with high species biodiversity levels, identified through field surveys performed within flora, fauna and habitats studies;
- areas with potential presence of endemic, restricted-range, critically endangered and endangered species of flora and fauna, identified through literature research and field surveys performed within flora and fauna studies;
- presence of protected areas.

#### 6.5.1.3 Baseline results

The steppe vegetation of Central Anatolia, especially areas covered by provinces of Yozgat, Ankara, Nevşehir and Kayseri have remarkable floristic characteristics. Consequently, a number of studies have been conducted on flora and vegetation in areas where the natural characteristics have been preserved. However, since the project site has lost its natural flora and vegetation characteristics, it does not stand out as a good representation of the steppe habitat with interesting features.

Based on field studies and literature review to determine species inhabiting the project area and its surroundings, a total of 22 terrestrial vertebrate species have been identified. The species identified within the project site, were also searched for within surrounding areas, and these areas were also evaluated considering the potential impacts of the project on fauna species.

### 6.5.2 Impact Analysis results

Since biodiversity summarizes all previously assessed biological, all previously assessed impacts are considered.

Onshore, during the operational phase of the Project, part of the vegetation will be cleared for the construction, therefore directly impacting the terrestrial flora, fauna and the habitat types present. The presence of the

facilities will cause a loss of potential habitat during operation. Dust and air pollution could impact terrestrial habitats during the Project phases.

Noise and vibrations could affect habitat suitability for terrestrial fauna during the construction and the operational phases.

Impact factors that could possibly affect biodiversity during the construction phase are:

- vegetation clearing and disturbance of terrestrial top soil;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations;

Impact factors that could possibly affect biodiversity during the operational phase are:

- occupation of land;
- emission of noise and vibrations;

### 6.5.3 Mitigation measures

No specific mitigation measures are identified for biodiversity. However, all mitigations measures described in the previous components will contribute to diminish the impacts on biodiversity.

### 6.5.4 Monitoring

No specific monitoring measures are described for this component. However, the monthly checks during construction proposed for terrestrial flora will help monitoring also the state of biodiversity.

## 7.0 SOCIAL COMPONENTS

With regards to social components, a qualitative methodology has been used to assess impacts, unlike the semi-quantitative methodology used for environmental components. Because of specific characteristics of social studies, the assessment cannot be translated in a numerical form, but is nonetheless based on a rigorous and sound analysis endorsed by professional judgement of experts in the fields. In particular social impacts are not assessed on reversibility and frequency. Socio-economic impacts are part of an ongoing process of interdependent economic and social interactions that generally cannot be reversed to return to one or all of the pre-project conditions. Although there are isolated exceptions, most socio-economic impacts are experienced continuously by people; thus, frequency is not a useful attribute for significance assessment. However, depending on the stage of the project (construction, operations, decommissioning), frequency of impact may increase or decrease. The scale of social impacts is therefore assessed in this study according to the following parameters:

The duration (D) defines the length of time when the impact factor is effective and it is differentiated in:

- short, within 1 year;
- medium-short, between 1 and 5 years;
- medium, between 5 and 10 years;
- medium-long, between 10 and 15 years;
- long, longer than 15 years.

The geographic extent (G) coincides with the area where the impact factor exerts its influence and it is defined as: local, regional, beyond regional.

The intensity (I) represents the entity or magnitude of the impact factor and can be defined as: negligible, low, medium, high.

The **sensitivity** (S) of the affected component is based on the baseline information gathered, and expresses the resilience of the component in responding to change and the ability to adapt to it. A high sensitivity means that the component is generally unable to address external change and impact factors will therefore induce higher alterations.

The **probability of occurrence** (P) corresponds to the probability that the potential impact occurs, according to the evaluators experience and/or on the basis of the available bibliography. It is distinguished in low, medium, high and certain.

The **mitigation** (M) corresponds to the possibility to alleviate the potential negative impact with proper design and/or management practices. The following mitigation classes are considered: high, medium, low, none.

The **impact assessment** on the single valued environmental and social component interfered in the different project phases is completed through the use of specific **environmental impact matrices** which compare the component state, expressed in terms of sensitivity, with the relevant impact factors, quantified on the basis of a series of parameters which include:

- duration (short, medium-short, medium, medium-long, long);
- frequency (concentrate, discontinuous, continuous);
- geographic extent (local, regional, beyond regional); and
- intensity (negligible, low, medium, high).

The quantification of the single impacts resulting from each factor acting on the environmental component is obtained assigning to each feature of the impact factor a score increasing in relation to the bigger entity of the impact related to it.

The Impact value is assigned distinguishing if the impact itself is to be considered positive or negative with respect to the affected component, considering as positive a reduction/mitigation of the negative impacts already existing or potential future positive impacts on the social component.

The Impact value (negative or positive) on each impact factor is valued according to the following scale:

- negligible overall impact;
- low overall impact;
- medium-low overall impact
- medium overall impact;
- medium-high overall impact;
- high overall impact.

## 7.1 Socio-economic conditions and employment issues

### 7.1.1 Baseline

#### *7.1.1.1 Study area*

For the socio-economic conditions and employment issues component, Yozgat province and central distinct- where the Project area is located- was considered as study area, since most statistical information is found at this level and from a social point of view the scale of the Project can cause broad impacts on the wide area.

#### *7.1.1.2 Methodology*

The collection of baseline data was mainly carried out by reviewing desktop literature, as most of the relevant information can be found through these means. In particular most of the information was found through Turkish

Statistical Institute (TurkStat) statistics databases and studies of the local authorities. The information gathered during a field visit conducted by Golder staff in July 2013 has also been used.

### 7.1.1.3 Baseline results

Yozgat province is one of thirteen provinces in the Central Anatolia of Turkey and central distinct of the province is one of 14 districts within the Province. Central district has 3 towns 32 quarters. Administrative units of the central districts are given below.

**Table 90: Administrative units in Central District[10]**

| Name of Administration Unit | Type of Settlement | Local Head |
|---|---|---|
| **District Center** | | |
| Central District | Central Urban Settlement | District Governor |
| **Towns** | | |
| Esenli Town | Rural Settlement | District Governor |
| Osmanpaşa Town | Rural Settlement | District Governor |
| Çadırardıç Town | Rural Settlement | District Governor |
| **Quarters of Central District** | | |
| Agahefendi Quarter | Central Urban Settlement | Mukhtar |
| Aşağıçatak Quarter | Central Urban Settlement | Mukhtar |
| Aşağınohutlu Quarter | Central Urban Settlement | Mukhtar |
| Bahçeşehir Quarter | Central Urban Settlement | Mukhtar |
| Develik Quarter | Central Urban Settlement | Mukhtar |
| Eskipazar Quarter | Central Urban Settlement | Mukhtar |
| Fatih Quarter | Central Urban Settlement | Mukhtar |
| İstanbulluoğlu Quarter | Central Urban Settlement | Mukhtar |
| Karatepe Quarter | Central Urban Settlement | Mukhtar |
| Köseoğlu Quarter | Central Urban Settlement | Mukhtar |
| Medrese Quarter | Central Urban Settlement | Mukhtar |
| Mutafoğlu Quarter | Central Urban Settlement | Mukhtar |
| M.Hulusi Efendi Quarter | Central Urban Settlement | Mukhtar |
| M.Erdoğan Akdağ Quarter | Central Urban Settlement | Mukhtar |
| Şey Osman Quarter | Central Urban Settlement | Mukhtar |
| Taşköprü Quarter | Central Urban Settlement | Mukhtar |
| Tekke Quarter | Central Urban Settlement | Mukhtar |
| Tuzkaya Quarter | Central Urban Settlement | Mukhtar |
| Yenicami Quarter | Central Urban Settlement | Mukhtar |
| Yukarıçatak Quarter | Central Urban Settlement | Mukhtar |
| Yukarınohutlu Quarter | Central Urban Settlement | Mukhtar |
| Bilal Şahin Quarter | Central Urban Settlement | Mukhtar |
| Çapanoğlu Quarter | Central Urban Settlement | Mukhtar |

[10] **Source:** Yozgat Governorship Website

| Name of Administration Unit | Type of Settlement | Local Head |
|---|---|---|
| **Quarters of the Towns** | | |
| Esenli Town Bahçelievler Quarter | Central Urban Settlement | Mukhtar |
| Esenli Town Çay Quarter | Central Urban Settlement | Mukhtar |
| Esenli Town Karşıkaya Quarter | Central Urban Settlement | Mukhtar |
| Esenli Town Gelingüllü Quarter | Central Urban Settlement | Mukhtar |
| Osmanpaşa Town Cami Quarter | Central Urban Settlement | Mukhtar |
| Osmanpaşa Town Şehitler Quarter | Central Urban Settlement | Mukhtar |
| Osmanpaşa Town Tekke Quarter | Central Urban Settlement | Mukhtar |
| Çadırardıç Town Merkez Quarter | Central Urban Settlement | Mukhtar |
| Çadırardıç Town Karalar Quarter | Central Urban Settlement | Mukhtar |

#### 7.1.1.3.1 Economic Structure

##### *7.1.1.3.1.1 Employment*

Labour force participation rate of Yozgat province is 50,7% and employment rate is 45.8% in 2013. On the other hand, the unemployment rate is 9,6% in the province. Employment data for Yozgat provided by TurkStat is as follows:

Population 15 years old and over: 339.368

Labour Force: 171.000

Employed Population: 159.000

Unemployed population: 12.000

##### *7.1.1.3.1.2 Business Environment*

Economy of Yozgat mostly depends on agriculture. According to report published by Yozgat Chamber of Commerce and Industry at 2013, %60 of total area of Yozgat is used for agricultural purposes. Since the agricultural activities are the most important item for economy of Yozgat, they also help the development of industry and business sectors.

Yozgat is one of the priority development cities in Turkey. Hence, many industry sectors are invested in by the government in the province. These sectors are food, textile, clothing, furniture, medical supplies, paper industry, machinery industry, crystal glass mosaic, agricultural tools, cosmetics, machinery, automobile equipment, packaging and construction.

There are 7 small industrial zones in Yozgat province and one of them is central distinct. 312 workplaces were established at central distinct of the province. Brick production, fodder production, flour and bran production, bread production, meat and milk production, home textiles, furniture production, manufacture of plastic and manufacture of central heating boilers are the main industries in center of the province.

Expropriation of Yozgat industrial zone was started in 1994 and completed in 1995. At the same time, project of the industrial zone is completed and 110 industrial parcels were planned inside the zone. The industrial

zone was located in 1,500,000 m$^2$ area. Infrastructure of the industrial zone was completed in 1997 and afterwards the zone was started to be operated.[11]

#### 7.1.1.3.2 Demographics

Population of Yozgat province is 453,221 in 2012 and according to data obtained from TurkStat, population of the province was decreased after this year. Population data of Yozgat between 2007 and 2012 is given in below.

**Table 91: Population Change of Yozgat Province with Years**

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|
| Population | 492,127 | 484,206 | 487,365 | 476,096 | 465,696 | 453,211 | 444.211 |

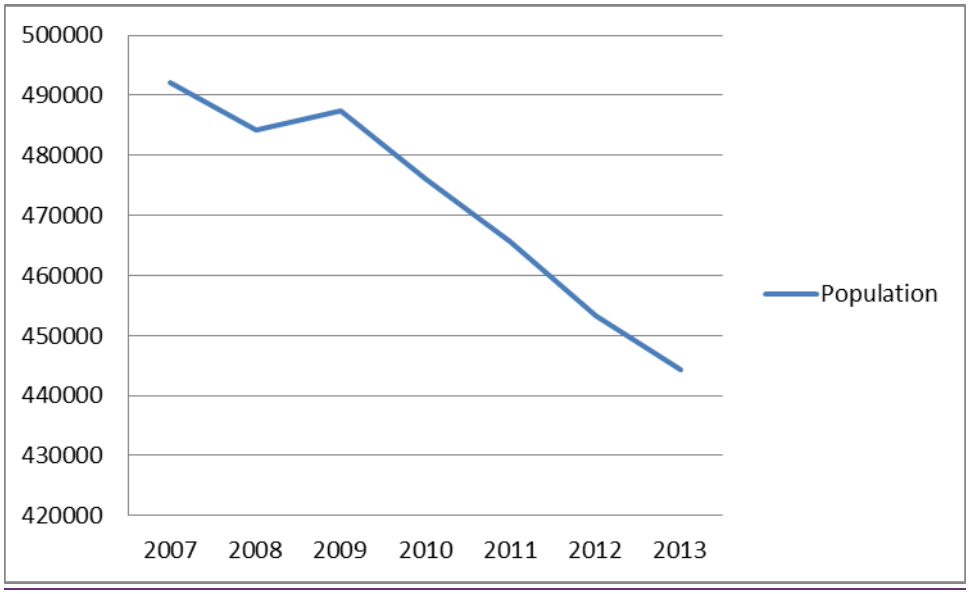



*Figure 48: Population Change of Yozgat Province with Years*

Population of Yozgat central district where the project is located is 97.443 according to 2013 data of TurkStat. Therefore, about 22% of total population in the province lives in the city center.

Age distribution in Yozgat province in 2013 is given below. According to the data provided from TurkStat, 20-24 age range is the most common age group in the province for both men and women population. Moreover, the statistics show that younger population in the province dominates older population.

**Table 92: Age Distribution in Yozgat central district province in 2013**

| Age Interval | Total | Men | Women |
|---|---|---|---|
| 0-4 | 6.694 | 3.413 | 3.281 |
| 5-9 | 7.343 | 3.777 | 3.566 |
| 10-14 | 7.701 | 3.982 | 3.719 |
| 15-19 | 9.336 | 4.863 | 4.473 |
| 20-24 | 9.519 | 5.111 | 4.408 |
| 25-29 | 7.754 | 3.882 | 3.872 |

[11] **Source:** Governorship of Yozgat, 2012

| Age Interval | Total | Men | Women |
|---|---|---|---|
| 30-34 | 7.872 | 4.090 | 3.782 |
| 35-39 | 6.844 | 3.536 | 3.308 |
| 40-44 | 6.229 | 3.080 | 3.149 |
| 45-49 | 5.902 | 2.989 | 2.913 |
| 50-54 | 5.294 | 2.706 | 2.588 |
| 55-59 | 4.536 | 2.268 | 2.268 |
| 60-64 | 3.871 | 1.922 | 1.949 |
| 65-69 | 2.935 | 1.348 | 1.587 |
| 70-74 | 2.144 | 992 | 1.152 |
| 75-79 | 1.535 | 667 | 868 |
| 80-84 | 1.395 | 618 | 777 |
| 85-89 | 430 | 150 | 280 |
| 90+ | 109 | 31 | 78 |
| **Total** | **97.443** | **49.425** | **48.018** |

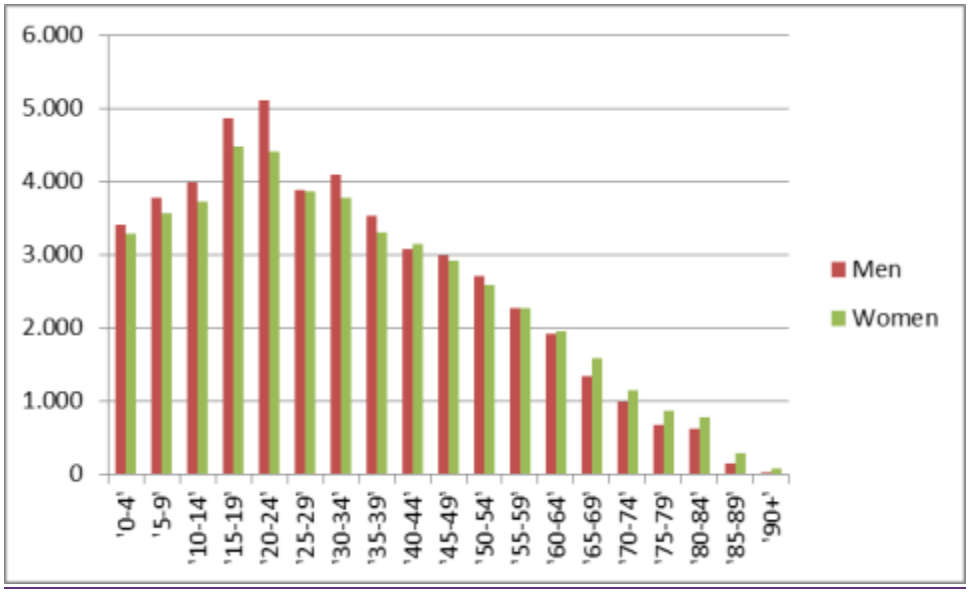



*Figure 49: Age Distribution in Yozgat province in 2013~~1~~*

### *7.1.1.3.2.1 Educational Status and Services*

General educational status of the population in central district of Yozgat is provided in the Table below. According to the Table, high school graduates are the most common group in the city centre

**Table 93: Educational status of the Population in Yozgat Central District in 2013**

| Education Status | Total | Men | Women |
|---|---|---|---|
| Illiterate | 1.546 | 229 | 1.317 |
| Literates with no official diploma | 1.583 | 439 | 1.144 |
| Primary School | 11.541 | 3.923 | 7.618 |
| Primary and Elementary School | 11.736 | 6.110 | 5.626 |
| Elementary School | 3.030 | 1.817 | 1.213 |
| High School | 19.230 | 11.417 | 7.813 |
| University | 9.051 | 5.380 | 3.671 |
| Masters | 618 | 398 | 220 |
| Doctorate | 233 | 172 | 61 |
| Unknown | 999 | 418 | 581 |
| Total | **59.567** | **30.303** | **29.264** |

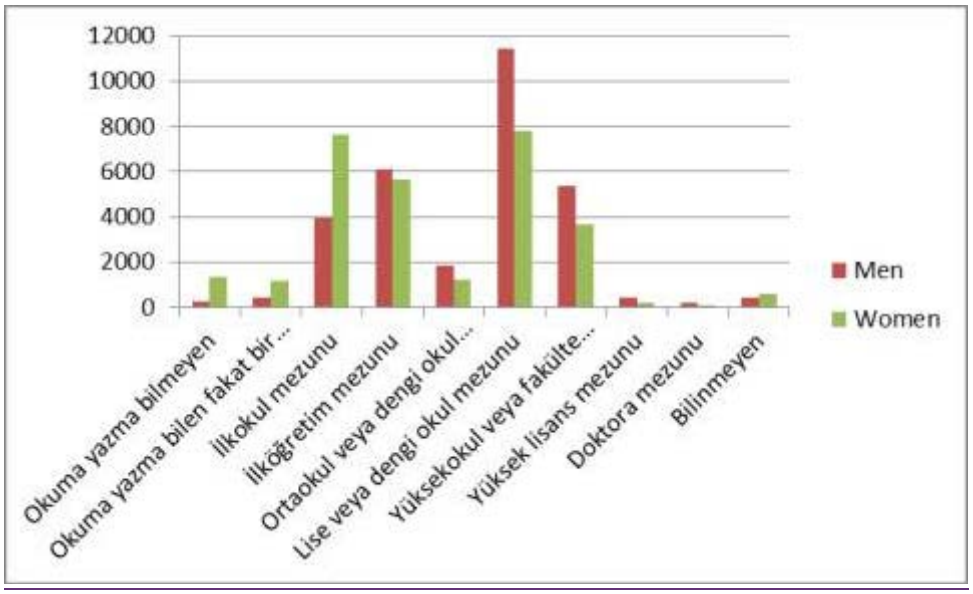



*Figure 50: Educational status of the Population in Yozgat Central Distinct in 2013*

According to the information from TurkStat, 5,610 teachers were employed in Yozgat province in 2011-2012 education year and 102,226 students were educated during this year. Information about student and teacher numbers in the province and its comparison with Turkey is given below.

**Table 94: Total Number of Students and Number of Students per Teacher**

| Educational Institution | Number of Students (A) | Number of Teacher (B) | A/B | A/B Turkey Average |
|---|---|---|---|---|
| Kindergarten | 7,778 | 282 | 27 | 20 |
| Primary | 65,399 | 3.714 | 17 | 20 |

| Educational Institution | Number of Students (A) | Number of Teacher (B) | A/B | A/B Turkey Average |
|---|---|---|---|---|
| Secondary School | 12,501 | 612 | 20 | 16 |
| Technical Vocational Education and Training Center | 16,548 | 1.002 | 16 | 28 |

#### 7.1.1.3.2.2 Marital Status

Marital status of Central disctrict of Yozgat province provided from TurkStat 2013 data is given below. According to the table, majority of the district population is married people.

**Table 95: Marital Status in Yozgat Province Central District in 2011**

| Gender | Single Population | Married Population | Divorced Population | Widow Population |
|---|---|---|---|---|
| Total | 16.784 20.214 | 37.052 48.011 | 1.408 1.822 | 2.648 4.314 |
| Men | 10.060 12.005 | 18.623 24.133 | 631 826 | 285 638 |
| Women | 6.724 8.209 | 18.429 23.878 | 777 996 | 2.363 3.676 |

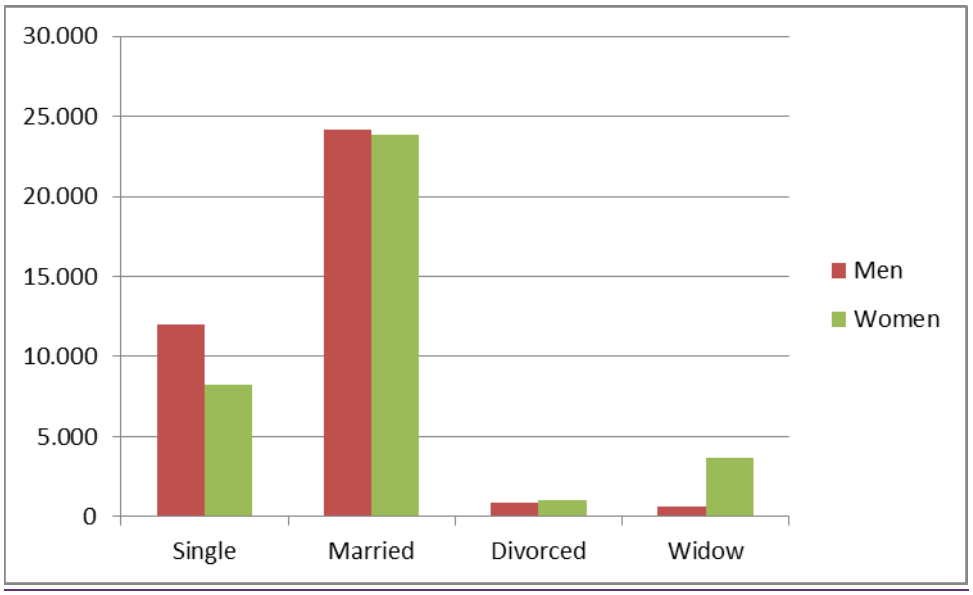



*Figure 51: Marital Status in Yozgat Province Central District in 2013*

### 7.1.1.3.3 Health Status and Services

List of public hospitals located in Yozgat province central is given below.

- Yozgat State Hospital

- Yozgat Oral and Dental Health Center
- Bozok Maternity Children's Hospital

There are 2 private hospital in the province listed below.

- Private Yozgat Şifa Hospital
- Private Yozgat Yimpaş Health Center

Moreover, 7 family health centers are present in the province.

The biggest health facility in Yozgat is Yozgat State Hospital. It has 290 bed capacities and closed area per bed is 65 $m^2$. Hospital does not serve for only local patients, but also incoming patients from neighbourhood provinces. Number of patients in State Hospital between 2008-2012 is given below. As it is seen from the table, bed occupancy rate increases every year.

**Table 96: Patient Intensity of Yozgat State Hospital between 2008-2012**[12]

| Year | Number of Beds | Policlinic Incidents | Emergency patient | In-patient | Surgery operation | Bed Occupancy Rate (%) |
|---|---|---|---|---|---|---|
| 2008 | 290 | 359,836 | 80,091 | 12,976 | 6,149 | 60.3 |
| 2009 | 290 | 412,772 | 90,097 | 12,819 | 8,983 | 65 |
| 2010 | 290 | 435,356 | 89,972 | 13,702 | 9,581 | 67.59 |
| 2011 | 400 | 487,146 | 137,881 | 24,367 | 13,528 | 67.4 |
| 2012 (2 months) | 400 | 74,505 | 16,898 | 3,913 | 2,189 | 73.30 |

Detailed information about health services in Yozgat province is also given in Section 1.2.

#### 7.1.1.3.4 Water and Sanitation Infrastructure

### Drinking Water

There is no drinking water treatment plant in Yozgat. However, construction of drinking water treatment plant by State Hydraulic Works has started on 08.09.2012. [13]

### Waste Water

Presently, 90% of the wastewater is collected and biologically treated in a wastewater treatment plant All the domestic waste water is discharged to the town's sewerage system and treated at wastewater treatment plant

#### 7.1.1.3.5 Housing

According to a study published by Civil Engineering Chamber, presently there is a housing deficiency problem in Yozgat. [14]

#### 7.1.1.3.6 Social Maladies

According to the "Yozgat Tourism and Social Infrastructure Sector Working Group Report" [15] prepared by academicians and representatives of local authorities for Yozgat province, common types of crimes committed in Yozgat between 2003-2008 is given below.

**Table 97: Main Types of Crime in Yozgat**

[12] **Source:** Yozgat State Hospital Web Page

[13] **Source:** State Hydraulic Works Web Page

[14] **Source:** http://e-imo.imo.org.tr/Portal/Web/new/uploads/file/menu/KONUT_RAPORU.pdf

[15] **Source:** http://www.oran.org.tr/materyaller/Editor/document/PlanlamaBirimi/Yozgat_Turizm_SCG_Raporu_Mayis2011.pdf

| Year | Total | Murder | Murder (%) | Malicious Wounding | Malicious Wounding (%) | Robbery | Robbery (%) | Roguery | Roguery (%) | Other | Other (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | 550 | 16 | 2,91 | 35 | 6,36 | 40 | 7,27 | 10 | 1,82 | 449 | 81,64 |
| 2004 | 627 | 22 | 3,51 | 32 | 5,10 | 41 | 6,54 | 10 | 1,59 | 522 | 83,25 |
| 2005 | 249 | 16 | 6,43 | 49 | 19,68 | 43 | 17,27 | 11 | 4,42 | 130 | 52,21 |
| 2006 | 605 | 34 | 5,62 | 53 | 8,76 | 39 | 6,45 | 18 | 2,98 | 461 | 76,20 |
| 2007 | 875 | 19 | 2,17 | 99 | 11,31 | 27 | 3,09 | 21 | 2,40 | 709 | 81,03 |
| 2008 | 374 | 18 | 4,81 | 49 | 13,10 | 20 | 5,35 | 14 | 3,70 | 273 | 72,99 |

### 7.1.2 Impact Analysis results

The baseline data collected allows to draw the following conclusions regarding the general socio-economic conditions in the project area and the close vicinity.

Economy of Yozgat mostly depends on agriculture. According to report published by Yozgat Chamber of Commerce and Industry at 2012, %60 of total area of Yozgat is used for agricultural purposes. Since the agricultural activities are the most important item for economy of Yozgat, they also help the development of industry and business sectors.

Yozgat is one of the priority development cities in Turkey. Hence, many industry sectors are invested in by the government in the province. These sectors are food, textile, clothing, furniture, medical supplies, paper industry, machinery industry, crystal glass mosaic, agricultural tools, cosmetics, machinery, automobile equipment, packaging and construction.

There are 7 small industrial zones in Yozgat province and one of them is central distinct. 312 workplaces were established at central distinct of the province. Brick production, fodder production, flour and bran production, bread production, meat and milk production, home textiles, furniture production, manufacture of plastic and manufacture of central heating boilers are the main industries in center of the province.

Expropriation of Yozgat industrial zone was started in 1994 and completed in 1995. At the same time, project of the industrial zone is completed and 110 industrial parcels were planned inside the zone. The industrial zone was located in 1,500,000 $m^2$ area. Infrastructure of the industrial zone was completed in 1997 and afterwards the zone was started to be operated.[16]

Possible impacts at a social level could be due to the need of a workforce which could lead to immigration of workers, with consequences on the housing market, on infrastructures and on the employment conditions in the area. Moreover a large construction site may create work opportunities that will be satisfied with local work force. However the project will also bring benefits to the local economy, in terms of occupation and demand of goods and services partly procured locally. It is recommended that communication with local communities is as open and clear as possible, to ensure that the general public is well informed about the planned activities and that possible situations of conflict and tension are addressed promptly.

A public consultation meeting details of which are presented in the Stakeholder Engagement Plan, was held on the 17th of September. No grievances or negative concerns by the attendees were brought to the attention of the project management during the meeting.

[16] **Source:** Governorship of Yozgat, 2012

## 7.2 Cultural resources, including archaeology

### 7.2.1 Baseline

### 7.2.2 Study area

The Study Area (SA) used for the archaeology and cultural resources impact assessment covers the Project Site.

#### *7.2.2.1 Methodology*

A literature investigation was performed for the archaeological and cultural resources in the vicinity of the Project Site.

#### *7.2.2.2 Baseline results*

As part of the social site investigations, no know archaeological site has been identified in the SA.

### 7.2.3 Impact Analysis results

Since no known archaeological site has been identified for the SA, impact analysis has not been performed for this component.

## 7.3 Ecosystem services

### 7.3.1 Baseline

Knowing the ecology of the region, the ecosystem services can be cited for the SA and the larger vicinity of the project area would be the agricultural activities. There is no agricultural activity going on the SA. Therefore no further analysis has been performed.

## 7.4 Human and ecological health risk assessment

### 7.4.1 Introduction

The focus of this section of the ESIA is on potential health impacts that could arise from release of contaminants to water and air; these environmental media may also lead to exposure from indirect pathways such as ingestion of contaminated food and plants, which also need to be considered.

This section also includes an evaluation on the potential effects of the traffic load increase due to the project activities on the public safety.

### 7.4.2 Study Area

The study area encompassed the same areas identified within the biophysical assessment which may potentially be influenced by the project.

### 7.4.3 Risk Assessment Approach

The risk assessment is conducted with reference to established protocols endorsed by the United States Environmental Protection Agency (USEPA) (1989, 1998). The method starts with a qualitative initial phase (problem formulation), then as needed moves through exposure and toxicity analysis and culminates in quantitative risk characterization. The first step is therefore to determine whether a certain Project activity has potential to cause substantive change in environmental chemical concentrations that may affect health (i.e., linkage between a Project activity and adverse change in environment). Subsequently, quantitative risk estimates would be calculated for scenarios where receptors, exposure pathways and substantive changes in environmental quality are plausible. The four main stages of HHERA are:

Problem Formulation: This step helps to focus the risk assessment on the chemicals, receptors and exposure pathways of greatest concern (i.e., chemicals with the greatest toxic potential; people with the greatest likelihood of being exposed and the greatest susceptibilities; exposure pathways that account for the majority

of exposure to the chemicals). If no unacceptable health risks are predicted for these, it is highly likely that no unacceptable health risks would also occur for other chemicals, receptors or exposure pathways. For this Project potential pathways via the aquatic and atmospheric environment will be considered.

Exposure Assessment: This quantitative step estimates the amount of a chemical that a person or animal may take into their body (referred to as a dose) through all applicable exposure pathways. The dose of a chemical depends on the concentration in various media (e.g., air, water, soil and food), the amount of time that people or aquatic life may be in contact with these media and the physiological characteristics of the person or animal (e.g., ingestion rates, inhalation rates, body weights and dietary preferences).

Toxicity Assessment: This step determines the acceptable dose that people and aquatic life can be exposed to on a daily basis without risk of adverse health effects over a lifetime of exposure.

Risk Characterization: This step compares the results of the exposure assessment and toxicity assessment and determines whether there is a potential for chemicals from the site to pose a health risk. It puts the predicted risk into context so that stakeholders, regulators and interested readers can more easily comprehend the results. The uncertainty in the assessment is also described and the methods for dealing with that uncertainty are explained.

### 7.4.4 Baseline results

As described above no freshwater/marine aquatic habitat exists on or near the Project site. Thus there is no potential linkage between Project water emissions and the environment.

It is via the atmosphere that health risks may exist from contaminants of potential concern (COPCs) generated by the Project. COPCs related to construction and operation will include $NO_2$, $SO_2$, particulates, and other chemicals from vehicle emissions during the construction and transportation activities during operation. Existing air quality baseline conditions have been assessed in the previous chapters.

All wastewater produced by the Project during construction and operations will be collected and then treated before release. The potential human and ecological health risk from this pathway are therefore not assessed further in this ESIA.

The impacts of the project on ecological health through air emissions can be result of the air emissions during construction and operation via construction and transportation equipment's exhaust gases.

The baseline traffic conditions are described in Section 5.5.2.1

#### *7.4.4.1 Impact Analysis results*

#### *7.4.4.2 Construction and operation phase*

With regards to the ecological and human health risk component, impacts during the construction and operation phase have been assessed jointly. The main potential consequences on human and ecological health risks during the construction and operation phases consist in the following:

- surface water pollution;
- discharge of organic and inorganic substances in the sea.
- pollutant and dust emission in the atmosphere
- increased traffic load

All wastewater produced by the Project during construction and operations will be collected and then treated before release. The potential human and ecological health risk from this pathway are therefore not assessed further in this ESIA.

The modelling studies performed to evaluate the impacts on the air quality resulting from various project activities are presented and discussed in the air quality section. The residual impacts and mitigation measures are also presented in Air Quality Section..

Referring to the air modelling study performed in air quality section the impact on the ecological health from the air emissions of the project will be negligible.

Referring to the existing traffic load and the estimated increase in traffic load (Ref. Section 5.5.2.1) the impact on the public safety will be minimum with the mitigation measures described in section 5.5.4.

Direction: negative

Duration (D): long

Geographic extent (G): local

Intensity (I): low

Probability of occurrence (P): low

Sensitivity (S): low

The overall impact is considered to be low

#### *7.4.4.3 Decommissioning phase*

Given that closure will not occur for at least 30 years it is not useful to comment in any detail on impacts of the decommissioning phase on human and ecological health risk. Operations of decommissioning will have to be performed so as to ensure that ecological and human health risks are reduced to a minimum, however they will have to be identified and implemented according to an analysis of the future context and practices, therefore cannot be anticipated at this stage.

### 7.4.5 Mitigation measures

All mitigations inherent within the Project design to minimize emissions of airborne pollutants will contribute to protection of human health offsite. The Project case impact predictions for both air quality and noise will be compared to the limits in regulations and additional guidance documents as described elsewhere in this ESIA. The mitigation measures for the minimisation of the public safety impact of the the traffic increase during construction will be:

- Emphasizing safety aspects among project drivers; specifically ensure drivers respect speed limits through built areas and urban centres
- Adopting best transport safety practices with the goal of preventing traffic accidents and minimizing injuuries suffered by project personnel and the public Rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction will be established
- Speed control devices on trucks, and remote monitoring of driver actions will be considered
- Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety
- Traffic control and appropriate signs will be used to highlight warnings and to improve safety especially at intersections and junctions and to indicate any type of diversion or traffic changes related to Project activities.
- Project will adopt best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public

- Traffic will be reduced routing through community areas wherever possible
- Traffic will be scheduled for daylight hours, where possible to minimize night disturbance and increase road safety
- Vehicles will be maintained in good condition to ensure they are no louder than other, similar vehicles on the roadways

Within the Project site occupational health and safety procedures for both normal and upset situations will be put in place to protect workers .(Ref. Section 10.4.1 ).

The mitigation measures inherent with the project design and operational procedures on minimising the impacts on the marine ecology and habitat are described in various sections of the ESIA report.

### 7.4.6 Residual impacts

#### *7.4.6.1 Construction and operational phase*

Impacts on component after applying mitigations and best practices will be negligible.

Direction: negative

Duration (D): long

Geographic extent (G): local

Intensity (I): negligible

Probability of occurrence (P): low

Sensitivity (S): low

The overall impact is considered to be negligible

### 7.4.7 Monitoring

Monitoring activities for this component are covered by those applied to the components. Further information can therefore be found in the respective sections.

## 7.5 Resettlement and compensation

### 7.5.1 Study area

The resettlement and compensation study area (SA) comprises the Project site.

### 7.5.2 Methodology

For the assessment of this component, The Project was asked to state the property and current use of all areas that will be used during the Project.

### 7.5.3 Baseline results

The Project will be entirely developed on land, where no building, structures or plots of other owners are present. In addition no major economic activities by third parties are affected by the project. Hence no impacts are predicted because the Project will not require the resettlement of people and will not cause the loss of sources of income for anyone. No economic compensation will therefore be needed due to the Project.

# 7.6 Visual aesthetics

## 7.6.1 Baseline

### *7.6.1.1 Study area*

The study area considered visual aesthetics component considers the Project site and all other areas from which the Project site is visible.

There is no agricultural activity conducted at Project site. According to the land use map below, Project area is classified as “Dry Agricultural” area. ın addition, Project area also classifies as non-calcareous brown soils in accordance with the soil groups. Dry agricultural areas are the areas that can not be irrigated economically. Water demand is only meet by rainfall.

Project area is declared as a medical area according to the zoning plan of the Municipality.

Project site was first owned by Tresury. The site was then allocated to the Ministry of Health. According to the New law on PPP, Law No. 6428 passed by parliament within February and passed by the President within the first week of March 2013, the rules and methods of construction of the health facilities on the basis of construction right of independent and continuous nature as not to exceed 30 years on the immovable owned by the Treasury, renewal of the existing facilities and commissioning of the facilities required by the Ministry of Health and subsidiaries.

### *7.6.1.2 Methodology*

The analysis of impacts on the visual component follows a simplified approach of landscape as defined by the European Landscape Convention[17], which emphasizes the centrality of people’s perception of a determined area. For this reason the impact of the Project has been assessed from a series of standpoints, considered more sensible than others, either because the site area is highly visible (i.e. elevated areas, areas with an open view, etc.) or because it is a highly used area by a significant number of people (i.e. recreational areas, public parks, roads, private houses). These standpoints were preliminarily identified on a map, on the basis of the knowledge of the area and of its morphological features, and then were visited in person during a site visit performed by Golder staff in July 2013, to confirm the visibility of the Project site. A photographic documentation was gathered in order to compare these views.

### *7.6.1.3 Baseline results*

A total of 5 pictures have been selected among all those that had been taken during the field visit. Their location and direction is indicated in the following map (Figure 48).

[17] “Landscape” means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.

***Figure 52*** *– Picture 01 – View of the project area from east to project site*

***Figure 53*** *– Picture 02 – View of the project area from north to project site*

***Figure 54*** *– Picture 03 – View of the Project site from south to project site*

***Figure 55*** *– Picture 04 – View of the Project site from west to project site*

## 7.6.2 Impact Analysis results

### *7.6.2.1 Construction phase and operation phase*

With regards to the visual aesthetics component, impacts during the construction and operation phase have been assessed jointly, as the construction activities will lead to consequences on the impact which will continue through the operation phase, therefore making it pointless to assess them separately. The main potential consequences on the visual aesthetics during the construction and operation phases consist in the following:

- Vegetation clearing and topsoil removal;
- Landscape features alteration;
- Presence of new constructions.

The impacts on the vegetation have been assessed in above sections. In line with findings of the baseline on the vegetation coverage area it will be reasonable not to attribute any significance of landscaping value on to the vegetation in the project area.

The baseline data collected allows to draw the following conclusions regarding the general visual aesthetics conditions in the project area:

- The Site is visible from a large portion of areas along Sivas Yozgat Highway. The standpoints are dynamic, meaning that the viewer is in movement while observing the area and there are no standpoints considered particularly sensitive (e.g. recreational areas, lookout etc).
- The area will be visible from residential units within the vicinity .However the area has a low density and is not considered a sensitive visual standpoint.
- The context of the Project site does not have valuable landscape characteristics, due to its position, a significant number of infrastructures and facilities have been already heavily altering the landscape with artificial elements, compromising the overall appeal of the area.

As shown by the pictures, the Project entails construction activities which will lead to alterations of the landscape, mainly consisting in the ground levelling and the creation of artificial structures on an area previously was covered by shrubs. However the general context of the area, as shown in the baseline pictures, does not have significant landscaping characteristics. As mentioned in the baseline results, standpoints from which the project area is highly visible is reduced therefore the overall sensitivity of the component is considered to be low.

Direction: negative

Duration (D): long

Geographic extent (G): local

Intensity (I): low

Probability of occurrence (P): high

Sensitivity (S): low

The overall impact is considered to be low.

### *7.6.2.2 Decommissioning phase*

Given that closure will not occur for at least 27 years and that the area is designated for on-going industrial use, it is not useful to comment in any detail on impacts of the decommissioning phase on the visual aesthetics industry. A program of mitigation measures and steps to be adopted after the closure will be necessary to ensure that the landscape is brought back to the state it had previously to the construction activities, as much as possible, and that the most prominent structures are demolishes, however they will have to derive from an analysis of the future context and therefore cannot be anticipated at this stage.

### 7.6.3 Mitigation measures

Mitigations from the aesthetic point of view aim at reducing the contrast between the artificial structures and the natural context in which they are placed. It is therefore recommended to use landscaping and revegetation techniques in all open areas, using native species that do not need major maintenance. This technique also leads to benefits from other points of view, such as reduction of possible natural hazards and creation of pockets for natural wildlife. During the construction and operation phases, it is recommended to use shielded lights at the Project facilities, and the lights will be directed downwards and so away from the nearest residential areas and the forest area on the peninsula, to minimize effects on both people and wildlife. Finally it is recommended that at the end of construction, the campsite is decommissioned and any waste from these facilities or construction materials is properly disposed of.

### 7.6.4 Residual impacts

#### *7.6.4.1 Construction and operational phase*

Due to the size and extension of the Project structures, mitigation measures cannot lead to major reductions in the overall impact on the visual aesthetic component.

Direction: negative

Duration (D): long

Geographic extent (G): local

Intensity (I): low

Probability of occurrence (P): high

Sensitivity (S): low

The overall impact is considered to be low.

### 7.6.5 Monitoring

Monitoring of impacts on the socio-economic context will be mainly done through the implementation of a Grievance Mechanism, which will represent an open channel for continuous and structured communication between the Company and the general public, allowing anyone to express individual and collective concerns and issues regarding the construction and operation of the facility.

# 8.0 CUMULATIVE IMPACTS ASSESSMENT

## 8.1 Methodology

IFC Performance Standard 1 (2012) notes that the scope of the cumulative impact assessment should be commensurate with the extent of cumulative impacts anticipated. This gives good direction to produce a focused assessment, considering only relevant disciplines. Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities. Examples of cumulative impacts include: incremental contribution of gaseous emissions to an airshed; reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed; interference with migratory routes or wildlife movement; or more traffic congestion and accidents due to increases in vehicular traffic on community roadways.

This cumulative effects assessment (CEA) is limited to those residual effects (post mitigation) resulting from past, present or reasonably foreseeable human activities or actions which occur within the area where a linkage between the residual effects resulting from the activities related to the Project and the residual effects of other actions occurs.

In general, foreseeable projects that will supplement the Project with a third party service or other independent projects proposed in the region to be considered in the CEA are identified and described. There must be a reasonable potential that the other projects' impacts will overlap with those of the Project in time and/or space. If this overlap is not apparent, then a CEA is not warranted.

For cumulative effects to occur, residual impacts from the Project need to overlap with residual impacts from other foreseeable projects. Because of this for biophysical impacts, the largest potential impact area is used for the CEA that is the air quality study area. For social disciplines, a hierarchy of areas is considered as has been done for the socio-economic impact assessment.

## 8.2 Results

### 8.2.1 Project considered

State Hydraulic Works (DSİ) has started to construct a water storage tank in a 100 $m^2$ area approximately with 20 m x 30 m dimensions whose distance is 200 m from the Project site.

It is not expected any overlaps between the constructions schedules of storage tank project and Yozgat Health Campus Project. Therefore there will no major cumulative effects to be expected during construction. Nevertheless, in case of any overlaps will occur throughout the life time of the projects, cumulative effects are analysed.

### Cumulative Effects Assessment

Considering the results of the Yozgat Health Campus Project, it is concluded that the Project impacts could have the potential to combine with DSİ project impacts not to produce higher levels of environmental consequence than those predicted for the Project alone for the following environmental and social components.

- Air quality
- Road traffic

#### *8.2.1.1 Air quality*

According to the calculations and dispersion modelling performed, contribution of dust emissions from construction activities is expected to be below the ambient quality limits defined in Turkish regulations.

In addition, a model was prepared to assess the contribution of dust emissions from construction activities of both Yozgat Health Campus project and DSİ project at the same time, it is still expected to be below the ambient quality limits defined in Turkish regulations.

#### 8.2.1.2 Road traffic

DSİ project, during the construction phase, estimates a total number of 15-20 trucks needed daily during the course of the excavation of the project site. Therefore the traffic increasing is negligible in case of overlapping the project execution schedules.

The cumulative effect on key public access routes is limited and the roads are in good condition but, in any case, especially during the Yozgat Health Campus construction phase, the increasing of heavy duty vehicle could cause a significant impact on traffic. Mitigation measures are further described in Section 7.4.

# 9.0 CONCLUSION

The present ESIA have provided valuable data and information, useful to assess the sensitivity of each component and the impact of the Project.

Physical and biological components potentially impacted by the Project have been analysed through a semi-quantitative impact assessment method; social components have been analysed through a qualitative impact assessment method.

Some potential impacts identified before the mitigation can be significantly reduced applying appropriate measures described in the document and synthetized in the commitment register. After mitigations all of the residual potential impacts are negligible or low.

With reference to physical components, no major concerns have been identified. With reference to soil, a characterization is necessary before the start of the levelling activities; with reference to air quality, the contribution due to the traffic increase is limited.

With regards to the biological component, no critical species and critical habitats are present in the study area. Fauna and flora species that are found in the area are already impacted by anthropogenic factors.

Possible impacts at a social level could be due to the need of a workforce which could lead to immigration of workers, with consequences on the housing market, on infrastructures and on the employment conditions in the area. Moreover a large construction site may create work opportunities that will be satisfied with local work force.. However the project will also bring benefits to the local economy, in terms of occupation and demand of goods and services partly procured locally. It is recommended that communication with local communities is as open and clear as possible; to ensure that the general public is well informed about the planned activities and that possible situations of conflict and tension are addressed promptly.

Public participation meeting was held at venue that belongs to the Yozgat Municipality at 17.09.2013. This place was easily accessible by the local people and communities. Announcements were made for the meeting in the areas, which were most likely to be affected by the Project and public notices with agenda, date, and time of the meeting was announced.

The number of the participation to the meeting was sufficient (26 people; 5 representatives from local media, 2 from local municipality, 15 from local public, 2 from project employees and 2 from ESIA consultants). In general, local stakeholders are aware of public benefit of the project and significant contribution to national economy.

Due to the type of facility, the Project will have consequences on the visual aesthetic component which cannot be easily mitigated; however the general context already present reduces the overall impact.

The commitment register presented below collects and summarizes all the mitigation measures and the monitoring activities identified and proposed within the study.

## 9.1 Commitment register

### Physical components

#### *Mitigations*

**GEOLOGY AND GEOMORPHOLOGY**

- Use best practices during construction activities to reduce accidental pollutants emission in groundwater;

**SOIL AND LAND USE**

- Stored soil will be covered by tarpaulins or gravel; the ground will be covered by impermeable material and the slope of the soils will not be over 5%;
- Temporary cross ditches will be constructed to redirect surface runoff;
- Vehicle restrictions will be applied to limit the speed, weight, or number of vehicles;

- Routine maintenance of the vehicles and equipment to prevent oil leaks ;
- Proper storage of the chemicals;
- Clean-up of spills as it occurs;
- Surface improvements, such as paving or adding gravel to the surface;
- There will be a waste management plan prepared for the project where the details of the waste collection, segregation and disposal will be detailed. The minimum requirements of the waste management plan is detailed in Waste Management Plan (Appendix A)
- Prior to construction, a detailed Phase I Environmental Site Assessment should be conducted in order to determine if there are any contaminant sources present within the site or in the near vicinity;
- If needed, a Phase II Environmental Site Assessment should be conducted by collecting soil samples, in order to determine if there is any contamination in the soil, types and distribution of the contaminants based on the "Regulation on Soil Pollution Control and Point Source Contaminated Sites";
- If the soil is contaminated: avoid or minimize temporary stockpiling of contaminated soils or hazardous material; isolate the stockpile with plastic sheeting or tarps; do not stockpile in or near storm drains or watercourses; install a berm around the stockpile to prevent runoff from leaving the area.

**SURFACE WATER HYDROLOGY**

- It could be useful to apply a water resource management plan, including surface water and wastewater (Appemdix A).
- ~~There will be a waste management plan prepared for the project where the details of the waste collection, segregation and disposal will be detailed. The minimum requirements of the waste management plan is detailed in Waste Management Plan (Appendix A)~~

**HYDROGEOLOGY**

- Use best practices during construction activities, to reduce accidental pollutant emission in groundwater;
- During construction the measures to mitigate the possible contamination of groundwater through the operation of the vehicles and construction equipment should be taken;
- It could be useful to apply a water resource management plan, including surface water and wastewater.

**ATMOSPHERE (AIR QUALITY, CLIMATE AND METERIOLOGY)**

- Construction sites, open storage piles will be moisturized;
- Trucks transporting fugitive material such as soil, sand, etc. will be covered to prevent dispersion during transportation;
- Periodic maintenance will be provided for construction machinery and equipment to control the exhaust emissions;
- Equipment in good condition will be used;
- The fuel system of the vehicles shall be controlled and shall be complied with the provision of the Regulation on the Control of Exhaust Gas Emission published on 04.04.2009 in Official Gazette No. 27190.
- Scheduling of traffic to avoid peak hours on local roads;
- Site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction will be established;

**NOISE AND VIBRATIONS**

- The limited construction activities will take place during night time;

- The hours of operation for specific pieces of equipment or operations will be limited, especially with regards to mobile sources operating through community areas;
- Project traffic routing through community areas will be reduced wherever possible;
- A grievance mechanism to record and respond to complaints will be developed;
- Regular maintenance will be made for the construction equipment to ensure that high noise levels generated by the equipment are decreased as much as possible;
- Top soil salvage areas will be located to aid in providing sound barriers.

**VEHICULAR TRAFFIC**

- Contractors will have to regularly maintain vehicles to minimize potentially serious accidents;
- Upgrading and enlarge work of the access road to the project area should be considered.

(Ref. Section 7.4.5)

- ~~Emphasizing safety aspects among project drivers; specifically ensure drivers respect speed limits through built areas and urban centres~~
- ~~Adopting best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public Rights-of-way, site speed limits, vehicle inspection requirements, operating rules and procedures (e.g. prohibiting operation of forklifts with forks in down position), and control of traffic patterns or direction will be established~~
- ~~Speed control devices on trucks, and remote monitoring of driver actions will be considered~~
- ~~Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety~~
- ~~Traffic control and appropriate signs will be used to highlight warnings and to improve safety especially at intersections and junctions and to indicate any type of diversion or traffic changes related to Project activities.~~
- ~~Project will adopt best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public~~
- ~~Traffic will be reduced routing through community areas wherever possible~~
- ~~Traffic will be scheduled for daylight hours, where possible to minimize night disturbance and increase road safety~~
- ~~Vehicles will be maintained in good condition to ensure they are no louder than other, similar vehicles on the roadways~~

## *Monitoring*

**GEOLOGY AND GEOMORPHOLOGY**

- Monitoring is not required.

**SOIL AND LAND USE**

- monitoring actions should be undertaken to define baseline quality of the component before construction, and to verify any changes eventually occurred during construction and operational activities;
- Monitoring sites would be selected among areas in which critical actions or activities are planned; frequency will be high during construction to plan corrective actions at the initial stage of pollution; during the operational phase it will be repeated with lower frequency.
- Monitoring of the application of the waste management plan will be required through inspections and audits as necessary in order to ensure that the disposal of medical wastes are in line with the industry practices and regulatory requirements.

**SURFACE WATER HYDROLOGY**

- A monitoring plan should be performed to verify contents of wastewater; samples should be taken monthly to avoid environmental risk of pollution and verify compliance of wastewater with regulatory requirements.

**HYDROGEOLOGY**

- Monitoring is not required.

**ATMOSPHERE (AIR QUALITY, CLIMATE AND METERIOLOGY)**

- Periodic dust (PM10 and settled dust) monitoring will be performed at the closest settlement, during construction stage;
- Exhaust emissions from construction and transportation vehicles will be periodically monitored (Regulation on Control of Exhaust Gas Emission).

**NOISE AND VIBRATIONS**

- No monitoring is foreseen

**VEHICULAR TRAFFIC**

- No specific monitoring activity is considered necessary.

## Biological components

### *Mitigations*

**TERRESTRIAL FLORA**

- Study areas will be clearly defined before vegetation clearance where construction activities will be taking place and permanent structures will be built.
- Topsoil will be removed and stored before construction activities start. Upon completion of construction activities, topsoil will be used to cover landscape areas and natural plant species will be allowed to grow again in the area.
- Vegetation clearance will take place gradually, so fauna elements will be allowed to leave construction sites.
- During vegetation clearance, equipment will be selected so as not to harm plant roots.

**TERRESTRIAL FAUNA**

Potential impacts of construction on terrestrial fauna can be listed as the following:

- Habitat loss at the project site,
- Animals leaving the site due to dust and noise emissions during stripping of topsoil and excavation activities,
- Mortality of those species that have limited mobility during stripping of topsoil and excavation activities.

In line with IFC Performance Standard 6, mitigation measures outlined in this section are put forward with the primary goal of avoiding any potential impact especially during crucial periods like the breeding season of animals, which might impact not only individual species but an entire population. Whenever a potential impact was considered as unavoidable, such as generation of dust and noise, the most effective measures are suggested to be taken so that the impacts on fauna are minimized.

As the findings of the fauna studies indicate, the project site does not bear any important habitats significant for rare, endemic or threatened fauna species. Besides, most of the habitats that could be inhabited by fauna elements have lost their natural state due to grazing and urbanization.

There will be habitat loss at project sites where there will be permanent structures and foundations during construction and operation phases of the project. Habitat loss will also cause permanent impacts on the terrestrial ecosystem. Project activities will also cause significant noise emissions that would impact fauna species. However, habitats inhabited by fauna species of the area are also found within the project site where there would be no permanent structures, as well as outside the project site. This indicates that the impact on fauna species would not be detrimental.

- Animals at the project site are likely to leave the area due to anthropogenic impacts. In order to minimize impacts on especially ground-dwelling and burrowing species, during the first year of construction, related activities should be carried out gradually over the breeding period of these species (April, May and June). This would allow these species to have enough time and energy to leave the site avoiding any project-related mortality.
- Species of limited mobility, such as the Testudo graeca (Spur-thighed tortoise) should be collected before the onset of construction activities and transferred to similar alternative habitats to avoid any mortality. Besides, if individuals of these species are come across during different phases of the project, they should also be transferred to alternative areas. The site personnel should be informed of these species and how they should be acting on the matter.

**HABITATS**

- All mitigation measures described in the previous assessments for terrestrial flora and fauna together with the mitigations described for alien species.

**PROTECTED AREAS**

- No specific mitigation measures.

**BIODIVERSITY**

- All mitigation measures described in the previous biological components.

## *Monitoring*

**TERRESTRIAL FLORA**

- No monitoring with respect to vegetation is required, apart from **monthly checks during construction** to ensure areas characterized by natural vegetation around the construction site have not been inadvertently impacted by equipment. Should any disturbance be noted, additional measures will be put in place to mark the boundary of the Project site and the vegetated area, construction staff should be better instructed in order to avoid damage to the natural vegetation.

**TERRESTRIAL FAUNA**

- No specific monitoring activity is considered necessary.

**HABITATS**

- All monitoring measures proposed for flora together

**PROTECTED AREAS**

- No specific monitoring measures are considered necessary.

**BIODIVERSITY**

- All monitoring measures proposed for terrestrial flora, together with the monitoring measures described for alien species.

## Social components

### *Mitigations*

**SOCIO-ECONOMIC CONDITIONS AND EMPLOYMENT ISSUES**

- Construction camps will be established for the temporary employees. Construction camps are considered a viable mitigation measure for the potential negative impacts brought about by the additional population;
- It is recommended that the Project adopts a transparent and clear hiring procedure, also extended to all other companies possibly involved in the hiring process;
- It is recommended that employment of workers is done locally as much as possible, in order to sustain the local economy and to build positive relationships with local communities;
- It is recommended that goods and services needed for the workforce's livelihood and welfare, as well as for other requirements for the operation of the facilities, are purchased by the Project locally.

**CULTURAL RESOURCES, INCLUDING ARCHAEOLOGY**

- No measures are identified

**ECOSYSTEM SERVICES**

- No measures are identified

**HUMAN AND ECOLOGICAL HEALTH RISK ASSESSMENT**

- All mitigations inherent within the Project design to minimize emissions of airborne pollutants , noise and impacts on the ecology and habitat.

**RESETTLEMENT AND COMPENSATION**

- No specific mitigation measures are considered necessary.

**VISUAL AESTHETICS**

- Use landscaping and revegetation techniques in all remnant areas, using low-maintenance, native flora of the region;
- Use lights at the Project facilitie; the lights will be directed downwards and away from the nearest residential areas and forest area, to minimize effects on both people and wildlife;
- At the end of construction, the campsite should be decommissioned and any waste from these facilities properly disposed of.

### *Monitoring*

**SOCIO-ECONOMIC CONDITIONS AND EMPLOYMENT ISSUES**

- Monitoring of impacts on the socio-economic context will be mainly done through the implementation of a Grievance Mechanism, which will represent an open channel for continuous and structured communication between the Company and the general public.

**CULTURAL RESOURCES, INCLUDING ARCHAEOLOGY**

- All possible findings of elements of archaeological or cultural value will have to be reported and chance find procedures will have to be followed,

**ECOSYSTEM SERVICES**

- Monitoring of impacts on the socio-economic context will be mainly done through the implementation of a Grievance Mechanism, which will represent an open channel for continuous and structured communication between the Company and the general public.

**HUMAN AND ECOLOGICAL HEALTH RISK ASSESSMENT**

- Monitoring activities for this component are covered by those applied to the components “Surface water hydrology”, “Hydrogeology”, “Atmosphere”.

**RESETTLEMENT AND COMPENSATION**

- No specific monitoring measures are considered necessary.

**VISUAL AESTHETICS**

Monitoring of impacts on the socio-economic context will be mainly done through the implementation of a Grievance Mechanism, which will represent an open channel for continuous and structured communication between the Company and the general public.

# 10.0 RISK ASSESSMENT

Turkish Labor Law No. 4857 aims to regulate the working conditions and work-related rights and obligations of employers and employees working within the confines of an employment contract. The law stipulates the legal rights of employees. In addition, Labor Law No. 4857, OHS Law - No: 6331 (Official Gazette Number 28339, Date: 30.06.2012) stipulates health and safety conditions within workplaces in detail. In compliance with the local requirements, a site-specific Risk Assessment Report and Emergency Response Plans must be prepared and implemented.

As a minimum, risk assessment procedures should be in place to manage the hazards and the associated risks during the construction and operation of the hospital. The risk assessment procedures must refer to the minimum requirements set in the chapter 2 of this report for the occupational health and safety of the workers.

The general approach which can be used for the Risk Assessment procedures are given below.

A similar approach can be used to identify the environmental hazards and associated impacts/risks of the project during construction and operation.

## 10.1 General Risk Assessment Approach

The process of identifying hazards, assessing risks and issuing HS procedures is a continuous process and have to be repeated/carried out every time significant changes to working conditions occurs or new working operations or new type of machineries are used for the Project purposes if there is no chance have to be repeated once in every 2 year.

To allow a systematic approach to managing hazards, the following processes have to be followed:

**Identification:** The first step in the hazards/risk management process is to identify the hazards in the workplace.

**Assessment:** Once the hazards have been identified, it is necessary to assess what risks they pose to personnel in the workplace. In this way, a measure of the risk can be established and priorities for corrective actions can be determined. The level of risk is dependent on the exposure to the hazard and the probability and consequences of an event occurring.

**Control:** Control process consists of determining and implementing appropriate measures to control risk. Legislation and codes of practice require that control of factors assessed as posing increased risk be implemented as low as reasonably practicable (ALARP).

**Evaluation:** Evaluation process consists of checking to see whether the changes introduced can reduce the risk previously assessed. It may involve repeating the process of hazard identification, risk assessment and risk control to confirm that OHS risks from a particular hazard have been controlled as far as is practicable. Where the evaluation of risk control measures reveals some remaining risk, the process continues.

**Monitoring:** Monitoring process consists of maintaining the control measures; the effectiveness of the control measures must be monitored on a regular basis.

### *Identify the hazards*

Hazards in the workplace can be identified in a number of ways:

- **Inspections -** Workplace inspections provide a system of recognizing and correcting hazardous conditions
- **Site Walk -** Walk around workplace and look at what could reasonably be expected to cause harm
- **Consult to the employees** – Department chiefs or managers can help identifying particular hazards that may occur during performance of a specific job or task

- **Use manufacturers' instructions -** Check manufacturers' instructions or data sheets for chemicals/equipment and machineries
- **Examine past accident and ill-health records** – Incidents/accidents and ill-health data can help to identify hazards
- **JHA for specific jobs or tasks -** JSAs assist in identifying particular hazards that may occur during performance of a specific job or task
- **Measurements** – Conduct Industrial Hygiene measurement to identify hazards in work places

Hazard Factors can be classified based on below categories but not limited to:

- Physical Factors
  - Vibration
  - Noise
  - Insufficient ventilation
- Chemical Factors
  - Toxic gasses
  - Carcinogenic substances/dust
  - Radiation
- Biological Factors
  - Bacteria
  - Virus
- Mechanical Factors
  - Slip/fall
  - Struck
- Ergonomic Factors
  - Insufficient space to move
  - Posture
  - Machine design/placement
- Psychological Factors
  - Work load
  - Stress (work/home)
  - Treadmill

## *Decide who might be harmed and how*

After identifying the hazards decide who might be harmed. The people who might be harmed listed but not limited to followings;

- Office staff
- Maintenance Personnel
- Contractors
- People sharing the workplace
- Operators
- Cleaners
- Interns
- Visitors
- Members of the public
- Staff with disabilities and students
- Inexperienced staff
- Technicians

## *Assess the Risk*

Whenever a hazard is identified, assess the risk by asking two questions:

- how likely is it that the hazard could harm me or someone else?
- how badly could I or someone else be harmed?

The risk is evaluated/assessed by looking at the probability of the hazard giving rise to problems and the consequent severity of that hazard, should it occur. Risk assessment can be done by using matrix structure given **as an example** below;

Risk Rating = Severity x Likelihood

**Table 98: Risk Matrix- Example**

| SEVERITY | Value | LIKELIHOOD | Value |
|---|---|---|---|
| Negligible<br>(No visible injury, no pain) | 1 | Very Unlikely<br>(Freak event – no known history) | 1 |
| Slight<br>(Minor cuts, bruises, no long-term effects) | 2 | Unlikely<br>(Unlikely sequence of events) | 2 |
| Moderate<br>(Heavy bruising, deep flesh wound, lost time accident) | 3 | Possible<br>(Foreseeable under unusual circumstances) | 3 |
| Severe<br>(Lost time accidents and major injuries (fractures) etc) | 4 | Likely<br>(Easily foreseeable, odd incidents may have occurred) | 4 |
| Very Severe<br>(Long-term disability or death) | 5 | Very Likely<br>(Common occurrence – aware of incidents) | 5 |

**Table 99: Risk Analyses/Priority of Action-Example**

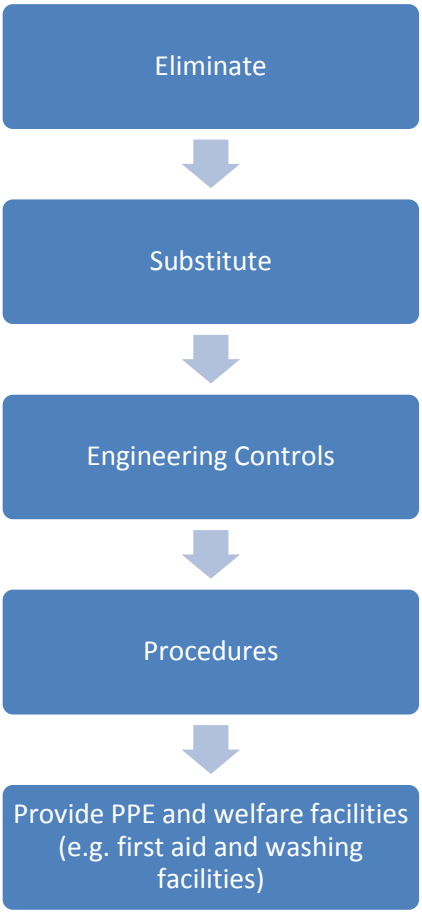
| SEVERITY | LIKELIHOOD | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |

| SEVERITY | LIKELIHOOD | | | | |
|---|---|---|---|---|---|
| 1 | Acceptable | Acceptable | Low | Low | Moderate |
| 2 | Acceptable | Low | Low | Moderate | High |
| 3 | Low | Low | Moderate | High | High |
| 4 | Low | Moderate | High | High | Immediate |
| 5 | Moderate | High | High | Immediate | Immediate |

A risk threshold value has to be defined and in all cases where there is a Risk Rating equal or higher than this threshold value, the Risk Assessment MUST contain details of additional actions which should be taken to control the risks to a lower and acceptable level.

## *Implement Measures*

Once the level of risk is determined, the control measures should reduce the risk to an acceptable or tolerable level. When deciding upon control measures, the Control Hierarchy principles should be applied in the following sequence;




## *Review risk assessment and update if necessary*

The process of identifying hazards, assessing risks and issuing HS procedures is a continuous process and have to be repeated/carried out every time significant changes to working conditions occurs or new working operations or new type of machineries are used for the Project purposes.

Risk assessment must be reviewed and renewed at once in every 2 year even there is no change in the conditions.

When a risk assessment is undertaken for a specific situation, results of the risk assessment, are to be shared with staff.

## 10.2 Major OHS Risks

### *Construction Phase*

The assessment process has to particularly address the following major OHS hazards typical for the construction activities (IFC EHS Guidelines - Construction and Decommissioning):

- **Over-exertion**, and ergonomic injuries and illnesses, such as repetitive motion, over-exertion, lifting and manual handling;
- **Slips and Falls** on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction materials, liquid spills, and uncontrolled use of electrical cords and ropes on the ground
- **Work in Heights**, falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures
- **Struck by Objects** related to the potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities
- **Exposure to dust** generated by various sources (traffic, tools, machinery)
- **Confined Spaces and Excavations** such as silos, vats, hoppers, utility vaults, tanks, sewers, pipes, and access shafts. Ditches and trenches
- **Moving Machinery** - Vehicle traffic and use of lifting equipment in the movement of machinery and materials on a construction site may pose temporary hazards, such as physical contact, spills, dust, emissions, and noise;
- **Exposure to chemicals, hazardous or flammable materials, and wastes** in a combination of liquid, solid, or gaseous forms.

In addition to above mentioned typical OHS hazards, the major OHS risks of the project during construction will be induced by the hazardous characteristics of the construction works including but not limited to;

- Trenching and Excavation
- Hot Work including welding operations
- Cutting and griding
- Use of electricity
- Use of hand tools
- Working with display screen equipment

The project will ensure, through management plans and the subcontractor management that the requirements, set out in the legislation listed in chapter 2 are in place during construction activities to control the construction OHS risks.

### *Operation Phase*

The operation of a hospital will include veery specific OHS hazards because of the specific characteristics of the activities performed by the hospital personnel. The major OHS risks of the operation of the hospital include, but not limited to the following:

- Chemical agents
- Biological agents
- Ergonomics
- Use of radiation devices
- Work equipment
- Fatigue
- Use of electricity
- Slips and Falls

The project will ensure, through management plans and operational procedures, that the requirements set in the legislation listed in chapter 2, are in place during operational activities to control OHS risks.

## 10.3 Major Environmental Risks

The assessment process has to particularly address the following major Environmental hazards typical for the construction activities (IFC EHS Guidelines - Construction and Decommissioning):

### *Construction Phase*

- **Noise and Vibration;** During construction and decommissioning activities, noise and vibration may be caused by the operation of pile drivers, earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people.
- **Soil Erosion;** Soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving, and excavation activities. The mobilization and transport of soil particles may, in turn, result in sedimentation of surface drainage networks, which may result in impacts to the quality of natural water systems and ultimately the biological systems that use these waters.
- **Air Quality;** Construction and decommissioning activities may generate emission of fugitive dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site.
- **Solid Waste;** Non-hazardous solid waste generated at construction and decommissioning sites includes excess fill materials from grading and excavation activities, scrap wood and metals, and small concrete spills. Other non-hazardous solid wastes include office, kitchen, and dormitory wastes when these types of operations are part of construction project activities. Hazardous solid waste includes contaminated soils, which could potentially be encountered on-site due to previous land use activities, or small amounts of machinery maintenance materials, such as oily rags, used oil filters, and used oil, as well as spill clean-up materials from oil and fuel spills.
- **Hazardous Material;** Construction and decommissioning activities may pose the potential for release of petroleum based products, such as lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. These materials may also be encountered during decommissioning activities in building components or industrial process equipment.

- **Wastewater Discharge;** Construction and decommissioning activities may include the generation of sanitary wastewater discharges in varying quantities depending on the number of workers involved.
- **Contaminated Land;** Land contamination may be encountered in sites under construction or decommissioning due to known or unknown historical releases of hazardous materials or oil, or due to the presence of abandoned infrastructure formerly used to store or handle these materials, including underground storage tanks.

***Operation Phase***

- **Wastewater Discharge;** Operation activities may include the generation of sanitary wastewater discharges in varying quantities depending on the number of consumers in the facilities.
- **Solid Waste;** Non-hazardous solid waste generated at operation includes include office, kitchen, and packaging wastes. Hazardous solid waste includes chemically contaminated waste materials, medical wastes.
- **Hazardous Material;** Operation of the hospital will include use of hazardous materials such as chemicals and radioactive material.

The mitigations proposed to minimise the levels of these risks are described in the above sections of this document; specifically Chapter 9.

The project will also develop management plans for the management and control if these risks throughout the project life-cycle.

## 10.4 OHS PLAN

The OHS Plan defines the minimum requirements for executing the works in line with all applicable occupational Health and Safety requirements during the Site construction and operation activities.

The overall objectives in implementing the OHS Management System are to:

- Require personal responsibility and accountability for OHS management.
- Incorporate the relevant OHS regulations and good industry practices into work processes for office, engineering, and project/site (field) activities.
- Provide effective training, efficient communication, and continuous performance review within the OHS Management System.
- Establish and monitor OHS performance targets for all workplaces, by the using appropriate tools such as audits, inspections, risk assessment, Job Hazard Analyses (JHAs).

The minimum topics that OHS Plan must include, but not limited to, given in the below sections;

- **OHS Organization;** Described Environmental, Health, Safety and Social responsibilities.
- **OHS Monitoring;** Including details of self-monitoring and subcontractor monitoring activities.
- **Communications;** Including detail of communication protocols of HSE Instrucions with the employees.
- **Hazard and Risk Identification;** Detailed in Section 10.1
- **OHS Work Procedures**; Produced Health and Safety Procedures for each task to address as a minimum the hazards identified for the works to be performed and the risks associated with each of task (detailed information given in Section 10.4.1).

- **Employee Well-fare;** Welfare, health and safety aspects related to the accommodation of workers in the accommodation camps.
- **Training;** Identification of the training requirements and minimum training needs including initial orientation training.
- **Audits and Inspections;** Including identification of the planned audit and inspection methodology.
- **Contractor Selection;** Identification of the Project contractors' selection requirements including the HSE performance criteria.
- **Accident and Incident Management;** Identification of the accident and incident reporting methodology.
- **Emergency Response;** Described emergency response preparedness requirements.

### 10.4.1 OHS Procedures

Health and Safety Procedures should be produced for each OHS critical task to address as a minimum the hazards identified for the works to be performed. The risks associated with each of task should be addressed through the means of a work procedure.

A minimum list of OHS procedure and work instruction to be prepared and related regulation is provided below (the need for additional OHS procedures and work instruction is likely to arise from the risk assessments):

**Table 100: Indicative list of procedures/policies/work instruction**

| Procedures/Policies/Instructions | Regulation | Phase of the project |
|---|---|---|
| Training and Orientation | ■ Occupational Health and Safety Law - No:6331 (Official Gazette No: 28339, 30.06.2012)<br>■ Regulation on Procedures and Principles of Health and Safety Training for Employees (Official Gazette No: 28648, 15.05.2013) | Construction and operation |
| Risk Assessment | ■ Occupational Health and Safety Law - No:6331 (Official Gazette No: 28339, 30.06.2012)<br>■ Regulation on Health and Safety Risk Assessment (Official Gazette No: 28512, 29.12.2012) | Construction and operation |
| Personal Protective Equipment | ■ Occupational Health and Safety Law - No:6331 (Official Gazette No: 28339, 30.06.2012)<br>■ Regulation on Personnel Protective Equipment Regulation (Official Gazette No: 26361, 29.11.2006)<br>■ Regulation on Use of Personnel Protective Equipment in Workplaces (Official Gazette No: 28695, 02.07.2013) | Construction and operation |
| Emergency Preparedness (Including firefighting and first aid) | ■ Occupational Health and Safety Law - No:6331 (Official Gazette No: 28339, 30.06.2012) | Construction and operation |

| Procedures/Policies/Instructions | Regulation | Phase of the project |
|---|---|---|
| | ■ First Aid Regulation (Official Gazette No: 24762, 22.05.2002) | |
| Hot Work (welding, cutting, burning) | ■ Occupational Health and Safety Law - No:6331 (Official Gazette No: 28339, 30.06.2012)<br>■ Regulation on Health and Safety Risk Assessment (Official Gazette No: 28512, 29.12.2012<br>■ Regulation on Health and Safety at Construction Sites (Official Gazette No: 28786, 05.10.2013) | Construction and operation |
| Working at Height/Fall Protection (including scaffolding) | ■ Regulation on Health and Safety at Construction Sites (Official Gazette No: 28786, 05.10.2013) | Construction and operation |
| Working with display screen equipment | ■ Regulation on Safety and Health Requirements Working With Display Screen Equipment (Official Gazette No: 28620, 16.04.2013) | Operation (limited applicability during construction for office works) |
| Incident/Accident Reporting and Investigation | ■ Social Security and General Health Insurance Law No:5510 (Official Gazette No: 26200, 16.06.2006)<br>■ Occupational Health and Safety Law - No:6331 (Official Gazette No: 28339, 30.06.2012)<br>■ Regulation on Health and Safety Risk Assessment (Official Gazette No: 28512, 29.12.2012) | Construction and Operation |
| Confined Space Entry | ■ Occupational Health and Safety Law - No:6331 (Official Gazette No: 28339, 30.06.2012)<br>■ Regulation on Health and Safety Risk Assessment (Official Gazette No: 28512, 29.12.2012) | Mainly construction; limited applicability during operation |
| Manual Handling | ■ Regulation on Manual Handling (Official Gazette No: 28717, 24.07.2013) | Construction and operation |
| Working Equipment | ■ Regulation on Health and Safety Conditions of Work Equipment (Official Gazette No: 28628, 25.04.2013)<br>■ Regulation on Health and Safety at Construction Sites (Official Gazette No: 28786, 05.10.2013) | Construction and operation |
| Excavation and erection | ■ Regulation on Health and Safety at Construction Sites (Official Gazette No: 28786, 05.10.2013) | Construction |

| Procedures/Policies/Instructions | Regulation | Phase of the project |
|---|---|---|
| Lifting | ■ Regulation on Health and Safety at Construction Sites (Official Gazette No: 28786, 05.10.2013) | Construction and Limited applicability during operation |
| Exposure to noise | ■ Regulation on Prevention of Workers from Risks Created from Noise (Official Gazette No: 28721, 28.07.2013) | Construction and operation |
| Exposure to dust | ■ Regulation on Management of Dust (Official Gazette No: 28812, 05.11.2013) | Construction and operation |
| Exposure to vibration | ■ Regulation on Prevention of Workers from Risks Created from Vibration (Official Gazette No: 28743, 22.08.2013) | Construction and operation |
| Working with chemicals | ■ Regulation on Health and Safety Precautions Regarding Working with Chemicals (Official Gazette No: 28733, 12.08.2013) | Construction and operation |
| Working with radioactive substances | ■ Regulation on Radiation Safety (Official Gazette No: 23999, 24.03.2000)<br>■ Regulation on the Exposure Limits and Working Conditions for the Personal with Ionizing Radiation at Health Care Facilities (Official Gazette No: 28344, 05.07.2012) | Operation |
| Biological Exposure | ■ Regulations on the Prevention of Biological Exposure Risks (Official Gazette No: 28678, 15.06.2013) | Operation |

# Report Signature Page

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| Sibel Gülen/Caner Şahin | Meryem Tekol Pelenk |
| Project Manager/Environmental Engineer | Managing Director |

ET/CS/GA/ES/SG

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| | |
|---|---|
| Africa | + 27 11 254 4800 |
| Asia | + 86 21 6258 5522 |
| Australasia | + 61 3 8862 3500 |
| Europe | + 356 21 42 30 20 |
| North America | + 1 800 275 3281 |
| South America | + 56 2 2616 2000 |

solutions@golder.com
www.golder.com

**Golder Associates (Turkey) Ltd. Co.**
**Hollanda Cad. 691. Sok. Vadi Sit. No:4**
**Yıldız 06550 Ankara**
**Turkey**
**T: +90 312 4410031**
**F: +90 312 4410714**


Golder Associates