



May, 2016

## İZMİR BAYRAKLI INTEGRATED HEALTH CAMPUS PROJECT

# Environmental and Social Assessment - Final

**Submitted to:**

İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş.

REPORT



Report Number 1451310053





## Record of Issue

Company	Client Contact	Version	Date Issued	Method of Delivery
İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş.	Mesut Doğan	Main_ESIA_İzmirBayraklı	June, 2015	Mail
İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş.	Mesut Doğan	Main_ESA_İzmirBayraklı_Draft_V02	June, 2015	Mail
İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş.	Mesut Doğan	Main_ESA_İzmirBayraklı_Final_V03	14 January, 2016	Mail
İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş.	Mesut Doğan	Main_ESA_İzmirBayraklı_Final_Final_V04	26 January, 2016	Mail
İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş.	Mesut Doğan	Main_ESA_İzmirBayraklı_Final_Final_V05	12 May, 2016	Mail



## Executive Summary

### Introduction

Health Services Transformation Program has been initiated by MoH in 2003 for with the purpose of extending the access to health services and increasing the number of health personnel per capita. Under the scope of this program 29 health regions were defined for 81 provinces. The aim for defining the health regions were to provide high quality health services to the citizens in these regions. The MoH is planning to build 30 health campuses with different bed capacities in 22 cities within this program.

Being one of these campuses, the purpose of the İzmir Bayraklı Integrated Health Campus Project (IHC) is to improve the quality of healthcare services and the number of beds by constructing a new healthcare facility in İzmir. When completed, the Project will provide high-quality healthcare services for the residents of İzmir and the surrounding settlements.

İzmir Bayraklı Integrated Health Campus Project is located in İzmir Province, Bayraklı District, near the Bayraklı Tunnels. Access to the Project Site is provided by the E87 (O-30) Highway, Bayraklı Exit. The Health campus area is a green field area and is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area"



### Project Location and surroundings

Izmir Bayraklı Integrated Healthcare Campus will be constructed over a 622,530 m<sup>2</sup> land consisting of several hospitals with a total enclosed area of 573,546 m<sup>2</sup> and bed capacity of 2,060. The health campus is going to include 3 hospitals which are: the Main (General) Hospital, the Physical Therapy and Rehabilitation Hospital and the High Security Forensic Rehabilitation Hospital.



The findings of the scoping and screening phase of the Project and potential environmental and social impacts and risks of the projects were identified during that phase the project is categorised as B in accordance with IFC Sustainability Framework, EBRD Environmental and Social Policy and OPIC Environmental and Social Statement. Some of the findings are:

- There are no identified cultural heritage and biodiversity concerns within the Project Area of influence
- The Project is located in the vicinity of already existing infrastructure facilities
- The Project is away from the densely populated areas

Moreover, some of identified impacts and risks are: its being site specific, readily identifiable and largely reversible (see Section 1.3)

İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. retained Golder Associates Turkey Ltd. Şti. ("Golder") to prepare the Environmental and Social Impact Assessment ("ESA") for the İzmir Bayraklı Integrated Health Campus Project ("Project") in compliance with the national and international requirements.

### **Land use**

The approximately 62.3 ha of the land where the Project will be realized is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area in the 1/5,000 scaled Master Plan. The MoH obtained consent from the former owner and the MoEU to use the site.

In the Project area the vegetation is characterized by low Mediterranean sclerophyllus shrubland (maquis) more or less heavily grazed and interrupted by many rock outcrops. There is no housing and no ongoing industrial or agricultural activity at the project site. There has been occasional grazing at the project site.

### **Environmental and Social Assessment**

An ESA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; and includes the process of mitigating and managing adverse environmental and social impacts throughout project implementation.

ESA takes into account the natural environment, community health and safety, and social aspects in an integrated way.

The overall objectives for an ESA will include:

- Identification and assessment of social and environmental impacts, both adverse and beneficial, in the Project's area of influence;
- Evaluation of the main environmental and social risks and potential impacts of the Project;
- Presentation of Environmental and Social Management Plan (ESMP), Environmental and Social Management System (ESMS), Stakeholder Engagement documentation, and Grievance Mechanism against the Applicable Standards;
- Description of the management, mitigation, monitoring and compensation measures, including the ESMS, the ESMP, and the thematic action or management plans (e.g. corrective action plan, resettlement action plan);
- Cumulative impact assessment;
- Assessment of associated facilities.

Environmental and Social Assessment as presented in this report was performed for key issues for each Environmental and Social component. The 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 significant potential effects;
- Analysis and characterization of residual effects; and
- As necessary, identification of monitoring to evaluate and track performance.

The ESA used the following tools and procedures to analyse and address potential effects: conditions;

- Predictive tools (calculations, models) and methods to quantitatively and qualitatively describe future environmental and socioeconomic conditions;
- Quantitative and qualitative information on the existing baseline environmental and socioeconomic of potential effects, including reference to management objectives, baseline conditions and the views of the proponent and stakeholders; and
- Characterization of potential residual effects after mitigation and their consequences for people and the environment.

Detailed information related to assessment methodology is defined in Appendix J and Section 1.4.

### ***Assessment of Alternatives***

No analyses of alternatives with respect to location have been performed. The project land where the Project will be realized is the property of the Treasury, and was allocated to the Ministry of Health upon designation as a "Health Campus Area in the 1/5,000 scaled Master Plan. The MoH obtained consent from the former owner and the MoEU to use the site

The designated location has advantages of being close to already developed areas with civil infrastructure and access possibilities from immediate or regional surroundings.

The Project will utilize highly advanced medical devices and facilities and will meet the health requirements of Izmir province and its nearby surroundings.

A portion of the power for the project during operation will be supplied through a trigeneration plant. The selected gas turbines for the trigeneration plant will be supporting the efficient use of energy resources for the project.

### ***Stakeholder Engagement***

A specific Stakeholder Engagement Plan has been prepared for the project. The overall objectives of the Stakeholder Engagement Plan are:

- Continuously informing the local community about the Project-related development activities;
- Ensuring that the local community is informed about the hazards associated with construction, operation activities of the Project and mitigation measures implemented to reduce impacts where possible;
- Minimizing potential disputes between Contractor's and Subcontractors' and the local community;
- Incorporating local knowledge during the entire Project life cycle, by taking into account bottom up information and feedback provided by local communities; and
- Timely and effectively responding to community concerns regarding the issues such as employment of the local workforce reserve in the construction and operation phases, disruption to daily activities, safety issues, disturbances due to noise or dust, and other environmental and social issues.

A Grievance Mechanism has been set up for communities and individuals to formally communicate their concerns, complaints and grievances to the company and facilitate resolutions that are mutually acceptable by the parties.

The identified project stakeholder categories are;



- Governmental authorities at the national, regional and local levels;
- Multi-national and international organizations (i.e. World Bank Group, EBRD, bilateral donors, etc.);
- Non-commercial, non-governmental and public organizations at the international, national, regional and local levels,
- Interest groups, such as universities and their foundations, cooperatives, local business establishments, business associations, chambers of commerce, hospitals, schools and others (i.e., labour, youth, religious, businesses, etc.);
- Local communities;
- Patients and patient families;
- Local businesses and potential Project contractors and suppliers;
- Project, contractor and subcontractor employees; and
- Media;
- Directly affected community members (living nearby the Project area, patients, hospital employees, visitors etc.)

The SEP is a working document that will be revised during the development of the Project.

A public consultation meeting was conducted in İzmir on 29<sup>th</sup> of May, 2015.

The main output of these activities can be summarised as;

- There is positive perception of the project being a public service infrastructure
- The project would benefit from improvement of existing transportation routes.
- Arrangements should be in place for minimising the social and environmental disturbance to nearby Laka Village during construction activities
- The project is expected to provide employment opportunity to the community members
- An increase in the real estate prices in Laka Village is expected



**Public Consultation Meeting**

### ***Baseline Data Collection***

As a key step in the ESA process; various studies have been conducted to collect information on the existing environmental and social baseline conditions. Apart from the desktop and relevant literature review the following activities were performed for the collection of social and environmental baseline data.

- For social baseline; qualitative baseline information was collected through key informant interviews, community level interviews and focus group discussions
- Air, soil and water quality measurement campaigns were conducted,
- Ambient noise measurements were done at selected points in the project area and surroundings
- Traffic count study was done on the possible approach routes to the project area.
- Site visit was performed for identification of biodiversity concerns
- It is expected that the regional groundwater level is deeper than 55 m. However; it is expected that localized perched groundwater and groundwater originating from fractures may be encountered at the Project Area during rainy seasons.



**Baseline Data Collection Activities**

**IMPACT ASSESSMENT RESULTS**

Main features of Current Situation	Potential impacts	Mitigation Measures
<b>Geology and Seismology</b>		
<p>The project area is in 1<sup>st</sup> degree earthquake zone.</p>	<p>Changes in the local morphology due to the earthworks and excavation during construction.</p> <p>Impacts of seismologic activities on the facilities.</p>	<p>Compliance of design with the provisions of the "Regulation on the Buildings to be Constructed on Earthquake Zones" (06.03.2007 O.G. No: 26454).</p>
<b>Soils</b>		
<p>The project area is a green field and no contamination has been observed in the boundaries of the project area.</p>	<p>The top soil and lower soil removal.</p> <p>Occupation of land, increase of artificial land use and discharge of wastewater.</p> <p>Potential contamination of soil as a result of accidental spills, storage of hazardous material and waste at site.</p>	<p>Removed topsoil will be stored in an appropriate area in the Project Area, to be used for landscaping after the construction.</p> <p>Prevention of leaks and spills.</p> <p>Spill response arrangements.</p>
<b>Hydrogeology and Groundwater Quality</b>		
<p>It is expected that the regional groundwater level is deeper than 55 m. However; it is expected that localized perched groundwater and groundwater originating from fractures may be</p>	<p>Hydrogeological change and potential groundwater pollution due to uncontrolled release of contaminants onto the ground.</p>	<p>Prevention of leaks and spills.</p>



Main features of Current Situation	Potential impacts	Mitigation Measures
encountered at the Project Area during rainy seasons.		

**Hydrology and Surface Water Quality**

<p>One small creek (Laka Creek) was observed within the Laka Village. The creek is 100 m of the Project Area.</p> <p>There is contamination observed in Laka Creek due to impacts from the anthropogenic and livestock activities.</p>	<p>Surface water pollution.</p> <p>Sediment pollution.</p>	<p>Engineering and design practices will be in place for the collection and disposal of wastewater from all sources during construction and operation of the project.</p> <p>The disposal of radioactive effluents during operation will be in line with the IFC/EBRD requirements defined for healthcare facilities.</p>
--	--	---

**Air Quality**

<p>PM<sub>10</sub>, settled dust and SO<sub>2</sub>&amp;NO<sub>2</sub> measurement values at and around project site comply with limit values from NO<sub>2</sub> values for two locations due to the heavy vehicular traffic on the stabilised road during the measurement period</p>	<p>Calculations on the estimated amount of air emissions during construction indicate no significant contribution to the ambient air quality.</p> <p>Air dispersion modelling shows that there will be only incremental addition of air pollutions to the ambient air quality pollutant levels.</p>	<p>Measures will be in place to minimise the air emissions during construction.</p> <p>Monitoring systems will be in place for the air emissions from the facility to be in compliance with regulatory requirements applicable to the project.</p> <p>A programme will be in place for the monitoring of NO<sub>2</sub> levels where the background NO<sub>2</sub> levels are in exceedance of limit values.</p>
--	---	--

**Noise**

<p>During the baseline studies except at a few locations close to road traffic, the measured ambient noise levels were recorded to be in in compliant with the standards.</p>	<p>Noise modelling shows the construction activities will not create additional noise values higher than the regulatory limit.</p> <p>As compared to the construction phase model results, operation phase noise level in the surroundings will be much lower and no exceedances in relation applicable standards are expected for the ambient noise levels.</p>	<p>Engineering controls.</p> <p>Limited construction works during night and weekends.</p>
---	--	---

**Traffic**

<p>The main existing access road that was assessed for the Project Site is the highway O-30 which runs along the south border,</p>	<p>During construction phase impacts will be mainly</p>	<p>Scheduling of traffic to avoid peak hours on local roads.</p>
--	---	--





Main features of Current Situation	Potential impacts	Mitigation Measures
<p>separating the Project area from the Bayraklı District.</p> <p>There is a service road which allows drivers to change the direction. The access to the Project would be from this service road..</p>	<p>associated with the increased road traffic.</p> <p>The land traffic in the operation phase will be generated by the transportation of personnel, patients and visitors to Bayraklı IHC.</p>	<p>Adopting best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public.</p> <p>Adopting traffic control and operations devices and emphasizing safety aspects among project drivers.</p> <p>Regular maintenance of vehicles should be undertaken to ensure that vehicles are safe and emissions and noise are minimized.</p>

**Biological Components**

<p>No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) were observed in the area.</p>	<p>The presence of the facilities will cause a loss of potential habitat for flora and fauna species within the project footprint during operation.</p>	<p>Project footprint will be minimized to the smallest extent possible in order to meet and support the Project works and activities.</p> <p>Inadvertent disturbance to the adjacent vegetated areas will be avoided through clear demarcation of the Project Site boundaries.</p>
---	---	--

**Social Components**

<p>□The project site is bounded by two settlement areas with different demographic and socioeconomics characteristics. Bayraklı District is a highly populated urban area whereas Laka –Village is a less populated area with rural characteristics</p> <p>The main economic activity in Bayraklı District is trading and small sized business whereas the main economic activity in Laka Village is agriculture and husbandry.</p> <p>Unemployment is specified as a concern at the interviews conducted with stakeholders during site data collection activities.</p>	<p>*The need of workforce that can be considered a positive impact.</p> <p>**Increased traffic and transportation requirements.</p> <p>***Community health and safety concerns in relation to Project construction and operation.</p>	<p>***A continuous stakeholder engagement process and grievance mechanism will be in place</p> <ul style="list-style-type: none"> <li>• to exchange information on the project with the local community and other stakeholder and</li> <li>• to record and respond any complaints and concerns raised by the local community members and other stakeholders</li> </ul> <p>*Maximising of local employment and procurement in order to increase the positive socio-economic impact of the project on the local community.</p> <p>***Coordination with the local community for the arrangements of accommodation and establishment of the construction camps.</p>
---	---	---



Main features of Current Situation	Potential impacts	Mitigation Measures
<p>There is not an educational or health services facility in the direct impact area of the project.</p> <p>Though public transportation network is fairly developed in İzmir and Bayraklı direct access to Laka village is only by bus.</p> <p>Other infrastructure; electricity network, communication, water and wastewater is available in Laka Village</p> <p>There is already a management system for the disposal of medical wastes in İzmir.</p> <p>No movable or immovable cultural assets have been identified within the project area.</p>		<p>** , ***Cooperation with local authorities and local community members on minimising the potential negative impacts of the project on animal husbandry in Laka village through measures such as but not limited to;</p> <ul style="list-style-type: none"> <li>• not disturbing the access routes of the buyers of food of animal origin to Laka Village</li> <li>• locating construction camp away from animal feedstock barns;</li> <li>• scheduling and planning of construction activities in such a way that nuisance to the animal feedstock is minimised ;</li> </ul> <p>***Local waste management authorities will be contacted to ensure the allocation of existing municipality resources and structures for the construction waste management.</p> <p>**A detailed traffic study will be performed to identify the best transportation routes with minimum impact on the existing traffic load and suggesting measures to improve the accessibility to Bayraklı IHC during operation.</p> <p>***Coordination with the local authorities to confirm the utilisation of existing medical waste disposal facility for the operational medical wastes.</p>

**Environmental and Social Management System**

The Environmental and Social Management System (ESMS) is required to ensure that the Project:

- complies with all applicable Turkish legislation as well as relevant IFI guidelines provided in the ESA;
- implements Good International Industry Practices (GIIP) to minimize potential environmental and social impacts during the construction, operation and decommissioning phases;
- is executed in compliance with the commitments addressed in the ESA for the minimization of potential environmental and social impacts;



- works in accordance with high standards of safety;
- cares for the protection of own employees and public;
- promotes its policies through training, supervision, regular reviews and consultation;
- generate local socio-economic benefits by using local and regional labour forces;
- engages and communicates with the local community and other stakeholders through a stakeholder engagement programme.

The minimum requirements of an ESMS have been defined in order to mitigate the risks associated with;

- Environmental aspects
- Labour Issues
- Community Health & Safety aspects
- Stakeholder management and social aspects
- Provision of healthcare services
- Waste Management
- Operation of Forensic Hospital
- Patient Data Security
- Dual management of the Facility

The basic framework of ESMS has been described in this study for the general management issues and ESMS will be further developed as the project progresses.

### **Conclusion**

As a result of the Environmental and Social Impact Assessment Study the following conclusions have been driven:

- 1) A detailed traffic study is required to identify the best transportation routes with minimum impact on the existing traffic load.
- 2) Stay in contact with local authorities to provide input on any future planning of the road and transportation in line with the developments in the area and maximize the benefit from future transportation network developments in the region.
- 3) The community health and safety concerns are valid especially in relation to the Forensic Hospital. Continuous liaison is necessary with the local community members to manage the associated risks.
- 4) Continuous stakeholder engagement is necessary to manage the social risks of the project.
- 5)
- 6) The project will develop an Environmental and Social Management System in line with the minimum requirements that are defined as part of the ESA study.



## ACRNYMS AND ABBREVIATIONS

µg	Microgram
Aol	Area of Influence
CCHP	Combined Cooling Heat and Power
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CRA	Community Relation Assistant
CRO	Community Relation Officer
dBA	A-weighted decibels
DPSIR	Drivers-Pressures-State-Impact-Response
EA	Environmental Assessment
EBRD	European Bank for Reconstruction and Development
EEA	European Environmental Agency
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EPA	Environmental Protection Agency
EPFI	Equator Principles Financial Institutions
EPs	Equator Principles
ER	Environmental Representative
ESAP	Environmental and Social Action Plan
ESA	Environmental and Social Assessment
ESHS	Environmental Social Health and Safety
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
EU	European Union
GHGs	Greenhouse gases
GIIP	Good International Industry Practice
Golder	Golder Associates Turkey Ltd. Şti
GPLV	Generic Pollutant Limit Value
ha	Hectar
HCF	Healthcare Facilities
HP	Horse Power



hPa	Hecto Pascal
hr	Hour
HSE	Health, Safety and Environment
IBA	Important Bird area
ICU	Intensive Care Units
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
IZKA	İzmir Kalınma Ajansı
IZTO	İzmir Ticaret Odası
KBA	key biodiversity area
kg	Kilogram
kVA	Kilovolt Ampere
L	Liter
L&FS	Life and Fire Safety
L&FS	Life and Fire Safety
LDRP	Labour, Delivery, Recovery and Past-partum
Leq	Equivalent continuous sound level
LSA	Local Study Area
LV	Low voltage
m	Meter
mg	Milligram
ml	Milliliter
mm	Millimeter
MoEU	Ministry of Environment and Urbanization
MoH	Ministry of Health
MoJ	Ministry of Justice
MTA	Directorate of Mineral Research and Exploration
MV	Medium voltage
NGOs	Non-governmental organizations
NICU	New-born Intensive Care
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Nitrogen oxides
O.G.	Official Gazette
OECD	Organization for Economic Co-operation and Development





PDF	Project Description File
PDoeU	Provincial Directorate of Environment and Urbanization
PM	Particulate matter
PM <sub>10</sub>	Particulate matter with diameter less than or equal to 10 micron
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PRs	Performance Requirements
PS	Performance Standard
QA/QC	Quality Assurance/Quality Control
RSA	Regional Study Area
s	Second
SA	Study Area
SO <sub>2</sub>	Sulfur dioxide
SPV	Special Purpose Vehicle
SSA	Social Study Area
ToC	Table of Contents
TOX	Total organic halogens
TPH	Total petroleum hydrocarbons
TÜİK	Türkiye İstatistik Kurumu (Turkish Statistical Institute)
VEC	Valued environmental components
WHO	World Health Organization



## Table of Contents

<b>1.0 INTRODUCTION.....</b>	<b>1</b>
1.1 Background and objectives.....	1
1.2 Project Rationale .....	2
1.3 Project categorisation .....	7
1.4 Key steps in the ESA process.....	8
1.4.1 Screening & Scoping.....	8
1.4.2 Baseline data collection .....	8
1.4.3 Stakeholders engagement .....	8
1.4.4 Impact assessment .....	8
1.4.5 Identification of mitigation measures.....	9
1.4.6 Uncertainties .....	9
1.4.7 Study Limitations.....	9
1.4.8 Environmental and Social Management System.....	9
1.4.9 Environmental and Social Action Plan .....	9
1.5 Outline of the ESA report.....	10
<b>2.0 GUIDELINES AND PROCEDURES ACCORDING TO EBRD AND IFC.....</b>	<b>10</b>
<b>3.0 REGULATORY AND POLICY FRAMEWORK .....</b>	<b>13</b>
<b>4.0 PROJECT DESCRIPTION.....</b>	<b>16</b>
4.1 Project Area.....	16
4.1.1 Project Location .....	16
4.1.2 Land use .....	16
4.2 Project components .....	19
4.2.1 Trigeneration Plant.....	21
4.3 Construction phase.....	22
4.4 Operation phase .....	23
4.5 Waste Management.....	24
4.5.1 Water Use and Wastewater .....	24
4.5.2 Medical Wastes.....	25
4.6 General Facility Design Issues .....	26
4.7 Occupational Health and Safety .....	27
4.8 Accreditation.....	28



4.9 Decommissioning/Closure phase ..... 28

**5.0 ANALYSIS OF ALTERNATIVES..... 28**

5.1 No project option..... 29

5.2 Technological selection ..... 29

5.2.1 Medical Services and Technologies..... 29

5.2.2 Energy Efficiency ..... 30

5.2.3 Soil disposal during construction..... 30

5.3 Location selection ..... 30

**6.0 STAKEHOLDER ENGAGEMENT ..... 31**

6.1 Stakeholder engagement plan ..... 31

6.2 Stakeholder management activities realised ..... 31

6.3 Summary of stakeholder input ..... 33

**7.0 IMPACT ASSESSMENT METHODOLOGY ..... 34**

7.1 Identification of area of influence ..... 35

**8.0 ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE..... 37**

8.1 Physical components..... 37

8.1.1 Geology and Geomorphology ..... 37

8.1.1.1 Baseline..... 37

8.1.2 Seismology ..... 38

8.1.2.1 Baseline..... 38

8.1.3 Soil and Subsoil Characteristics..... 38

8.1.3.1 Baseline..... 39

8.1.4 Hydrology and Surface water quality..... 42

8.1.4.1 Baseline..... 42

8.1.5 Hydrogeology and Groundwater Quality ..... 45

8.1.5.1 Study area ..... 45

8.1.5.2 Baseline..... 45

8.1.6 Meteorology and Climatology..... 45

8.1.6.1 Baseline..... 45

8.1.7 Air Quality ..... 46

8.1.7.1 Baseline..... 46

8.1.8 Noise and Vibration..... 50

8.1.8.1 Baseline..... 51



8.1.9 Traffic and Infrastructure ..... 52

8.1.9.1 Methodology ..... 53

8.1.9.2 Baseline Results ..... 53

8.1.10 Conclusions ..... 54

8.2 Biological components ..... 55

8.2.6 Conclusions ..... 62

8.3 Social Components ..... 62

8.3.1 Socio-economic conditions and employment issues ..... 64

8.3.1.1 Economic Structure ..... 64

8.3.1.2 Conclusions ..... 65

8.3.2 Social Services and Facilities ..... 66

8.3.2.1 Education ..... 66

8.3.2.2 Health ..... 66

8.3.2.3 Conclusions ..... 67

8.3.3 Infrastructure ..... 67

8.3.3.1 Transportation ..... 67

8.3.3.2 Others ..... 70

8.3.3.3 Conclusions ..... 71

8.3.4 Land use ..... 71

8.3.5 Cultural Heritage ..... 72

8.3.5.1 Baseline Study Results ..... 73

8.3.5.2 Conclusions ..... 73

**9.0 IMPACT ASSESSMENT ..... 74**

9.1 Physical components ..... 74

9.1.1 Geology and Geomorphology ..... 74

9.1.1.1 Impact Analysis ..... 74

9.1.1.1.1 Construction phase ..... 74

9.1.1.1.2 Commissioning and operational phase ..... 75

9.1.1.1.3 Decommissioning/Closure phase ..... 75

9.1.1.2 Mitigation measures ..... 76

9.1.1.3 Residual Impacts ..... 76

9.1.1.4 Monitoring ..... 76

9.1.2 Soil and subsoil characteristics ..... 76



9.1.2.1 Impact Analysis..... 76

9.1.2.1.1 Construction phase ..... 76

9.1.2.1.2 Commissioning and operational phase ..... 77

9.1.2.1.3 Decommissioning/Closure phase ..... 77

9.1.2.2 Mitigation measures..... 78

9.1.2.3 Residual Impacts ..... 79

9.1.2.3.1 Construction phase ..... 79

9.1.2.4 Monitoring..... 80

9.1.3 Hydrology and Surface water quality..... 80

9.1.3.1 Impact Analysis..... 80

9.1.3.1.1 Construction phase ..... 80

9.1.3.1.2 Commissioning and operational phase ..... 81

9.1.3.1.3 Decommissioning/Closure phase ..... 82

9.1.3.2 Mitigation measures..... 82

9.1.3.3 Residual Impacts ..... 82

9.1.3.4 Monitoring..... 83

9.1.4 Hydrogeology and Groundwater Quality ..... 83

9.1.4.1 Impact Analysis..... 83

9.1.4.1.1 Construction phase ..... 83

9.1.4.1.2 Commissioning and operational phase ..... 84

9.1.4.1.3 Decommissioning/Closure phase ..... 84

9.1.4.2 Mitigation measures..... 84

9.1.4.3 Residual Impacts ..... 85

9.1.4.4 Monitoring..... 85

9.1.5 Meteorology and Climatology..... 86

9.1.5.1 Impact Analysis..... 86

9.1.5.1.1 Commissioning and operational phase ..... 86

9.1.6 Air Quality ..... 87

9.1.6.1 Impact Analysis..... 87

9.1.6.1.1 Construction phase ..... 88

9.1.6.1.2 Commissioning and operational phase ..... 89

9.1.6.1.3 Decommissioning/Closure phase ..... 90

9.1.6.2 Mitigation measures..... 90





9.1.6.3 Residual Impacts ..... 91

9.1.6.4 Monitoring ..... 91

9.1.7 Noise and Vibration ..... 91

9.1.7.1 Impact Analysis ..... 92

9.1.7.1.1 Construction phase ..... 92

9.1.7.1.2 Commissioning and operational phase ..... 92

9.1.7.1.3 Decommissioning/Closure phase ..... 92

9.1.7.2 Mitigation measures ..... 92

9.1.7.3 Residual Impacts ..... 93

9.1.7.3.1 Construction phase ..... 93

9.1.7.4 Monitoring ..... 93

9.1.8 Traffic and Infrastructure ..... 93

9.1.8.1 Impact Analysis ..... 93

9.1.8.1.1 Construction phase ..... 93

9.1.8.1.2 Commissioning and operational phase ..... 94

9.1.8.1.3 Decommissioning/Closure phase ..... 94

9.1.8.2 Mitigation measures ..... 94

9.1.8.3 Residual Impacts ..... 95

9.1.8.4 Monitoring ..... 95

9.2 Biological components ..... 95

9.3 Social Components ..... 102

9.3.1 Socio-economic conditions and employment issues ..... 102

9.3.1.1 Impact Analysis results on Project Affected People ..... 102

9.3.1.1.1 Construction phase ..... 102

9.3.1.1.2 Operational phase ..... 104

9.3.1.1.3 Decommissioning phase ..... 105

9.3.1.2 Mitigation measures ..... 105

9.3.1.3 Residual impacts ..... 106

9.3.1.4 Monitoring ..... 106

9.3.2 Social Services and Facilities ..... 107

9.3.2.1 Impact Analysis results ..... 107

9.3.2.1.1 Construction phase ..... 107

9.3.2.1.2 Operation phase ..... 107



9.3.2.2 Mitigation measures..... 107

9.3.2.3 Residual impacts ..... 107

9.3.2.4 Monitoring..... 107

9.3.3 Infrastructure..... 107

9.3.3.1 Impact Analysis results ..... 107

9.3.3.1.1 Construction Phase ..... 107

9.3.3.1.2 Operation Phase ..... 108

9.3.3.1.3 Decommissioning phase ..... 108

9.3.3.2 Mitigation measures..... 108

9.3.3.3 Residual impacts ..... 108

9.3.3.4 Monitoring..... 109

9.3.4 Cultural Heritage ..... 109

**10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)..... 109**

10.1 Environmental and Social Management System Structure ..... 110

10.2 Overall Environmental and Social Management System ..... 111

10.2.1 Organization - Roles and Responsibilities..... 111

10.2.2 Risk Assessment and Risk Register ..... 111

10.2.3 Training and Awareness ..... 111

10.2.4 Communication of Environmental and Social Issues ..... 112

10.2.5 Document and Record Controls ..... 112

10.2.6 Corrective Actions..... 112

10.2.7 Inspections and Audits ..... 112

10.2.8 Budget..... 112

10.3 Environmental and Social Management Plan ..... 112

10.3.1 Management Mechanism..... 112

10.3.2 Construction Phase..... 112

10.3.2.1 Contractor’s Environmental and Social Management ..... 112

Responsibilities of Contractors..... 112

Personnel and Resources ..... 113

Training and Communication ..... 113

Inspection and Audits..... 113

Event Management ..... 113

Emergency Response ..... 114



Progress Tracking and Reporting.....	114
Record Keeping.....	115
10.3.3 Operation Phase .....	115
10.4 Social Management Plan.....	115
10.4.1 Management Mechanism.....	115
10.4.2 Stakeholder Identification.....	115
10.4.3 Stakeholder Engagement.....	116
10.4.4 Grievance Mechanism .....	116
10.4.5 Monitoring and Reporting.....	117
10.5 Labour Issues and Health & Safety Management Plan .....	117
10.5.1 Labour Conditions .....	117
10.5.2 Occupational Health and Safety.....	120
10.5.3 Community Health And Safety .....	120
10.5.3.1 Transportation related safety risks.....	121
10.5.3.2 Waste management related health risks.....	121
10.5.3.3 Management of Camp and Construction Site .....	122
10.5.3.4 Infrastructure, building, and equipment design and safety.....	122
10.5.3.5 Risks induced through provision of health care services .....	123
10.6 Treatment of Patients .....	123
10.6.1 Dual Management.....	123
10.6.2 Patient Data Security .....	125
10.6.3 Forensic Hospital Services.....	127
<b>11.0 CUMULATIVE IMPACTS.....</b>	<b>128</b>
<b>12.0 CONCLUSION .....</b>	<b>131</b>
Pre-construction Phase.....	<b>Hata! Yer işareti tanımlanmamış.</b>
Construction Phase.....	<b>Hata! Yer işareti tanımlanmamış.</b>
Operational Phase .....	<b>Hata! Yer işareti tanımlanmamış.</b>
<b>TABLES</b>	
Table 1: Bed Occupancy Rate (%) in the Hospitals in İzmir Province .....	5
Table 2: Number of Health Personnel in İzmir Province.....	6
Table 3: Health Indicators for İzmir Province.....	6
Table 4: Project Categorisation .....	7
Table 5: Compliance Table Summary .....	10



Table 6: Bed Capacity of the İzmir Bayraklı Integrated Health Campus based on project information available at this stage .....	19
Table 7: Closed Construction Areas (m2) of Project Components based on project information available at this stage .....	19
Table 8: Car Parking Lots.....	19
Table 9: Estimated Excavation Quantities (m3) .....	22
Table 10: Estimated Number of Personnel to be employed during the Operation Phase .....	24
Table 11 Medical Waste Management Methods of the Hospital Project .....	25
Table 12: Noise measurement points.....	50
Table 13: Turkish Ambient Noise Standards .....	52
Table 14: Ambient Noise Standards in IFC General EHS Guidelines .....	52
Table 15: area of each habitat type for the footprint area, the buffer area and the total LSA .....	56
Table 16 Infrastructure in Laka Village .....	71
Table 17: Residual impacts on geology and seismology components .....	76
Table 18: Residual impacts on soil component.....	79
Table 19: Residual impacts on hydrology component.....	82
Table 20: Residual impacts on the hydrogeology component.....	85
Table 21: Global Warming Potentials (100 Year Time Horizon, 1996 Intergovernmental Panel on Climate Change - IPCC) .....	86
Table 22: Cumulative Values of PM10 and Settled dust .....	88
Table 23: Annual Cumulative Values of SO2 and NO2.....	89
Table 24: Residual impacts on air quality component.....	91
Table 25: Residual impacts on noise component.....	93
Table 26: Residual impacts on traffic component.....	95
Table 27: Residual impacts on flora and vegetation.....	97
Table 28: Residual impacts on fauna .....	99
Table 29: Habitat types within the footprint, buffer and their sum (total LSA).....	100
Table 30: Residual impacts on fauna component .....	101
Table 31 Planned employment numbers.....	104
Table 32: Main features of Active Faults in İzmir Region .....	148
Table 33: The List of Historical Earthquakes in İzmir Region .....	150
Table 34: The List of 20 <sup>th</sup> and 21 <sup>st</sup> Century Earthquakes in İzmir Region .....	151
Table 35: Land Use Classification for İzmir Province .....	152
Table 36: Land Use Capability Classification for İzmir Province .....	153
Table 37: Major Rivers within İzmir Province .....	156
Table 38: Groundwater Reserves in İzmir Province .....	157
Table 39: İzmir Meteorological Station - Normal Temperature Values (1960-2014).....	159



Table 40: İzmir Meteorological Station Precipitation Normals (1960-2014)..... 160

Table 41: İzmir Meteorological Station Relative Humidity Values ..... 161

Table 42: Local Pressure Values measured at İzmir Meteorological Station (hPa) (1960-2014) ..... 162

Table 43: Counted Days and Annual Average Values (1960-2014)..... 164

Table 44: Monthly number of winds at İzmir Meteorological Station ..... 167

Table 45: Seasonal and Annual numbers of wind in İzmir Meteorological Station ..... 167

Table 46: Monthly mean wind speed at İzmir Meteorological Station..... 170

Table 47: Matrix for physical components ..... 179

Table 48: Matrix for biological components..... 180

Table 49: Matrix for social components..... 181

Table 50: Matrix of physical components - Project Actions/Impact Factors..... 184

Table 51: Matrix of biological components - Project Actions/Impact Factors..... 186

Table 52: Matrix of social components – Project Actions/Impact Factors..... 188

Table 53: Impact assessment matrix for geology and geomorphology during construction phase after mitigation ..... 189

Table 54: Impact assessment matrix for soil and subsoil characteristics during construction phase after mitigation ..... 190

Table 55: Impact assessment matrix for soil and subsoil characteristics during commissioning and operational phase after mitigation ..... 192

Table 56: impact evaluation matrix for on hydrology and surface water quality component during construction phase after mitigation ..... 193

Table 57: impact evaluation matrix for on hydrology and surface water quality component during commissioning and operational phase after mitigation ..... 195

Table 58: impact evaluation matrix for on hydrogeology and groundwater quality component during construction phase after mitigation ..... 197

Table 59: impact evaluation matrix for on hydrogeology and groundwater quality component during commissioning and operational phase after mitigation ..... 198

Table 60: Impact assessment matrix for air quality during construction phase after mitigation ..... 200

Table 61: impact evaluation matrix for atmosphere component during operational phase after mitigation ..... 202

Table 62: Impact evaluation matrix for noise and vibration component during construction phase after mitigation ..... 203

Table 63: Impact assessment matrix for traffic and infrastructures during construction phase after mitigation ..... 205

Table 64: Impact assessment matrix for traffic and infrastructures during commissioning and operational phase after mitigation..... 206

Table 65: Impact evaluation matrix for terrestrial flora component during construction phase after mitigation..... 208

Table 66: Impact evaluation matrix for terrestrial flora component during operational phase after mitigation ..... 210

Table 67: Impact evaluation matrix for terrestrial fauna component during construction phase after mitigation..... 211

Table 68: Impact evaluation matrix for terrestrial fauna component during operational phase after mitigation ..... 213

Table 69: Impact evaluation matrix for habitat and biodiversity component during construction phase after mitigation ..... 214

Table 70: Impact evaluation matrix for habitat and biodiversity component during operational phase after mitigation ..... 216

Table 71: Impact evaluation matrix for protected areas component during construction phase after mitigation..... 218



Table 72: Relevant Turkish Regulations for the Hospital Project ..... 221

Table 73: Relevant European Regulations..... 224

Table 74: National Domestic Wastewater Discharge Standards ..... 235

Table 75: Ambient Air Quality Standards ..... 236

Table 76: Regulation on Control of Industrial Air Pollution Table 5.2. - Emission Limits for Facilities with Thermal Capacity Lower than 50 MW ..... 238

Table 77: Turkish Ambient Noise Limits Generated by Industrial Facilities ..... 238

Table 78: Turkish Ambient Noise Limits Generated by Construction Sites ..... 238

Table 79: Hospital Services Soil Quality Parameters and Generic Limits ..... 240

Table 80: The lithology obtained from borehole logs..... 244

Table 81: The lithology obtained from bore test pit logs ..... 249

Table 82: Soil Sampling Locations ..... 253

Table 83: The activity specific contamination indicator parameters ..... 253

Table 84: Comparison of the soil chemical analysis results with the Generic Pollutant Limit Values ..... 255

Table 85: Surface Water Sampling Locations ..... 256

Table 86: Surface Water Quality ..... 256

Table 87: PM<sub>10</sub>, Settled Dust and SO<sub>2</sub>&NO<sub>2</sub> Measurement Summary..... 257

Table 88: Background Noise Levels Observed at 15 Minutes Measurement Points ..... 259

Table 89: Background Noise Levels Observed at 24 Hours Measurement Points ..... 259

Table 90: list of vascular plant observed during the survey on the LSA ..... 260

Table 91: Amphibia (Amphibians) ..... 262

Table 92: Reptilia (Reptiles) ..... 263

Table 93: Aves (Birds)..... 264

Table 94: Mammalia (Mammals)..... 266

Table 95: Exhaust Emission Factors for Construction Equipment..... 270

Table 96: Exhaust Emission Values..... 271

Table 97: Total Dust Emissions..... 274

Table 98: Modelling Results ..... 276

Table 99: Settled Dust..... 276

Table 100: Fragmentation ..... 277

Table 101: Converted Concentrations..... 277

Table 102: Cumulative Values of PM10 and Settled dust ..... 277

Table 103: Stack Properties ..... 288

Table 104: Maximum NO<sub>2</sub>&SO<sub>2</sub> concentrations..... 288

Table 105: Annual Cumulative Values of SO<sub>2</sub> and NO<sub>2</sub>..... 289

Table 106: Expected Sound Levels of Machinery and Equipment to Be Used During Construction ..... 293

Table 107: Model Inputs..... 295



Table 108: Ambient Noise Limits of Turkish Legislation for Construction Sites.....	297
Table 109: Expected Sound Levels of Machinery and Equipment to Be Used During Construction .....	298
Table 110: Model Inputs.....	298

### FIGURES

Figure 1: Number of Beds per 10,000 People in İzmir Province (2007-2013).....	3
Figure 2: Hospital Beds in EU countries and EU-candidate countries per 1,000 population between the years 2000 and 2012 (if 2012 data is not available, the latest available data is considered) .....	4
Figure 3: Google Earth View of the Project Area.....	17
Figure 4: Preliminary Site Layout of İzmir Bayraklı Integrated Health Campus Project.....	18
Figure 5: Preliminary Man-Power Histogram.....	22
Figure 6 Area of Influence (Study Area).....	36
Figure 7: Land Use Profile of the Project Area .....	40
Figure 8: Soil Groups and Land Use Capability Classification of the Project Area.....	41
Figure 9: Measurement Locations .....	47
Figure 10: Locations of noise measurements points .....	51
Figure 11: Traffic routes .....	53
Figure 12: Vehicle Movements on O-30 Highway .....	54
Figure 15: Protected Areas .....	61
Figure 16: Maritime Services in İzmir Province-Bayraklı Port.....	68
Figure 17: Public railway transportation system .....	68
Figure 18: Bus services from Bayraklı to Laka Village-project site.....	69
Figure 19: Bus services from Salhane to Laka Village-project site.....	69
Figure 20: Figure 8: Bus services from Bornova to Laka Village-project site .....	70
Figure 21: Road network close to project site .....	70
Figure 22: Archaeological Team in the Project Area .....	73
Figure 23: Archaeological Sites in the Vicinity of the Project Area .....	73
Figure 24: Manpower Histogram for construction phase .....	103
Figure 25: The Location of the Urban Transformation Project Area and the Project Area .....	130
Figure 26: Location of Katip Çelebi University Campus in relation to the location of Bayraklı IHC.....	131
Figure 27: Simplified Geology Map of İzmir Region .....	143
Figure 28: Stratigraphic Columnar Section of İzmir Region.....	144
Figure 29: Simplified geological map depicting main basins on İzmir bay and Surroundings.....	146
Figure 30: Simplified map showing major structural elements of Western Anatolia .....	147
Figure 31: The Earthquake Zoning Map of İzmir Province .....	149
Figure 32: 20 <sup>th</sup> and 21 <sup>st</sup> Century Earthquakes (M $\geq$ 4.0) in İzmir Region .....	152
Figure 33: Land Use and Land Use Capability Classification for İzmir Province .....	154



Figure 34: Soil Groups in İzmir Province ..... 155

Figure 35: GW Levels in Gediz, Bakırçay and K.Menderes Basins ..... 158

Figure 36: Maximum Temperature Recorded at İzmir Meteorological Station ..... 159

Figure 37: Average Temperature Recorded at İzmir Meteorological Station ..... 160

Figure 38: Minimum Temperature Recorded at İzmir Meteorological Station ..... 160

Figure 41: İzmir Meteorological Station Average Relative Humidity Changes by Months ..... 162

Figure 42: İzmir Meteorological Station Local Average Pressure Changes by Months ..... 163

Figure 43: İzmir Meteorological Station Local Maximum Pressure Changes by Months ..... 163

Figure 44: İzmir Meteorological Station Local Minimum Pressure Changes by Months ..... 163

Figure 45: İzmir Meteorological Station. Distribution of Monthly Snow Days ..... 164

Figure 46: İzmir Meteorological Station. Distribution of Monthly Depth of Snow ..... 165

Figure 47: İzmir Meteorological Station. Distribution of Monthly Foggy Days ..... 165

Figure 48: İzmir Meteorological Station. Distribution of Monthly Hail Days ..... 165

Figure 49: İzmir Meteorological Station. Distribution of Monthly Frosty Days ..... 166

Figure 50: İzmir Meteorological Station. Distribution of Monthly Thunder-stormy Days ..... 166

Figure 52: Seasonal number of winds in İzmir Meteorological Station ..... 169

Figure 53: Annual number of winds at İzmir Meteorological Station ..... 169

Figure 54: Annual mean wind speed at İzmir Meteorological Station ..... 171

Figure 55: Aegean And Western Turkey Sclerophyllous and Mixed Forests ecoregion (Source: The Encyclopedia of Earth <http://www.eoearth.org/>) ..... 172

Figure 56: Soil and Surface Water Sampling Locations ..... 254

Figure 57: Quercus coccifera (top left), Calicoma villosa (top right), Asphodelus ramosus (bottom left), Anemone coronaria (bottom right) ..... 262

Figure 58: Annual number of winds at İzmir Meteorological Station ..... 275

Figure 59: Number of winds at year of 2005 İzmir Wind Number ..... 275

Figure 60: Controlled Annual ..... 279

Figure 61: Controlled Daily ..... 280

Figure 62: Controlled Settled Dust ..... 281

Figure 63: Uncontrolled Annual ..... 282

Figure 64: Uncontrolled Daily ..... 283

Figure 65: Uncontrolled Settled Dust ..... 284

Figure 66: Fragmentation Annual ..... 285

Figure 67: Fragmentation Daily ..... 286

Figure 68: Fragmentation Settled Dust ..... 287

Figure 69: NO<sub>2</sub> Annual ..... 290

Figure 70: NO<sub>2</sub> Hourly ..... 291

Figure 71: SO<sub>2</sub> Annual ..... 292





Figure 72: SO<sub>2</sub> Daily..... 293

**APPENDICES**

**APPENDIX A**

Traffic Study

**APPENDIX B**

Waste Management Plan

**APPENDIX C**

Forms and Questionnaires-Socioeconomic Survey

**APPENDIX D**

Site Photos

**APPENDIX E**

Stakeholder Engagement Plan

**APPENDIX F**

Public Consultation Meeting

**APPENDIX G**

Lab Results and Borehole and Testpits Logs

**APPENDIX H**

Regional Physical and Biological Baseline Characteristics

**APPENDIX I**

HSE Risk Register

**APPENDIX J**

Impact Assessment Methodology and Matrices

**APPENDIX K**

Regulatory Framework

**APPENDIX L**

Data Collected From Site

**APPENDIX M**

Air Quality and Noise Modelling

**APPENDIX N**

Environmental and Social Action Plan (ESAP)

**APPENDIX O**

Correspondences





## 1.0 INTRODUCTION

### 1.1 Background and objectives

İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. ("Client"), retained Golder Associates Turkey Ltd. Şti. ("Golder") to prepare the Environmental and Social Assessment ("ESA") for the İzmir Bayraklı Integrated Health Campus Project ("Project") in compliance with the national and international requirements.

İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. is a subsidiary of Gama-Türkerler and GE Joint Venture which is called "SPV".

This document represents the ESA report for the İzmir Bayraklı Integrated Health Campus Project. Before the preparation of this document a separate Scoping document was prepared in April 2015.

The Project is legally exempt from the requirement of an official Environmental Impact Assessment ("EIA") Process. However, in Turkey concrete plant(s) with the capacity of 100 m<sup>3</sup>/hr and above and Trigeration plant with the power capacity of 20 MWt and higher, are subject to the preparation of Project Description File ("PDF") in accordance with the Regulation on Environmental Impact Assessment (dated: November 25, 2014, Official Gazette No: 29186, Annex – II Article 18 and Article 44 of the Regulation, respectively).

A Trigeration plant will be installed as part of the Project to produce part of the power required for the operation of the facilities. The capacity of the unit will be 4 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 11.2 MWt (thermal power). The capacity is lower than the aforementioned criteria stated in the Regulation on Environmental Impact Assessment. Hence the Project is not subject to the preparation of PDF in relation to the Trigeration Plant.

There will not be concrete plant constructed under the scope of the Project. Needed concrete will be supplied from external concrete batching plants which are located close to the site, however there is a also possibility to construct a concrete batching plant with 90 m<sup>3</sup>/h capacity which in that case; there will not be requirement for preparing a single PDF.

If in the future during the construction works a requirement arises to increase the capacity of the concrete batching plant which will exceed 100 m<sup>3</sup>/hr, referring to the aforementioned Turkish EIA criteria, preparation of a single PDF will be necessary

Although the overall Project is legally exempt from the requirement of an official EIA Process, an ESA study, which will be based on the latest design data in accordance with the pertinent international regulations and guidelines including a comprehensive assessment of certain environmental and social issues, is required by the International Finance Institutions which are EBRD, OPIC and EDC.

The İzmir Bayraklı Integrated Health Campus Project ("IHC") is based on a Public - Private Partnership ("PPP") investment-finance model. The construction period (investment) is 3 years, whereas the operation will last for about 25 years. After 25 years of operation IHC will be transferred to the MoH. There will be a dual management system between the Ministry of Health ("MoH") and the Project Company in the campus. Under this system, The MoH will assign doctors, nurses and other clinical staff to the campus.

In the feasibility study conducted by the MoH, there is no information on the closure and capacity decrease of other hospitals located in İzmir An official response has been requested from MoH on the potential closure or capacity decrease of other hospitals.

The objectives of the ESA report are:

- Identification and assessment of social and environmental impacts, both adverse and beneficial, in the project's area of influence;
- Evaluation of the main environmental and social risks and potential impacts of the Project;



- Presentation of Environmental and Social Management Plan (ESMP), Environmental and Social Management System (ESMS), Stakeholder Engagement documentation, and grievance mechanism against the Applicable Standards;
- Description of the management, mitigation, monitoring and compensation measures, including the ESMS, the ESMP, and the thematic action or management plans (e.g. corrective action plan, resettlement action plan);
- Cumulative impact assessment (as required by the Applicable Standards);
- Assessment of associated facilities.

Main components of the assessment include:

- the potential environmental and social impacts of the Project throughout the full life cycle;
- a public consultation 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.

## 1.2 Project Rationale

The purpose of the İzmir Bayraklı Integrated Health Campus Project is to improve the quality of healthcare services and the number of beds by constructing a new healthcare facility in İzmir. When completed, the Project will provide high-quality healthcare services for the residents of İzmir and the surrounding settlements.

Health Services Transformation Program has been initiated by MoH in 2003 with the purpose of extending the access to health services and increasing the number of health personnel per capita. Under the scope of this program 29 health regions were defined for 81 provinces. The aim for defining the health regions was to provide high quality health services to the citizens in these regions. The MoH is planning to build 30 health campuses with different bed capacities in 22 cities within this program<sup>1</sup>.

İzmir has two Health Regions (20th and 21st Health Regions of Turkey), and the Project is in the 20th Health Region of Turkey which covers northern part of the İzmir, Manisa and Uşak provinces. İzmir is defined as a centre of the region because of the current health personnel number, health facilities, health services capacities, better transportation possibilities and the higher population.

The population of İzmir, according to the census carried out by the Turkish Statistical Institute in 2014 is 4,113,072. The universities in İzmir also attract many students and contribute to an increase of the population. Given an increasing population and the requirements for higher quality of services, new healthcare facilities are needed in İzmir.

Due to the increasing population of the İzmir Province, the need for healthcare services has increased. The present hospital infrastructure in the Province is relatively old and has not been recently upgraded. For example, the Urla State Hospital was built in 1958. It is not possible to expand the present hospital beds capacity since the hospital facilities are located in the central areas of the city with lack of adjacent building space, insufficient car parking capacity and green areas.

İzmir is the centre for health services for the neighbouring towns while the city provides healthcare for other provinces, as well. According to health data of the Turkish Statistical Institute for 2013, there are 59 hospitals in total in the İzmir Province. Of these, 29 hospitals are Ministerial, meaning that they are administered by the MoH, 4 are university hospitals, 24 are private hospitals, 90 are emergency service units (112) and 1138 are

<sup>1</sup> MoH, Planning Guide for Facilities Providing Inpatient Healthcare, June 2011



family practice centres. The total bed capacity in the İzmir province is 11,361. Of these, 6,188 of these beds are in the Ministerial hospitals. It is, thus recognized that a major part of the healthcare services is provided by the public sector. When the numbers are compared with the European Union (“EU”) countries and EU-candidate countries, Turkey has the lowest number of beds per 10,000 inhabitants. Nevertheless, the bed capacity per 10,000 inhabitants has increased over the years; however this number does not meet the EU requirements ( See Figure 2)

In order to close this gap and in the light of above discussion, existing health facilities in İzmir are inadequate for providing health care services, hence facilities located in less crowded part of the city, and providing higher quality services are necessary and new investments for healthcare facilities are needed. (see Figure 1).

After the implementation of the planned projects, the current bed capacity of the MoH will increase from 847 to 2,055 and the bed capacity ratio of İzmir province will become 30 beds for 10,000 individuals.

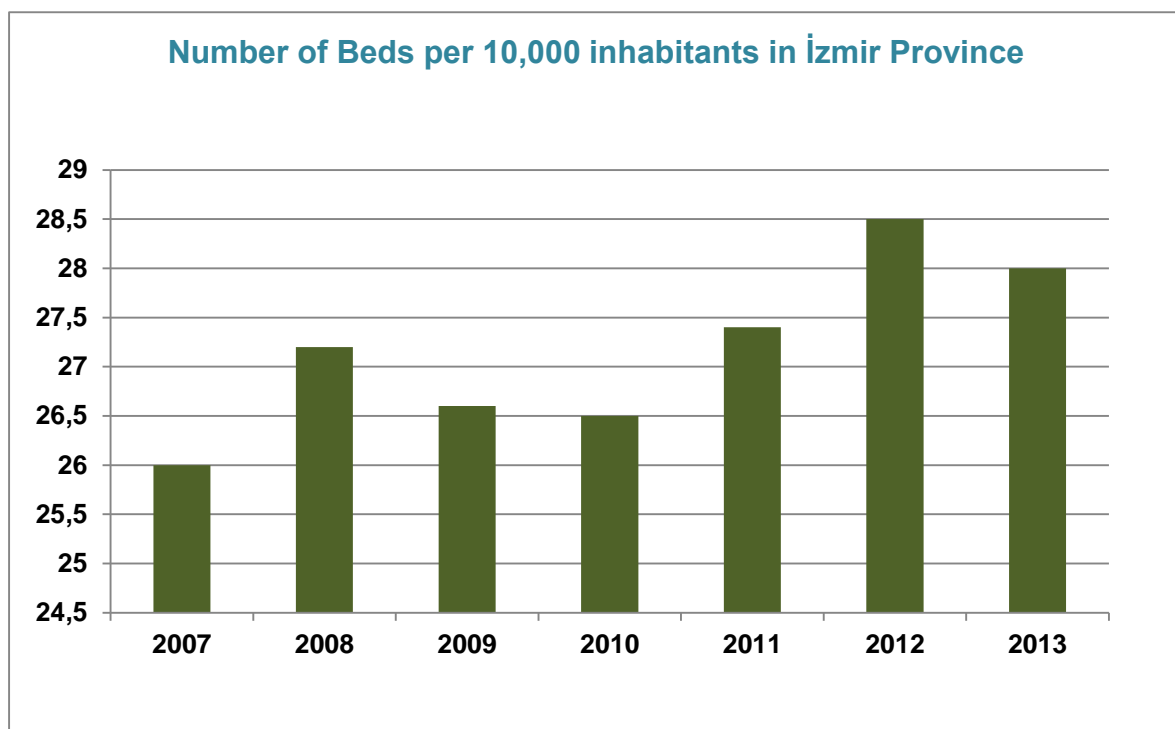


Figure 1: Number of Beds per 10,000 People in İzmir Province (2007-2013)<sup>2</sup>

<sup>2</sup> Turkish Statistical Institute, 2015



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

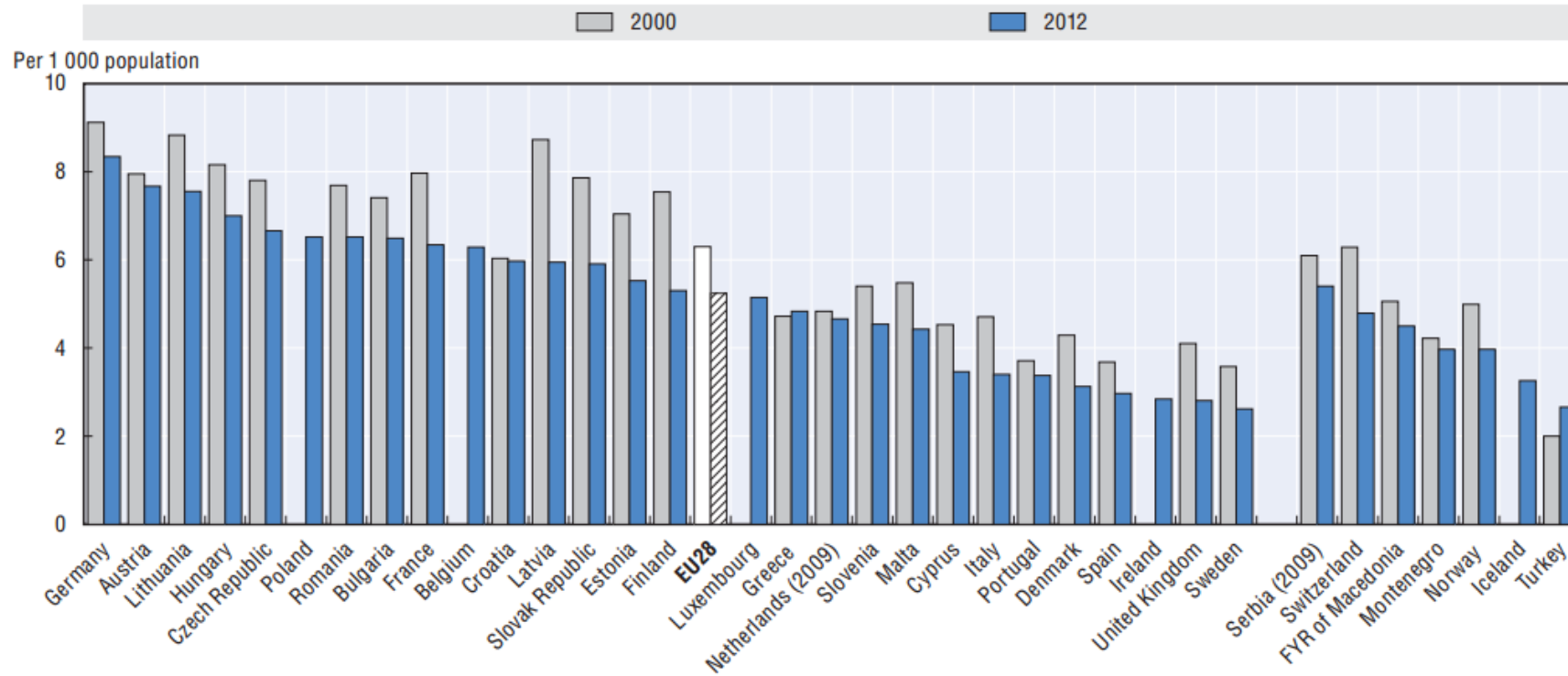


Figure 2: Hospital Beds in EU countries and EU-candidate countries per 1,000 population between the years 2000 and 2012 (if 2012 data is not available, the latest available data is considered)<sup>3</sup>

<sup>3</sup> OECD Health Statistics 2014, <http://dx.doi.org/10.1787/health-data-en>; Eurostat Statistics Database; WHO Europe Health for All Database



The portion of number of beds in the intensive care units (“ICU”) in the total the number of beds in the hospitals in İzmir Province is close to the 7% declared by the MoH for Turkey. However this number is not sufficient for İzmir which is a coastal town with heavy marine traffic and itinerant people (sailors, tourists, etc.). The nearby provinces have rather high ICU bed occupancy rate, as well.

While the average occupancy rate of the beds across all the hospitals in the İzmir Province is 57.4%, the average occupancy rates for several health care facilities and the peak occupancy rates for the province, in general, are much higher. For example, the Menemen State Hospital had an average occupancy rate of 99.24% in 2009 while İzmir Tepecik Training Research Hospital reached 80.37% in 2009 (see Table 1). The increase in the occupancy rate of the beds clearly indicates the need for additional beds and implicitly new facilities.

**Table 1: Bed Occupancy Rate (%) in the Hospitals in İzmir Province<sup>4</sup>**

	Bed Occupancy Rates (%)	
	2009	2010 <sup>(a)</sup>
İzmir Aliağa State Hospital	46.32	67.87
İzmir Çeşme Alper Çizgenakat State Hospital	23.27	29.4
İzmir Alsancak Nevvar Salih İşgören State Hospital	51.91	57.39
İzmir Atatürk Training and Research Hospital	83.53	81.28
İzmir Bayındır State Hospital	53.26	66.01
İzmir Bornova Türkan Özilhan State Hospital	73.05	46.37
İzmir Bozyaka Training and Research Hospital	76.15	73.89
İzmir Buca Maternity and Pediatric Hospital	14.19	52.59
İzmir Buca Seyfi Demirsoy State Hospital	61.48	55.58
İzmir Çiğli State Hospital	68.73	57.89
İzmir Dr.Behçet Uz Pediatric Surgery Training and Research Hospital	66.34	65.82
İzmir Dr.E.Hayri Üstündağ Gynecology and Obstetrics Hospital	43.68	57.68
İzmir Bergama Dr.Faruk İlker State Hospital	39.78	43.16
İzmir Dr.Suat Seren Pulmonary Diseases and Pulmonary Surgery Training and Research Center	76.63	79.25
İzmir Ege Maternity and Gynecology Training and Research Hospital	66.47	63.59
İzmir Foça State Hospital	28.3	43
İzmir Karşıyaka State Hospital	56.78	65
İzmir Kiraz State Hospital	39.15	56.41
İzmir Torbalı M.Enver Şenerdem State Hospital	61.19	66.83
İzmir Menemen State Hospital	99.24	85.16
İzmir Seferihisar Nejat Hepkon State Hospital	46.94	43.07
İzmir Ödemiş State Hospital	49.28	49.64
İzmir Selçuk State Hospital	39.64	66.42
İzmir Tepecik Training and Research Hospital	80.37	92.06
İzmir Tire State Hospital	62.51	71.99
İzmir Urla State Hospital	54.81	67.48
(a) Values are referred to the first 3 months of 2010		

According to the personnel distribution table obtained from the Provincial Directorate of Health, which indicates the staff quotas needed by the healthcare organizations, there is a need for nurses and midwives at the health

<sup>4</sup> Ministry of Health Website <http://www.saglik.gov.tr/TR/belge/1-10633/saglik-bolge-planlamasi-hakkinda-genelge-ile-hastane-ya-.html>





facilities in the İzmir Province. The World Health Organization (“WHO”) emphasises that the number of health workers is important in reducing the infant and maternal mortality. While the number of health workers is sufficient for existing medical centres in accordance with the personnel distribution table, the new medical centres are required to employ new health workers.

Some health indicators for İzmir province according to the Health Statistics Yearbook - 2013 of the MoH are given in Table 2 and Table 3.

**Table 2: Number of Health Personnel in İzmir Province<sup>5</sup>**

	Number of Personnel
Specialist Physician	5,688
Practitioner	2,149
Physician Assistant	1,907
Total Number of Physicians	9,744
Dentist	1,549
Pharmacist	1,874
Nurse	8,491
Midwife	2,713
Other Health Personnel	7,562

**Table 3: Health Indicators for İzmir Province<sup>6</sup>**

	İzmir
Number of Hospitals	59
Number of Beds	11,361
Number of Beds per 10,000 people	28
Qualified Bed Number	4,253
Number of Beds in ICU	1,512
Number of Family Practice Centre	1,138
Population per Family Doctor	3,569
Number of Emergency Service Units (112)	90
Population per Emergency Service Units	45,123
Number of Ambulances (112)	114
Population per ambulance	35,623

According to the 2009 data on haemodialysis patients and treatment facilities across the province, 2,998 patients were treated. Of these 358 patients were treated at dialysis centres of the MoH; 2517 were treated in private hospitals; and 123 in university hospitals. There was an average of 3.3 patients per dialysis machine in the İzmir Province. According to the European Renal Association and European Society of Nephrology, for effective and beneficial treatment, patients should take dialyses 3 days per week, each session lasting 4 hours. As a result, the maximum patient number per machine should be 5. It can, thus, be concluded that the 3.3 average for the province of İzmir is a good rate.

When the above issues are considered, it is obvious that the İzmir Bayraklı Integrated Health Campus Project will be supporting in :

<sup>5</sup> Health Statistics Yearbook, 2013, Ministry of Health

<sup>6</sup> Health Statistics Yearbook, 2013, Ministry of Health



- decreasing the patient load of existing public hospitals;
- increasing the efficiency and quality of health services;
- achieving the adequate quantity and higher quality of patient beds and;
- providing the region with comprehensive healthcare services.

### 1.3 Project categorisation

The requirements from IFC, EBRD and OPIC regarding the Environmental and Social Assessment process and outcomes differ depending on the category of the project. Projects are categorized as follows:

**Table 4: Project Categorisation**

Category	Description of the Project		
	IFC	EBRD	OPIC
<b>Category A</b>	Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented	Project that could result in potentially significant adverse future environmental and/or social impacts which, at the time of categorisation, cannot readily be identified or assessed, and which, therefore, require a formalised and participatory environmental and social impact assessment process.	Project that are likely to have significant adverse environmental and/or social impacts that are irreversible, sensitive, diverse, or unprecedented.
<b>Category B</b>	Projects with potential limited adverse environmental and social risks and/or impacts those are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.	Projects with potential adverse future environmental and/or social impacts that are typically site-specific, and/or readily identified and addressed through mitigation measures.	Project that are likely to have limited adverse environmental and/or social impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.

With the findings of the scoping/screening phase of the Project it can be concluded that:

- There are no identified cultural heritage and biodiversity concerns within the direct Project Area of Influence.
- The Izmir Project is located in the vicinity of already existing public infrastructure including traffic infrastructure and hazardous/medical waste handling facilities.
- The Izmir Project is away from densely populated areas.
- The Project land is a greenfield, owned by the Turkish Under-secretariat of Treasury and has been allocated specifically to this project.
- The Izmir Project will not result in closure of any other health service facilities in the province of Izmir or elsewhere.

The potential environmental and social impacts and risks of the projects were identified based on the project screening information presented in the scoping report and the additional information collected during the scoping phase. These impacts and risks are:



- Site specific,
- Readily identifiable and
- Can be readily addressed by standard industry practice mitigation measures (as also detailed in the following sections).
- Largely reversible

Thus, the project is determined to be category B.

## 1.4 Key steps in the ESA process

### 1.4.1 Screening & Scoping

Golder prepared a Scoping Report in April 2015 for the Project. The purpose of the Scoping Report was to identify the key environmental and social issues associated with the Project and requiring detailed evaluation as part of the ESA process, to establish the most appropriate approach to the assessment and the categorisation of the project.

The Scoping Report was based on the review of the characteristics of the Project and the associated releases to the environment and a walkover survey of the site and of the surrounding area carried out in March 2015. Major potential environmental and social issues associated with the Project are identified together with the requirement for additional studies on specific issues during that phase. Some further potential impacts, as some of them have been identified after the scoping stage, during the ESA process are considered in detail, specific studies are performed (such as primary baseline data collection modelling and consultation) and all potential impacts are reported in the individual assessment sections.

### 1.4.2 Baseline data collection

Baseline information has been obtained from the Project specific social and environmental baseline studies that have been carried out as part of this ESA, utilising both desktop and field-based approaches. These studies have been compiled through specifically commissioned surveys, collated from a range of sources including publicly available information and through consultation. Relevant information used to support the assessment process is referenced in the relevant sections.

### 1.4.3 Stakeholders engagement

EBRD and IFC recommend that the project sponsor consults with the relevant stakeholders at least twice:

- a) during scoping and before the terms of reference for the ESA are finalized, and
- b) once a draft EA report is prepared. The ESA report must be made accessible to the public once completed, however it is recommended to consult and inform local stakeholders in earlier phases of the process.

As part of the scoping phase, preliminary engagement activities during the site visit were performed, whereas additional consultations with local people have been implemented during the ESA process.

Detailed information is provided about the Stakeholder Engagement in Section 6.0 of this report.

### 1.4.4 Impact assessment

Impact assessment was performed for main issues for each Environmental and Social 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.

### 1.4.5 Identification of mitigation measures

Mitigation measures were identified through the application of the mitigation hierarchy of avoid, minimize, or, where residual impacts remain, compensate/offset providing the framework for developing a checklist of mitigations measures for risks and adverse environmental and social impacts. This approach implies that priority have been given to preventive actions mainly related to Project design, location and implementation rather than curative interventions that handle adverse outcomes after the emergence of the anticipated problems.

Realistic and affordable (cost-effective) mitigating measures have been proposed to prevent, reduce or minimise environmental impacts to acceptable levels and address other issues such as the need for e.g. worker health and safety improvements, community engagement, institutional involvement.

Given the fact that changes would be possible in the course of the development of the Project, mitigation measures have been designed to adapt to the changes readily through an adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the Project’s lifecycle. With this flexibility of the proposed mitigation measures sufficiently considered, it would prevent any unnecessary delay due to further assessment.

### 1.4.6 Uncertainties

This ESA is prepared based on the Project information provided by the Client (refer to Section 4.0). Like most ESAs, the current ESA faced a number of challenges in terms of retrieving baseline information, the level of accuracy of predicting impacts, and developing appropriate mitigation. Furthermore, even with a firm Project design and an unchanging environment, predictions are by definition uncertain.

In order to facilitate decision-making, then areas of uncertainty, data gaps and deficiencies, during further stages of Project development have been highlighted within the ESA report. In order to address the uncertainties, monitoring will be undertaken by the Client to understand whether the identified mitigation measures are sufficient or there is a need for any refinements.

### 1.4.7 Study Limitations

The ESA is depending on the available and convenient information provided by the SPV.

With regard to the environmental and social baseline data collection; there has been no significant limitations in relation to the site surveys and literature studies.

Regarding to the project description contents, there has been some limitations connected with the MoH. Before beginning of the ESA studies, correspondences were sent by SPV to the MoH on information requests to the closure of the existing hospitals in that region. However, those information requests have not yet been responded.

### 1.4.8 Environmental and Social Management System

The general framework for the environmental and social management system to be developed and implemented by the Project through the project lifecycle has been defined in Section 10.0.

### 1.4.9 Environmental and Social Action Plan

The Environmental and Social Action Plan (ESAP) has included APPENDIX N.



## 1.5 Outline of the ESA report

This document is the ESA report for İzmir Bayraklı Integrated Health Campus Project in compliance with the national and international requirements.

- This document presents the following sections:
- Introduction (Section 1),
- Guidelines and Procedures according to EBRD and IFC (Section 2),
- Regulatory and Policy Framework (Section 3),
- Project Description (Section 4),
- Analysis of Alternatives (Section 5),
- Stakeholder Engagement (Section 6),
- Impact Screening and Definition of the Valued Environmental and Social Components (Section 7),
- Environmental and Socio-Economic Baseline (Section 8),
- Impact Assessment (Section 9),
- Environmental and Social Management System (Section 10),
- Environmental and Social Action Plan (Section 11) and
- Conclusions (Section 12).

## 2.0 GUIDELINES AND PROCEDURES ACCORDING TO EBRD AND IFC

The present ESA has been structured in accordance with the Performance Requirements (“PR”) of EBRD, Performance Standards (“PS”) of IFC.

The IFC Performance Standards and EBRD Performance Requirements that are triggered by the project summarised in the below table with reference to the chapter where the compliance with these requirements are assessed.

**Table 5: Compliance Table Summary**

Theme/Sub-Theme	EBRD PRs	IFC PSs	Addressed in Chapter
<i>Environmental and social assessment</i> Take into account all applicable laws and regulations to the project including the laws implementing host country obligations under international law	PR 1	PS 1	3-Regulatory and Policy Framework
<i>Environmental and social assessment/</i> Examination of technically and financially feasible alternatives, including the non-project alternative	PR 1	PS 1	5- Alternatives Assessment
<i>Environmental and social assessment/</i> Document the rationale for selecting the alternative	PR 1	PS 1	5- Alternatives Assessment
<i>Resource efficiency/</i> Identify opportunities and alternatives for resource efficiency relating to the project in accordance with GIP	PR 3	PS 3	5- Alternatives Assessment



Theme/Sub-Theme	EBRD PRs	IFC PSs	Addressed in Chapter
<i>Stakeholder Engagement</i> Stakeholder engagement is conducted to provide local communities that are directly affected by the project and other relevant stakeholders.	P10	PS 1	6-Stakeholder Engagement
<i>Stakeholder Engagement</i> Stakeholders are identified, stakeholder engagement plan is prepared, consultation meeting is conducted, and grievance mechanism is described.	PR 10	PS 1	6-Stakeholder Engagement
<i>Environmental and social assessment/</i> Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1	7- Impact Assessment Methodology
<i>Environmental and social assessment/</i> The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1	7- Impact Assessment Methodology
<i>Identification of Risks and Impacts</i> Environmental and social risks and impacts is identified in the context of the project's area of influence.	PR 1	PS 1	7- Impact Assessment Methodology
<i>Environmental and social assessment/</i> Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1	8-Environmental and Social Baseline
<i>Environmental and social assessment/</i> Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1	9- Impact Assessment
<i>Environmental and social assessment/</i> The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1	9- Impact Assessment
<i>Identification of Risks and Impacts</i> Environmental and social risks and impacts are identified in the context of the project's area of influence.	PR 1	PS 1	9- Impact Assessment
<i>Mitigation</i> Define mitigation measures in line with mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment.	PR1	PS 1	9- Impact Assessment
<i>Biodiversity Conservation</i>	PR 6	PS 6	9- Impact Assessment





Theme/Sub-Theme	EBRD PRs	IFC PSs	Addressed in Chapter
Identify and characterise, the potential direct and indirect project-related risks and impacts on biodiversity.			
<i>Land Acquisition and Involuntary Resettlement and Economic Displacement</i> Avoid or minimize physical and/or economic displacement, when displacement cannot be avoided, displaced communities and persons will be offered compensation	PR5	PS5	9- Impact Assessment
<i>Environmental and Social Policy/</i> Establish and manage mitigation and performance improvement measures and actions that address the risks and impacts	PR 1	PS 1	10-Environmental and Social Management System
<i>Organisational capacity and commitment/</i> Establish, maintain and strengthen an organizational structure that defines roles, responsibilities and authority	PR 1	PS 1	10-Environmental and Social Management System
<i>Organisational capacity and commitment/</i> Designate specific personnel, including management representatives with clear lines of responsibility and authority	PR 1	PS 1	10-Environmental and Social Management System
<i>Community Health and Safety</i> Risks and adverse impacts to the health and safety of the potentially affected communities are identified and assessed and protection, prevention and mitigation measures are defined	PR 4	PS4	10-Environmental and Social Management System
<i>Labour and Working Conditions</i> Minimum standards are defined for ensuring labour and working conditions to be in compliance with project requirements	PR2	PS2	10-Environmental and Social Management System
<i>Occupational Health and Safety</i> Minimum standards are defined for ensuring occupational health and safety to be in compliance with project requirements	PR2	PS2	10-Environmental and Social Management System
<i>Health Services</i> Consider the impacts on employees, patients and the immediate community	Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal	Environmental, Health, and Safety Guidelines; HEALTH CARE FACILITIES	10-Environmental and Social Management System
<i>Cumulative Impacts</i> Cumulative impacts of the project are considered during impact assessment process in combination with impacts from other past, existing and reasonably foreseeable developments as well as unplanned but predictable activities enabled by the project that may occur later or at a different location.	PR 1	PS 1	11-Cumulative Impact Assessment





Theme/Sub-Theme	EBRD PRs	IFC PSs	Addressed in Chapter
<p><i>Cumulative Impacts</i>                      Potential adverse project impacts on existing ambient conditions are addressed                      The project-related impacts and issues associated with resource use, and the generation of waste and emissions are assessed in the context of project location and local environmental conditions</p>	PR 3	PS 3	11-Cumulative Impact Assessment

In order to support the reader in the analytical process, a self-explanatory and systematic tool for addressing the relevant requirements or standards is reported. This tool is proposed as a Conformance Table at the beginning of each main section of the ESA and is meant to communicate essential information about the ESA compliances to stakeholders and authority in an efficient, easy-to-read format.

The Conformance Table contains the short description of the themes discussed in the related section and specific PRs and PSs that address the Equator Principles. A case in point is shown in the following:

Conformance Table – [Reference Section to the ESA]		
Theme/Sub-Theme	EBRD PRs	IFC PSs
Release of pollutants	PR 3	PS 3
Identification of potential hazards to workers	PR 2	PS 2
[...]		

### 3.0 REGULATORY AND POLICY FRAMEWORK

Conformance Table – Regulatory and Policy Framework		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<p><i>Environmental and social assessment</i>                      Take into account all applicable laws and regulations to the project including the laws implementing host country obligations under international law</p>	PR 1	PS 1

A Trigeneration plant will be installed as a part of the Project to produce part of the power required for the operation of the facilities. The capacity of the unit will be 4 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 11.2 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 15.2 MWt (11.2 + 4) which is below 20 MW. The capacity is lower than the aforementioned criteria stated in the Regulation on Environmental Impact Assessment. Hence the project is not subject to the preparation of PDF for the Trigeneration Plant.



There will not be concrete plant constructed under the scope of the Project. Needed concrete will be supplied from external concrete batching plants which are located close to the site, however there is a also possibility to construct a concrete batching plant with 90 m<sup>3</sup>/h capacity which in that case; there will not be requirement for preparing a single PDF.

If in the future during the construction works a requirement arises to increase the capacity of the concrete batching plant which will exceed 100 m<sup>3</sup>/hr , referring to the aforementioned Turkish EIA criteria, preparation of a single PDF will be necessary

Hospitals and healthcare facilities having capacity higher than 20 beds are included in Annex- 2 and the trigeneration plants having capacity more than 1 MW thermal power are included in Annex-2 of the Regulation on Environmental Permits and Licenses (dated: September 10, 2014, Official Gazette No: 29115). Hence, Environmental Permit for operation phase will be received from the Ministry of Environment and Urbanization ("MoEU").

The regulatory framework for the project is composed of the applicable requirements of :

- Current National Environmental and Social Legislation
- International Conventions and Agreements
- Current European Union Environmental and Social legislation
- Requirements of Equator Principles

The Equator Principles are a set of voluntary environmental and social guidelines that have been adopted by a significant number of financial institutions influential in the project finance market (collectively the Equator Principles Financial Institutions, EPFIs). The EPs comprise a set of ten broad principles that are underpinned by the environmental and social policies, standards and guidelines.

- EBRD Performance Requirements

The 2014 Environmental and Social Policy of the EBRD is a document which details the commitments of the agreement establishing the Bank particularly for the "promotion of environmentally sound and sustainable development". These Performance requirements include;

- PR1 - Assessment and management of environmental and social impacts and issues
- PR2 - Labour and working condition
- PR3 - Resource efficiency, pollution prevention and control
- PR4 – Health and safety
- PR5 - Land acquisition, involuntary resettlement and economic displacement
- PR6 - Biodiversity conservation and sustainable management of living resources
- PR7 - Indigenous peoples
- PR8 - Cultural heritage
- PR9 - Financial intermediaries
- PR10 - Information disclosure and stakeholder engagement

- IFC Standards and Guidelines

IFC 2012 Performance Standards (IFC 2012 PS) have been considered the main reference as they are the most recent environmental and social standards issued by an International Financial Institution. IFC 2012 PS comprises 8 documents:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts



- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

### ■ IFC EHS Guidelines

The Environmental, Health, and Safety (“EHS”) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (“GIIP”). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

### ■ IFC EHS Guidelines for Healthcare Facilities

- Workers’ accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009
- Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal, 2009

### ■ EIB Requirements

The 2013 Environmental and Social Practices handbook of the EIB is a document which provides advice on planning and managing the environmental and social appraisal and monitoring. It describes the steps for determining the scope of the environmental and social review process throughout the project cycle that the EIB shall carry out for all projects in all regions. It also explains the role of highly specialised units or individuals who collectively ensure that the Bank’s activities respond to the highest possible standards.



## 4.0 PROJECT DESCRIPTION

### 4.1 Project Area

#### 4.1.1 Project Location

İzmir Bayraklı Integrated Health Campus Project is located in İzmir Province, Bayraklı District, near the Bayraklı Tunnels. Access to the Project Site is provided by the E87 (O-30 ) Highway, Bayraklı Exit.

İzmir province is surrounded by the Balıkesir, Manisa and Aydın Provinces. İzmir has the highest population among the other provinces in the Aegean Region of Turkey.

Bayraklı District is surrounded by the Karşıyaka and Bornova districts.

The Project Site is located between the slopes of the Küçükkalete Mound, southeast of the Doğançay Quarter and the Laka Stream. The O-30 highway borders the south of the Project Site. The Baltali Stream is located west and the Laka Stream is located east of the Project Site.

The nearest residential area to the Project Site is the Laka village which is 50 m from the site. R. Şevket İnce quarter is approximately 190 m from the Project Area across the E87 highway. The Doğançay Quarter is located approximately 1640 m northwest of the Project Area.

The nearest protected area (Spil Mountain Natural Park) are located more than 20 km north-east of the project site (air distance). The main sources of living at the Laka village (the nearest settlement) are agriculture and livestock.

The Project Area is notably steep with slopes over 22%. The Project Area has a trapezoidal shape and a very sharp elevation difference (190 m) between the lowest point (127 m) in its south-eastern corner and the highest (317 m) in its north-western corner. There would be rain water runoff flowing along the slope direction. It is planned to excavate during the construction the entire Project Area to depths varying between 0.45 m to 37.14 m.

#### 4.1.2 Land use

The approximately 62.3 ha of the land where the Project will be realized is the property of the Undersecretariat of Treasury and was allocated to the MoH upon designation as a "Health Campus Area" in the "1/5,000-scaled Master Plan. The MoH obtained consent from the former owner and the MoEU to use the site. MoH transferred the right of construction of the land to the SPV at 06.03.2014.

In the Project area the vegetation is characterized by low Mediterranean sclerophyllus shrubland (maquis) more or less heavily grazed and interrupted by many rock outcrops.

There is no housing and no ongoing industrial or agricultural activity at the project site.

The Google Earth view of the project site and layout of the project are given in Figure 3 and Figure 4. The Site Photographs are provided in the Appendix B.





Figure 3: Google Earth View of the Project Area



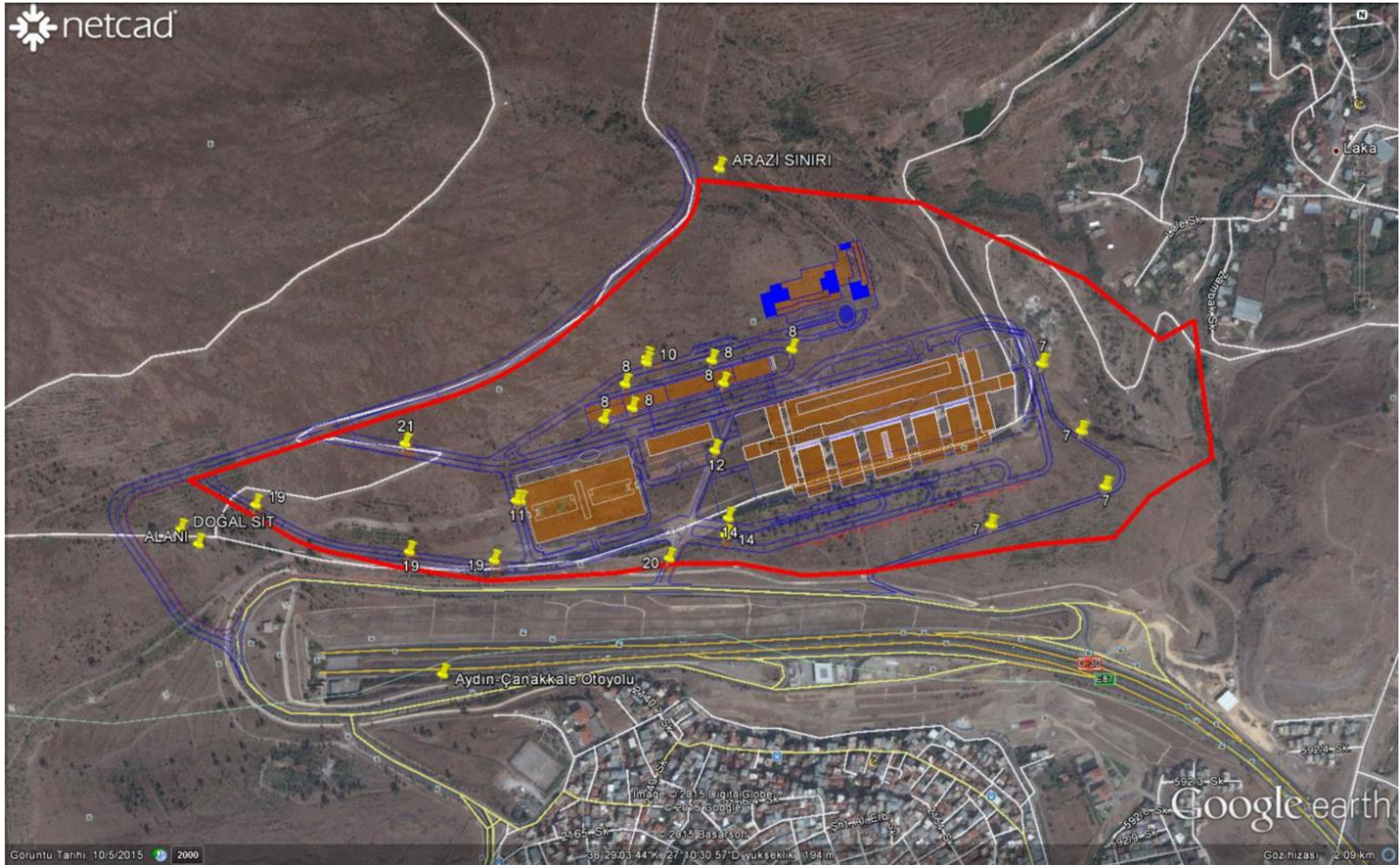


Figure 4: Preliminary Site Layout of İzmir Bayraklı Integrated Health Campus Project





## 4.2 Project components

Izmir Bayraklı Integrated Healthcare Campus will be constructed over a 622,530 m<sup>2</sup> land consisting of several hospitals with a total enclosed area of 573,546 m<sup>2</sup> and bed capacity of 2,060. The health campus is going to include 3 hospitals which are: the Main (General) Hospital, the Physical Therapy and Rehabilitation Hospital and the High Security Forensic Rehabilitation Hospital. The Main Hospital also includes a General Hospital, a Women & Paediatrics Hospital, the Cardiovascular Hospital and an Oncology Hospital. The bed capacities and the closed construction areas of each hospital unit above are given in

Table 6 and Table 7. Table 8 shows the car parking capacity of the main hospitals.

**Table 6: Bed Capacity of the İzmir Bayraklı Integrated Health Campus based on project information available at this stage**

Hospital	Bed Capacity
Main Hospital	
General Hospital	715
Women & Paediatric Hospital	424
Cardiovascular Hospital	380
Oncology Hospital	141
Physical Therapy and Rehabilitation Hospital	300
High Security Forensic Rehabilitation Hospital	100
<b>Total Number of Beds</b>	<b>2,060</b>

**Table 7: Closed Construction Areas (m<sup>2</sup>) of Project Components based on project information available at this stage**

Project Component	Closed Construction Areas (m <sup>2</sup> )
Main Hospital	433,009
Main Hospital Diagnostics and Beds	283,609
Main Hospital Closed Car parks	149,400
Physical Therapy and Rehabilitation Hospital	94,423
Rehabilitation Hospital Diagnostics and Beds	76,423
Rehabilitation Hospital Closed Car parks	18,000
High Security Forensic Rehabilitation Hospital	23,347
Forensic Rehabilitation Hospital Diagnostics and Beds	20,347
Forensic Rehabilitation Hospital Closed Car parks	3,000
Technical Services Building	22,768
<b>TOTAL CLOSED CONSTRUCTION AREA</b>	<b>573,547</b>
<b>TOTAL AREA OF LAND</b>	<b>622,530</b>

**Table 8: Car Parking Lots**

Hospital	Car Parking Lots
Main Hospital	4,980
Physical Therapy and Rehabilitation Hospital	300
High Security Forensic Rehabilitation Hospital	100
<b>Total Car Parking Capacity</b>	<b>5,380</b>

The Project, which will have 573,547 m<sup>2</sup> closed area, will meet the health requirements of İzmir province and its nearby provinces. When the new Campus starts to operate at full capacity, it is predicted to provide





healthcare services to an estimated 12,000 people (polyclinics and emergency) per day in modern conditions

The following facilities are going to be present in İzmir Bayraklı Integrated Health Campus:

Main Hospital Units	General Hospital Units	Cardiovascular Hospital Units	Women and Paediatrics Hospital Units	Oncology Hospital Units	Forensic Hospital Units	Rehabilitation Hospital Units
16 Cardio Intensive Care (ICU)						
7 Iodine Treatment						
15 Burn						
40 Surgery						
4 Angiography			264 ACUT			
12 Angiography Pre/Post Operation	528 ACUTE7		54 ICU			
40 Surgery Pre Operation	72 ICU	308 ACUT	20 SUIT	88 ACUT		
80 Surgery Post Operation	20 SUITE8	36 ICU	16 Labour, Delivery, Recovery and Postpartum ("LDRP")	36 ICU	100 ACUT	300 ACUT
40 Emergency Observation	12 Transplant	20 SUIT	70 New-born Intensive Care ("NICU")	20 SUIT		40 Clinics
5 Emergency Observation Private	10 Trauma	96 Clinics	96 Clinics	96 Clinics		
12 Emergency Women and Paediatrics Observation,	96 Clinics					
12 Emergency Women and Paediatrics Treatment						

<sup>8</sup> Private hospital rooms



<b>Main Hospital Units</b>	<b>General Hospital Units</b>	<b>Cardiovascular Hospital Units</b>	<b>Women and Paediatrics Hospital Units</b>	<b>Oncology Hospital Units</b>	<b>Forensic Hospital Units</b>	<b>Rehabilitation Hospital Units</b>
8 Emergency Green Code Exam						
10 Triage						
12 Emergency Trauma						
20 Emergency Yellow Code Exam						
2 Emergency Yellow Code Isolation Rooms						
24 Haemodialysis Centre						
20 Chemotherapy						
8 Day Surgery						
48 Prison Service						

**4.2.1 Trigeneration Plant**

The Project is to produce part of its own power through a Trigeneration plant. The capacity of the unit will be 4 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 11.2 MWt (thermal power). The remaining electricity shall be obtained from the national electricity grid. As it is to be a Trigeneration plant, the wasted energy from the production of electricity shall be recaptured and used to supply some of the both the heating and cooling needs of the Project during the operational phase. The remaining heating needs will be met through the use of boilers.

The emissions from the Trigeneration plant will comply with the Turkish, EU and IFC requirements.

The Trigeneration system is to use natural gas supplied by the city network. In case of shortage, generators and boilers will be fed by diesel tanks that will be located on site. It is envisaged that the fuel tanks will be located next to both technical buildings. The total amount of stored diesel will be designed to suffice the IHC’s needs for three days. The exact location and arrangement of the diesel storage tanks is still to be confirmed. These tanks will be attached to the backup generators.

The Proposed Design for the proposed system generates simultaneously Power and Thermal (Hot Water/Steam and Chilled Water) based on a topping cycle. In a topping cycle, energy from the fuel generates shaft or electric power first, and thermal energy from exiting stream is recovered for other applications, in this case steam, hot water and chilled water production.

It is envisaged that the Combined Cooling Heat and Power (“CCHP”) system consists of as follows:



- Prime Mover: The prime Movers are reciprocating spark ignition engines, fuelled by natural gas.
- Electricity-Generating System: The electricity generating system consists of generators (alternator system) that are coupled to the prime movers, transformers coupled to a generator to convert low voltage (LV) to a medium voltage (MV), and circuit breakers and switches to stop the flow of current when there is a fault and to turn on or off the electrical current.
- Heat Recovery System: The heat recovery system is subdivided into two systems:
  - Exhaust Gas System: Heat from engine exhaust gas is partially salvaged by using a heat recovery silencer. This heat is used to produce steam.
  - Cooling System: Engines have two cooling systems, one at low temperature and another at high temperature. Heat from the high-temperature cooling system can be salvaged to produce hot water.
- Chilled Water Production System: By Absorption Water Chiller Plants, the system produces chilled water. The absorption plants use the steam produce for the Exhaust Gas System as heat supply.

### 4.3 Construction phase

The construction period (investment) of the İzmir Bayraklı Integrated Health Campus Project is planned to be 3 years.

It is predicted that approximately 4000 people will be employed during the construction of the health campus at peak times (see below graphic).

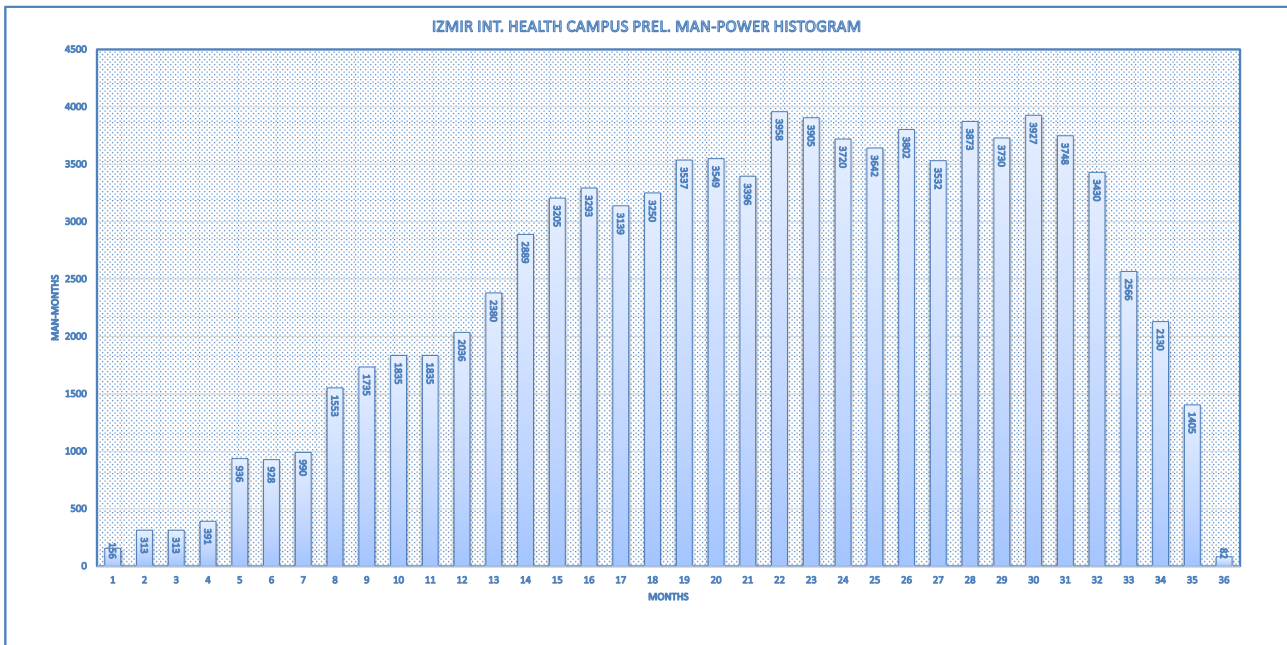


Figure 5: Preliminary Man-Power Histogram

The amount of estimated soil to be excavated during the construction is given in Table 9. The soil to be excavated will be disposed of to appropriate disposal sites. The assessment of these disposal sites is presented in section 5.2.3.

Table 9: Estimated Excavation Quantities (m3)



	Excavation Quantities (m <sup>3</sup> )
Main Hospital	1,770,524
Rehabilitation Hospital	453,878
Forensic Hospital	334,106
Technical Buildings	25,897
Pedestrian Area and Roads etc.	118,774
<b>TOTAL</b>	<b>2,703,180</b>

90% of the excavated material is planned to be used at the site for refilling.

The construction equipment will possibly use diesel fuel which would lead to the emission of particulate matter (PM<sub>10</sub>), oxides of nitrogen (NO<sub>x</sub>) and sulphur dioxide (SO<sub>2</sub>). Construction traffic may also lead to a temporary increase in local air pollutants in the area surrounding the construction activities.

Land transport to the construction site will be through the E87 (O-30). The existing connection road need to be maintained and/or short distance new access roads may need to be constructed to ensure the access of equipment and vehicles to site. There will be service roads inside the project area. This roads will be planned as much as possible to be used as during operation phase in order to reduce the excavation waste.

There will be a construction camp to be established for construction workers. The accommodation blocks will not include kitchen, laundry and social areas. There will be individual block for these services.

## 4.4 Operation phase

The number of the administration personnel planned for the operation phase of the İzmir Bayraklı Integrated Health Campus Project is estimated to be 3629 in light of the existing information available at this stage. The details of the employment are given in Table 10 below. There will 355 specialist physicians and practitioners, 780 nurses and midwives, and 340 auxiliary health personnel. The MoH will be the responsible party for the recruitment and management of health employees.

There is going to be a designated management system at the campus where the MoH will assign special health staff to the campus, while the Ministry of Justice (“MoJ”) will only be responsible for the section of the forensic hospital where prisoners with mental problems will be accommodated.

### Forensic Hospital

The operation of forensic hospital needs specific engineering design and management considerations to mitigate potential environmental and social risks such as: community health and safety risks associated the accommodation of the prisoners with mental problems, management system challenges; the Ministry of Justice (“MoJ”) will only be responsible for the section of the forensic hospital where prisoners with mental problems will be accommodated, management of security systems and services and treatment of prisoners with mental problems. In order to mitigate these risks the following measures will be in place:

- There will be security systems to eliminate the unauthorized entry and exit to the premises of the hospital.
- There will be a stakeholder engagement and grievance mechanism system in place to ensure the information exchange between the community members in the neighbourhood, record and respond the concerns of these people.
- There will be communication mechanisms in place with community heads. The emergency response plan will include informing them in case of a security breach at the hospital.



- The hospital will be designed to accommodate 100 patients with mental problems. The hospital design will ensure the patient welfare and the security by allocating separate clinics for different gender types, open-air areas for patients and personnel, security provisions in line with security zoning, ensuring patient privacy when deciding on surveillance system design and similar.
- There will be close coordination and communication among Bayraklı IHC management, Ministry of Health, Ministry of Justice and Ministry of Interior for the operation of forensic hospital and provision of security forces

The Regulation on the Association of Private Hospitals (dated: 27.03.2002, Official Gazette No: 24708) is taken into consideration during the operation of forensic hospital.

**Table 10: Estimated Number of Personnel to be employed during the Operation Phase**

	Number of Personnel
Laundry	39
Cafeteria	225
Laboratory	76
Imaging	153
Sterilization	33
Rehabilitation	167
Waste Management	11
Cleaning- Room Cleaning	645
Hospital Information Management System (HBYS)	78
Security	235
Patient Guidance	301
Other Medical Support Services	25
Building and Land Services	64
Common Services	22
Furnishing	11
Garden Care Services	31
Disinfection	9
Parking Lot	34
Specialist physicians and practitioners	355
Nurses and midwives	780
Auxiliary health personnel	340
<b>TOTAL</b>	<b>3629</b>

## 4.5 Waste Management

The details of the waste management are presented in Appendix B. Summary of specific items are given in the following sections.

### 4.5.1 Water Use and Wastewater

The water supply for construction activities will be from municipality network. Maximum daily amount of water to be used will be 525 m<sup>3</sup>/day.

The primary and the only source of water for operation phase consumption will be the municipality network. In the case of groundwater consumption the water physico-chemical and microbiological quality will be ensured



to be in line with national and WHO (World Health Organization) standards through appropriate treatment and monitoring.

The domestic wastewater during construction will be collected by the municipality sewage network. Maximum daily amount of domestic wastewater will be approximately 525 m<sup>3</sup>/day (assuming worst case of; the supplied amount of water is converted to wastewater at a ratio of 1/1).

During operation phase, wastewater from departments will be collected via different piping systems and discharged directly into the municipality sewer system, except for the wastewater that is contaminated with radioactive substances (i.e. from nuclear medicine department) which will be collected separately and/or subject to neutralization prior to being discharged into the sewer system. It is important to note that several conditions are set for liquid wastes contaminated with radioactive substances in the Regulation on Wastes Generated upon Usage of Radioactive Substances (OG date/no: 02.09.2004/25571) related to discharging this type of wastewater into the sewer system.

4.5.2 Medical Wastes

Medical wastes are the most important type of wastes which will be created during the operation of the project. Medical wastes are classified into three main groups according to the Regulation for Medical Waste Control:

- Infectious waste
- Sharps
- Pathologic waste

The main strategy of waste management of medical wastes is to separate all medical wastes from other hazardous wastes (such as chemical wastes or radioactive wastes) and non-hazardous general waste. However, to provide a minimum level of safety to staff and patients, each type of medical wastes would be collected separately. Waste management methods used for each type of medical waste in operation phase of the project is summarized below:

Table 11 Medical Waste Management Methods of the Hospital Project9

Type of Medical Waste	Contents	Segregation Options	Disposal Options
Infectious Waste	Includes waste suspected to contain pathogens (e.g. bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. Includes pathological and anatomical material (e.g. tissues, organs, body parts, human fetuses, animal carcasses, blood, and other body fluids), clothes, dressings, equipment / instruments, and other items that may have come into contact with infectious materials.	Yellow or red coloured bag / container, marked "infectious" with international infectious symbol.  Strong, leak proof plastic bag, or container capable of being autoclaved	Bayraklı Belediyesi and/or licensed medical waste sterilization/disposal plants

<sup>9</sup> IFC EHS Guidelines for Health Care Facilities, 2007



Type of Medical Waste	Contents	Segregation Options	Disposal Options
Sharps	Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	Yellow or red colour code, marked "Sharps".  Rigid, impermeable, puncture-proof container (e.g. steel or hard plastic) with cover. Sharps containers should be placed in a sealed, yellow bag labelled "infectious waste"	Izmir Municipality and/or licensed medical waste sterilization/disposal plants
Pharmaceutical Waste	Includes expired, unused, spoiled, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.).	Brown bag / container. Leak-proof plastic bag or container.	Izmir Municipality and/or licensed medical waste sterilization/disposal plants

Main points in medical waste management activities are given in APPENDIX B. A detailed Waste Management Plan will be prepared in the operation phase of the project, which specifies separate collection and storage, equipment and vehicles used in waste storage and transportation activities, waste types and quantities, frequency of collection, temporary storage systems, cleaning and disinfection of collecting equipment, measures and actions during accidents, responsible staff etc., according to the Regulation on Control of Medical Wastes.

## 4.6 General Facility Design Issues

The design of the health care facility will ensure the following general principles are followed;

- Provision of adequate separation of clean/sterilized and dirty/contaminated materials and people flows
- Provision of adequate disinfection/sterilization procedures and facilities
- Provision of adequate space for the storage of recyclable materials (e.g., cardboard and plastic) for pickup
- Provision of ventilation and air conditioning systems that provide isolation and protection from airborne infections
- Water system is designed to provide adequate supplies of potable water to reduce risks of exposure to *Legionella* and other water borne pathogens
- Provision of adequate hazardous materials and waste storage and handling areas
- Provision of treatment and exhaust systems for hazardous and infectious agents
- Use of easily cleaned building materials that do not support microbial growth, are slip-resistant, non-toxic and non-allergenic and that do not include VOC-emitting paints and sealants





### Waste Management

Health care waste management system will be in place that includes the following elements:

- Source reduction measures (e.g., product/material substitution to avoid products containing hazardous materials that require products to be disposed as hazardous wastes; use of physical rather than chemical practices where such practices do not affect disinfection or patient safety)
- Waste toxicity reduction measures (e.g., product/material substitution for equipment containing mercury, PVCs, VOCs, PBT compounds and products that contain substances known to be carcinogenic, mutagenic or teratogenic)
- Use of efficient stock management practices and monitoring (for chemical and pharmaceutical stocks)
- Safe equipment re-use procedures (e.g., reuse of sharps following sterilization and disinfection)
- Adequate waste segregation strategies that specifically address mercury, cadmium, thallium, arsenic and lead; biomedical wastes, and aerosol cans and PVCs (to avoid disposal via incineration, if incineration will be used)
- Adequate on-site handling transport and storage procedures that specifically address limits on storage periods, mercury, cytotoxic waste and radioactive waste.
- Dangerous goods transport guidelines, including adequacy of packaging, labelling and transport vehicles
- Treatment and disposal technologies for infectious wastes, sharps, pharmaceutical wastes, genotoxic/cytotoxic wastes, chemical wastes, radioactive wastes, wastes with high concentrations of heavy metals, pressurized containers and general health care wastes (e.g., food wastes, paper, plastics)
- The details of the waste management plan is presented in Appendix B.

### Air Emissions

- Control measures will be in place for exhaust gases from HVAC systems and fugitive emissions from waste storage areas, medical research areas and isolation wards

### Wastewater

- There will be procedures and mechanisms for separate collection of urine, faeces, blood and vomit from patients treated with genotoxic drugs
- There will be prevention of large quantities of pharmaceuticals, and all antibiotics and cytotoxic drugs from discharge to municipal sewer systems
- There will be engineered controls for removal of pharmaceutical active ingredients

## **4.7 Occupational Health and Safety**

Following occupational health and safety measures will be included in the design and panning of the facility;

- Exposure control plan for blood borne pathogens
- Staff and visitors informed on infections control policies and procedures
- Immunize staff, as necessary
- Use and adequate supplies of gloves, masks, gowns and other personal protection gear
- Adequate facilities for hand washing
- Procedures and facilities for handling contaminated laundry



- Adequate sharp management procedures
- Policies regarding animals on the property
- Procedures to reduce exposure to waste anaesthetic gases
- Comprehensive plan for reducing exposure to radiation
- Adequate fire and life safety measures, including smoke alarms and sprinkler systems, training in evacuation procedures, and fire prevention, emergency response and evacuation plans
- Occupational health and safety related to personnel of forensic hospital unit.

### 4.8 Accreditation

The project will obtain an accreditation based on a quality evaluation of the technical competence of the institution’s resources and organization by an internationally recognized accreditation organization (such as Joint Commission International).

### 4.9 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project site and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed. After 25 years of operation, the IHC will be transferred to the MoH.

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also the foundations of the structures would be removed. The impacts during decommissioning phase are likely to be similar to the construction phase. The description of the decommissioning/closure phase would include:

- Duration
- Personnel employed during decommissioning/closure (number of people and timeline for presence on site)

The details of this information are not available at this stage of the project. These details will be available and used for the preparation of the ESA report.

## 5.0 ANALYSIS OF ALTERNATIVES

Conformance Table - Analysis of Alternatives		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<i>Environmental and social assessment/</i> Examination of technically and financially feasible alternatives, including the non-project alternative	PR 1	PS 1
<i>Environmental and social assessment/</i> Document the rationale for selecting the alternative	PR 1	PS 1
<i>Resource efficiency/</i> Identify opportunities and alternatives for resource efficiency relating to the project in accordance with GIP	PR 3	PS 3



The Project is planned to achieve compliance with the regulatory requirements and Health Services Transformation Program has been initiated by Turkish MoH in 2003. For the purpose of analysis of alternatives for the project is assessed focusing on the following topics:

- No-project option
- Technological selection
- Location selection

### 5.1 No project option

The “No project option” implies that Project will not be realized (i.e. the no go alternative) no construction activities will occur and therefore there will be no positive and negative environmental and social risks connected to the Project. Furthermore no socio-economic benefits would accrue to the nearby communities and the government.

The positive local, regional and national socio-economic effects of the Project will occur over a long period of 25 years (operations), with the potential to extend benefits past that time due to Project improvements. Planning has emphasized integration of the Project with the nearby communities and Authorities, with mutual benefits for all parties.

The Project was planned to meet the demand in terms of health facilities and beds availability. A development activity in an area inevitably involves its alteration from the environmental point of view. However, to manage this alteration, an analysis of the Project also considered all the socio-economic elements in question in addition to ensuring the maximum protection of environment by use of latest, state-of-the-art technologies.

Failure to implement the proposed Project would involve the following:

- loss of opportunity to increase bed capacity and provision of health services with better quality in the project area;
- loss of opportunity to create direct employment for hundreds of workers, including health workers and non-health workers;
- loss of opportunity to create a new investment for the health care system
- failure to rationalize the use of health facilities in the project area.

Expanding the patient demands by extending the existing hospital facilities may as well be an option however would have the following limitations and risks:

- existing facilities are in the populated areas with limited capacity of land extension
- existing facilities would need refurbishment in addition to extension
- during the extension of the existing facilities there may be disruptions to the health services provided to the patients
- there is no forensic hospital at the current condition in İzmir and surroundings

## 5.2 Technological selection

### 5.2.1 Medical Services and Technologies

The Project will utilize highly advanced medical devices and facilities and will meet the health requirements of İzmir province and its nearby provinces. When the new Campus starts to operate at full capacity, it is predicted to provide healthcare services to an estimated 12,000 people (polyclinics and emergency) per day in modern conditions with 355 specialist physicians and practitioners, 780 nurses and midwives, and 340 auxiliary health personnel.



Example of relevant high-tech devices and technologies chosen are listed in Section 4.0.

### 5.2.2 Energy Efficiency

The technology chosen for the Project is to produce part of its own power through a Trigeneration plant. The capacity of the unit will be 4 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 11.2 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 15.2 MWt (11.2 + 4). Traditional gas turbines typically operate at an efficiency of 35% whereas trigeneration systems operate up to 85% by converting 45% of the source energy to electricity, 40% to heating and cooling.

The remaining electricity shall be obtained from the national electricity grid. As it is to be a Trigeneration plant, the wasted energy from the production of electricity shall be recaptured and used to supply some of the both the heating and cooling needs of the Project during the operational phase. The remaining heating needs will be met through the use of boilers.

In addition the in-design planning has incorporated the design of a system generating simultaneously Power and Thermal (Hot Water/Steam and Chilled Water) based on a topping cycle instead of alternative thermodynamic cycles.

The energy technologies selected as described above will guarantee increased efficiency throughout the Project life by recovering productions.

### 5.2.3 Soil disposal during construction

Alternatives analyses have been conducted for the site selection of disposal of excavated material.<sup>10</sup>

There are three disposal locations for excavated materials in İzmir. These are;

- Yelki Excavated Material Storage Area (50 km from the Project area),
- Gökdere Excavated Material Storage Area (15 km from the Project area),
- Belkahve Excavated Material Storage Area (16 km from the Project area),

Gökdere and Belkahve excavated material storage areas were identified as suitable for disposal of excavated material, with other areas ruled out on the basis of potential environmental impacts (e.g. interference with natural habitats). These areas were assessed based on a number of criteria including distance, availability of dumping volumes, traffic and infrastructure facilities. The assessment identified that Gökdere and Belkahve are the best option due to the closeness and availability. This choice will result in a lower impact on the surrounding area (i.e., reduction of noise and air emissions to the receptors) and reduced transport movements across the area, leading to a lower impact on the local transport movements.

## 5.3 Location selection

No analyses of alternatives with respect to location have been performed. As a matter of fact should be considered that approximately about 62.3 ha of the land where the Project will be realized is the property of the Treasury, and was allocated to the Ministry of Health upon designation as a "Health Campus Area" in the "1/5,000-scaled Master Plan.

The MoH obtained consent from the former owner and the Ministry of Environment and Forestry to use the site.

For such a large urban development, there is a need for a large piece of land at or close to the city centre, yet site alternatives within the city are insufficient in İzmir. The Project Site is advantageous in that respect that is

<sup>10</sup> It is planned to use the excavated soil as much as possible for refilling. Current planning foresees to reuse 90% of the excavated soil for refilling purposes at site and send 10% to potential dumping sites.



also away from the crowded parts of the city. This site is considered further advantageous due to the fact that it is located in a developed area close to existing urban infrastructures such as transportation and waste handling.

The project is located in the north of the City in Bayraklı District nears the Bayraklı Tunnels in an area with a topographic structure based on hills. The plot limited to the site by the O-30 (E87) highway which articulates to the City. The air distances of the site planned for the Health Campus to some of the Main transport centres are as follow,

- İzmir Bus Terminal 6.70 km
- Basmane Gar Station 7.20 km
- İzmir Adnan Menderes Airport 21.50 km

There are, in fact, no sites which is owned by the State and planned to be a Health Campus within İzmir that are large enough to hold such a facility, owned by the public and close enough to the city to be relevant. Thus, no other alternative sites have been evaluated for this Project.

## 6.0 STAKEHOLDER ENGAGEMENT

Conformance Table - Stakeholder Engagement		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<p><i>Stakeholder Engagement</i> Stakeholder engagement is conducted to provide local communities that are directly affected by the project and other relevant stakeholders.</p>	P10	PS 1
<p><i>Stakeholder Engagement</i> Stakeholders are identified, stakeholder engagement plan is prepared, consultation meeting is conducted, grievance mechanism is described.</p>	PR 10	PS 1

### 6.1 Stakeholder engagement plan

Detailed information on the Stakeholder Engagement process is provided in Appendix E.

### 6.2 Stakeholder management activities realised

During the baseline data collection activities for Bayraklı IHC following local authorities have been contacted to request various information on the Project Area and exiting baseline conditions.

- Ministry of Health, Health Investments Directorate
- İzmir Environment and Urbanisation Provincial Directorate, Protection of Natural Resources Department
- Ministry of Culture and Tourism, İzmir Regional Directorate of Protection of Cultural Heritage

Considering the social context and the nature of the project and in addition to the secondary data the qualitative primary baseline information has been collected at district and village/quarter level by using four different means of site data collection. During the socioeconomic baseline data collection following engagement activities were conducted with the project stakeholders between 7<sup>th</sup> and 11<sup>th</sup> of April, 2015

Key informant interviews with various stakeholders;

Interviews have been performed with the following groups of stakeholder using a customized in-depth questionnaires. (See APPENDIX C)

Bayraklı Municipality Environmental Protection Directorate



- Bayraklı Municipality Development Directorate
- Bayraklı District Health Directorate
- İzmir Greater Municipality Development General Secretariat
- Northern Hospital Association

### In-depth interviews focused on economic activities

In depth interviews have been carried out with stakeholders engaged with economical activities in the local study area..

The stakeholders contacted in Laka Village are;

- Husbandry owners
- Shop owners
- Workshop owner

### Community level interviews with village people,

Information on the socioeconomic status at local study area has been collected through interviews with the following local stakeholders using community level questionnaires

- Laka Village Mukhtar
- Osmangazi Village Mukhtar
- Osmangazi Village Mukhtar
- Laka Village Council Member
- Laka Village Religious Head
- Head of Laka Municipality Sports and Cooperation Association

During the interviews the concerns of the stakeholders on the potential impacts of the project have also been collected.

### Focus groups.

Focus group meetings where the attending stakeholder can interactively engage to the meeting, have also been conducted with the following groups. (See questionnaire for focus group discussions.(See APPENDIX C):

- Laka Village women
- Laka Village men
- Bayrakli City Council

### Engagement with the project sponsor

SPV has been requested through a filling a specific questionnaire to provide information on the recruitment policy and the social and environmental management plans to be prepared to minimize the impacts of the project.

A Public Consultation Meeting has been conducted in İzmir on 29<sup>th</sup> of May, 2015 at Laka Coffehouse. 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. Photos of the meeting are shown in Appendix F.

The number of the participation to the meeting was sufficient. In general, local stakeholders are aware of public benefit of the project and significant contribution to national economy.

The stakeholder groups that attended the meeting are:

- Local authority (İzmir Provincial Directorate of Health) (1 representatives)
- Local Public ( 20 representatives)
- Project Employees (1 representatives)
- ESA consultant (2 representatives)

The points that were discussed during the meeting were:

- Project information,
- Construction period,
- Environmental and social studies that were conducted for the project,

No specific concern for public on community members. The opinions and issues that were raised during the answer and question session is shown below:

- Will the Project be called off due to the election?
- Will there be the transportation from village to the Hospital?

The main outputs of those meetings are provided in Section 6.3

### 6.3 Summary of stakeholder input

The stakeholder input collected during the socio-economic baseline data collection survey can be summarized as;

- Laka village residents consider the overall project impacts as tolerable with the fact that there will be a health care facility in accessible distance to the village and the real estate value in the village will increase.
- The PPP model for the construction and operation of the project is not known by the community members and this creates concern on the affordability of the provided health care services.
- Laka village mukhtar has contacted various local authorities for getting information on the Bayraklı IHC project. However he has come to the conclusion that even the local authorities don not have detailed information on the project and requests being informed on the project in the future.
- One important factor for choosing the Bayraklı IHC by the local public has been stated by the District Health Directorate is the provision of high service quality of the emergency services. He stated that the emergency services at the existing health care facilities are not adequate for the patients and the waiting times for getting the services can reach up to hours. The management of Bayraklı IHC not by public authorities may create advantages in the form of the quality of services.
- During the interviews conducted with local public it has been stated that the project would benefit from the extension of transportation routes. One other alternative to the Integrated Health Campus would have been improving the preventive health care services in İzmir.





## 7.0 IMPACT ASSESSMENT METHODOLOGY

Conformance Table - Impact screening and definition of the valued environmental and social components		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<i>Environmental and social assessment/</i> Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1
<i>Environmental and social assessment/</i> The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1
<i>Identification of Risks and Impacts</i> Environmental and social risks and impacts is identified in the context of the project’s area of influence.	PR 1	PS 1

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; however the final methodology will be the result of consultation with the client and the relevant stakeholders.

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.

Impact assessment was performed for main issues for each Environmental and Social 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; however the final methodology will be the result of consultation with the client and the relevant stakeholders. The details of the impact assessment methodology is presented in Appendix J.

### 7.1 Identification of area of influence

The area of influence is defined by IFC performance standard 1 as “The area likely to be affected by: (i) the project and the client’s activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities’ livelihoods are dependent.”

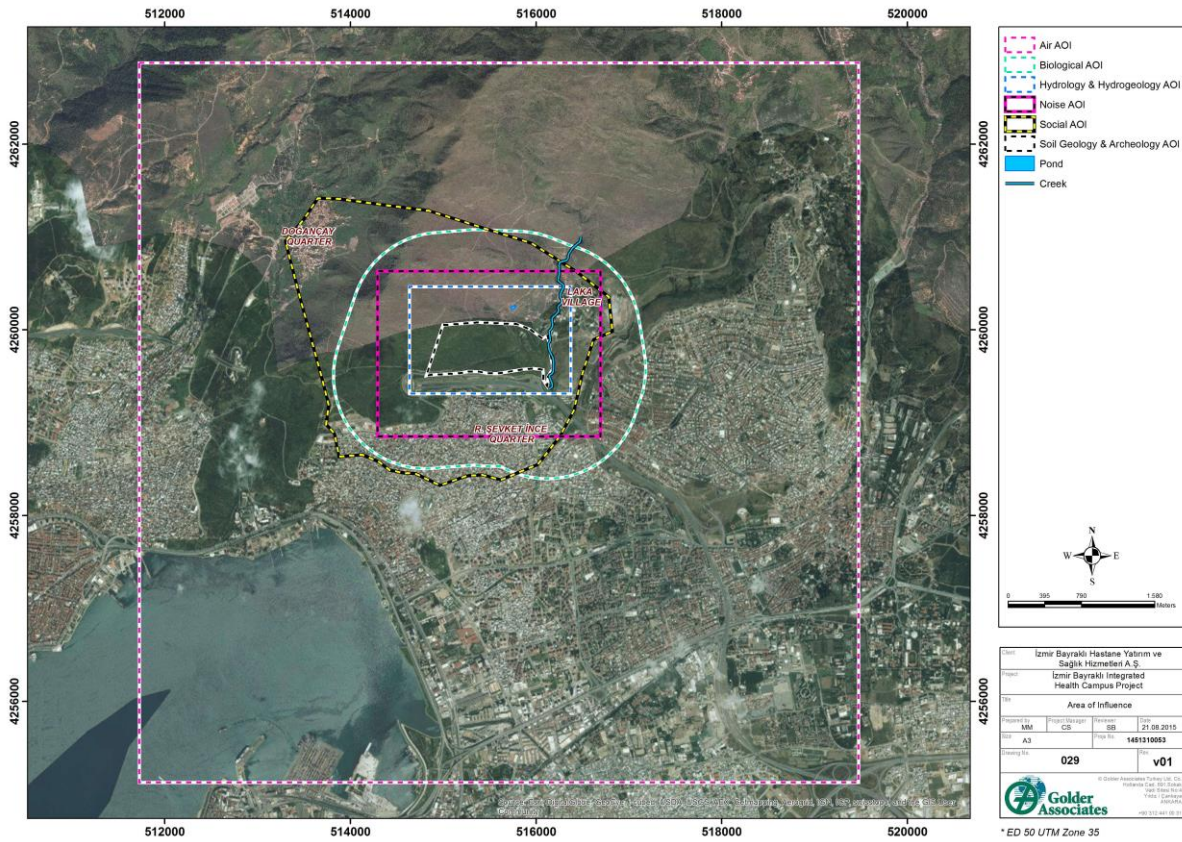
The Area of Influence is defined for each environmental and social component. The baseline data collection and impact assessment is focused on the geographical extends of the area of influence for each individual component and referred as Study Area in the context of the Impact Assessment Methodology.

The area of influence of the project would also include;

- Project area occupied by the project facilities
- New and existing transportation routes to be used for construction and operation
- Dumping sites for construction debris
- Waste and waste water disposal facilities to be used during operation and construction

The following drawing presents the Aol set as study area for baseline data collection to be used during impact assessment for environmental and social components.

- Though the actual waste disposal facilities, dumping sites and transportation routes are not specifically included in any of the Aols drawing below; they are included in the assessment and impacts associated with these facilities are discussed in relevant sections accordingly.
- Considering the dispersion of air quality impacts, the area of influence, where the air quality impacts are to be assessed, will be extended in relation to the results of any applicable dispersion study to be conducted.
- When available, literate information is also collected and presented at a national level and regional level to support the description of the baseline conditions.



Please note that :

Noise and air quality Aol is set by the modelling boundaries

Social components Aol approximates the nearest settlement boundaries however specific social impacts of a broader region including İzmir Municipality are also addressed in relevant sections.

Though the natural protected areas are not included in this drawing they are discussed in relevant sections.

Figure 6 Area of Influence (Study Area)



## 8.0 ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE

Conformance Table - Impact screening and definition of the valued environmental and social components		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<i>Environmental and social assessment/</i> Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1

The physical, biological and socioeconomic baseline data has been collected through literature and site surveys as detailed in the appropriate subsections below.

The baseline site data collection was performed through January and April 2015 being in line with the project execution plan. The data collection period would not cover a specific season however the data collection team has considered that the period would establish a baseline condition that would be appropriate for a sound impact assessment. The team has also considered recording any observed seasonality sensitivities of the baseline components during data collection activities and plan additional data collection surveys if required. The findings of the site data collection does not point out a necessity to collect additional baseline data in other seasons of the year except for ambient NO<sub>2</sub> levels that are measured to be higher than national and international standards over the sampling period. Recommendations are provided for the additional monitoring of NO<sub>2</sub> in Section 8.

### 8.1 Physical components

The study area and methods for the collection of baseline information on physical components are for the each subcomponent and presented in the subsequent sections below. The regional baseline characteristics collected through desktop review are presented in APPENDIX H.

#### 8.1.1 Geology and Geomorphology

Study area for this component is presented in Figure 6.

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

Main sources reviewed is İzmir-Bayrakli Integrated Health Campus Geological – Geotechnical Investigation Report Phase I, January 2015;

##### 8.1.1.1 Baseline

A geological and geotechnical investigation was carried out in the Project Area to determine its geological characteristics and geotechnical parameters. It included field works and laboratory test.

The field studies were conducted by the Toker Drilling and Construction Eng. Cons. Co. between December 9<sup>th</sup> and 22<sup>nd</sup> 2014. They followed the Technical Specification of Foundation Borings for Structures published by The Ministry of Environment and Urban Planning. Nineteen boreholes with 832.40 m of total depth were drilled and 23 test pits were excavated during investigation. The depths of the boreholes varied between 32 m and 55 m below ground level and their locations are shown in Appendix H. Borehole logs and geological cross-sections are given APPENDIX G.

Based on the characteristics described above, geology and geomorphology are a component with a low sensitivity.



### 8.1.2 Seismology

Study area for this component is presented in Figure 6.

Baseline conditions of seismology component have been assessed from desktop studies and literature data review.

Main sources reviewed are listed below:

- Pamukçu, Oya et al., “A Microgravity Model for the City of İzmir (Western Anatolia) and its Tectonic Implementations”, Acta Geophysica vol. 62, no. 4, Aug. 2014, pp. 849-871;
- Bozkurt, E., 2000, “Neotectonics of Turkey - a synthesis”, Geodinamica Acta, 14, 3-30;
- Emre O, Ozalp S, Dogan A, Ozaksoy V, Yildirim C, Goktas F (2005), “The active faults and their earthquake potential in Izmir Province”. MTA General Directorate of Geology Etudes Official Report no: 10754, Ankara, Turkey;
- Modelling of ground seismic behaviour for construction design safety in the Izmir Metropolitan Area, Aliağa and Menemen Districts, September 2007;
- “2012 Annual Earthquake Report” published by Prime Ministry; Disaster & Emergency Management Authority; Department of Earthquake;
- The Map of Turkey Seismic Zones published by Prime Ministry; Disaster & Emergency Management Authority; Department of Earthquake.

#### 8.1.2.1 Baseline

Project Area is located in 1<sup>st</sup> degree earthquake zone according national classification criteria for earthquake zoning.

### 8.1.3 Soil and Subsoil Characteristics

Study area for this component is presented in Figure 6.

Information regarding soil and land use had 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:
  - İzmir Provincial Environmental Status Report, 2013;
  - “Technical Instructions for the Classification Standards of the Soil and the Land Use” prepared by the Ministry of Food, Agriculture and Livestock;
  - Soil Groups, Land Use and Land Use Capability Classification Maps published by the Ministry of Food, Agriculture and Livestock;
  - Helvacı, Cahit, “Relationships between boron and arsenic elements in nature”, Dokuz Eylül Uni., Geological Engineering Dept., International Medical Geology Symposium, 2008;
  - Regulation on Soil Pollution Control and Point Source Contaminated Sites“ (“Soil Regulation”) 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 became effective as of 08 June 2015.
- Soil sampling





- Observations were made during the site walk over to identify any visual indications of contamination or potential contamination sources;
- Soil samples (and duplicate sample for QA/QC) were collected from the topsoil layer (upper 30 cm);
- During sampling, the collected samples were observed for any visual and olfactory signs of contamination;
- During sampling the photographs were taken at each soil sampling location;
- The samples were stored in a sealed glass jar and preserved in cooler boxes at around 4°C for shipping to the laboratory;
- After the samples were collected, the locations were recorded using a hand-held GPS instrument;
- Prior to commencing sampling at each location, the sampling equipment (gloves, shovel etc.) were decontaminated or replaced with the new one in accordance with Golder's in-house procedure (Golder Procedure 10\_Proc-04 - Decontamination of Equipment) in order to prevent cross contamination of the samples.

### 8.1.3.1 *Baseline*

The Project Area is considered a Greenfield. The land surface of the Project Area is mainly covered with bare soil and weeds. A geotechnical investigation (mentioned before) was carried out at the Project Area. Based on this investigation Andesite/Agglomerate has been observed as the dominant formation while Tuff forms interlayers within the Andesite/Agglomerate. Topsoil and fill /debris with a thickness varying between 0.40-0.50m and 0.30-1.30, respectively <sup>11</sup> have also been observed above the base rock in 8 boreholes.

The "Land Use Profile" for the Project Area, based on the classification assigned by the Ministry of Food, Agriculture and Livestock is meadow land (Figure 7). As seen in Figure 8, the soil in the Project Area is non-calcareous brown soil and has a "Land Use Capability Classification" as Class VI.

---

<sup>11</sup> This is an indication of less suitable soil for agricultural activities.



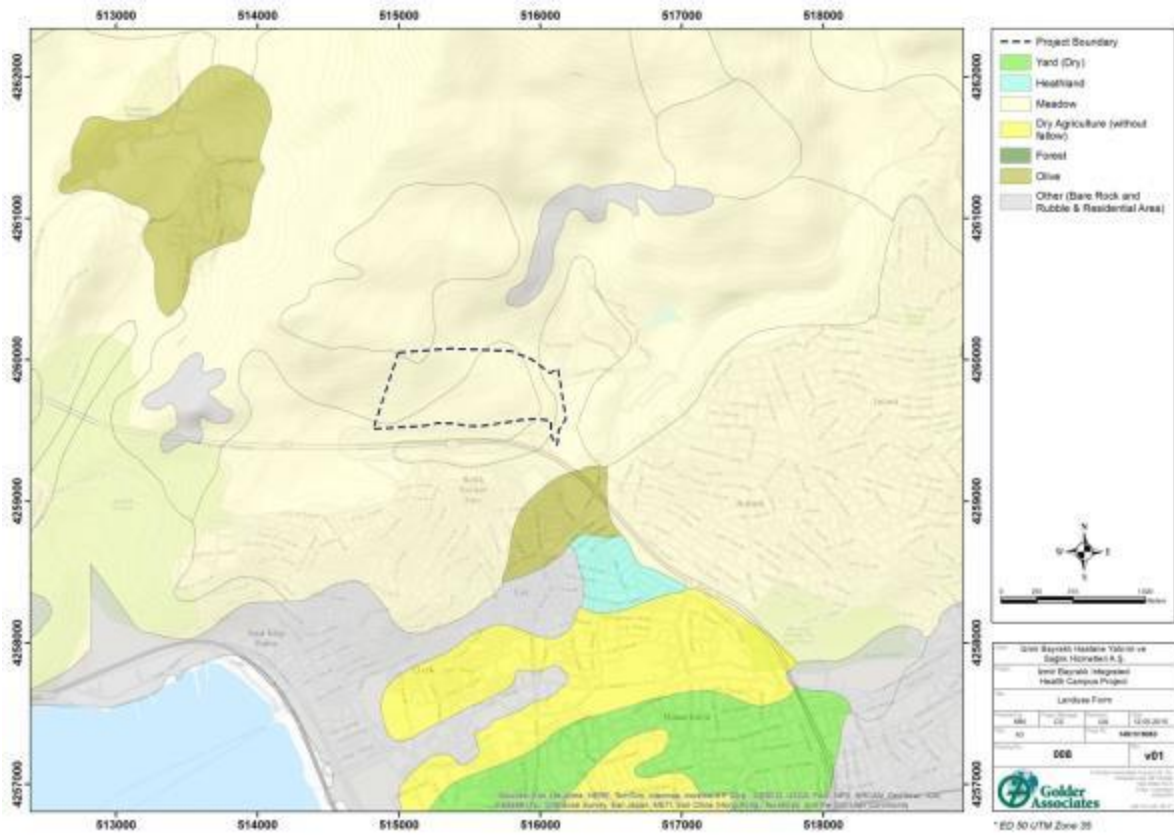


Figure 7: Land Use Profile of the Project Area

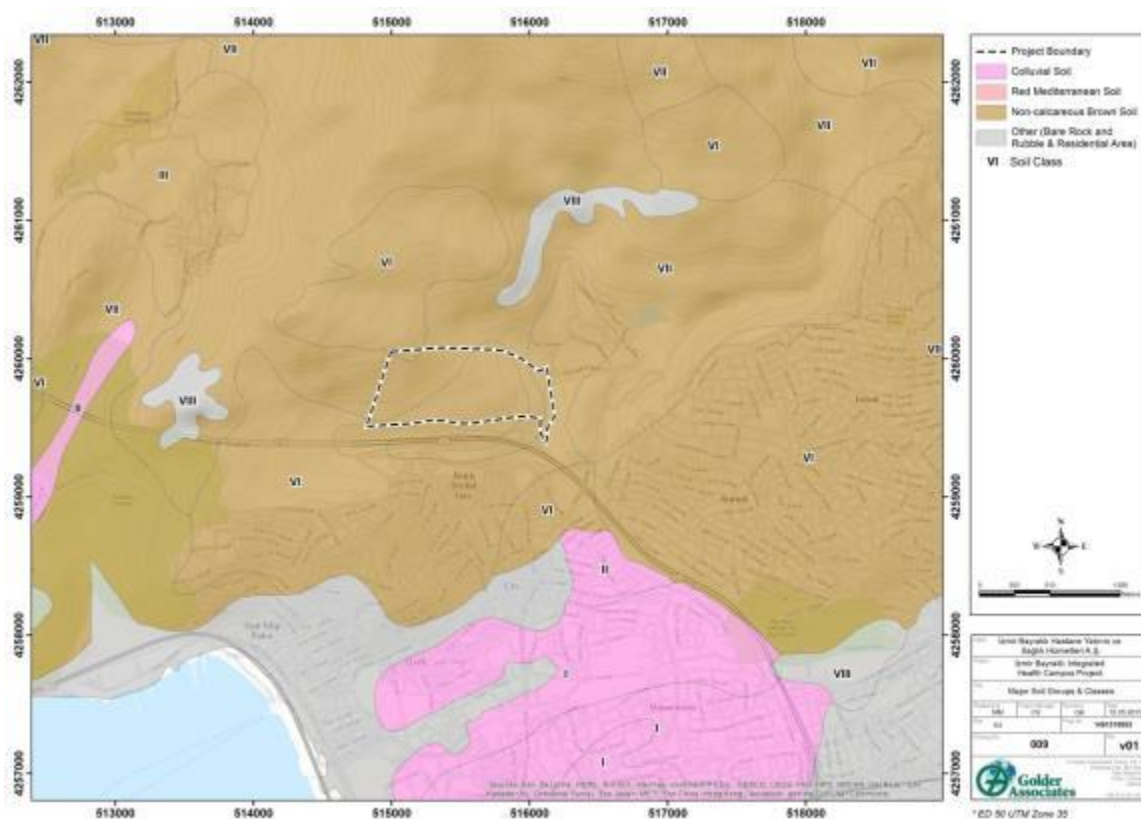


Figure 8: Soil Groups and Land Use Capability Classification of the Project Area

No visual indications of contamination or potential contamination sources were observed at the Project Area during the site visit conducted on 2 - 3 February 2015. In the light of this observation, in order to describe the baseline soil quality, 4 soil samples (and 1 duplicate sample for QA/QC) were collected from the topsoil layer (upper 30 cm) during the site visit. The soil sampling locations and the relevant sample information (coordinates, names, sampling date and time) and the comparison of the soil chemical analysis results to the Turkish Regulatory Limits are given APPENDIX L .

All samples, except TZ-3, have concentrations of Arsenic exceeding the Regulation Limit. There are trace concentrations of TPC and TOX in all samples. Samples TZ-1 and TZ-2 have Chromium concentrations exceeding the regulatory limit.

The Arsenic exceedance does not necessarily indicate a Site impact. Naturally occurring soil in the region is known to have elevated Arsenic concentrations<sup>12</sup>.

Chromium occurs naturally in volcanic rocks as a mineral in combination with sulphurs of other metals (Fe, Cu, etc.) in andesite (which are present in the greater site area). In contact with atmospheric oxygen and water sulphuric acid is formed which produces a rapid degradation of the andesite into clay and the release of metals. Undefined human activities may also have contributed to the concentrations found, but these cannot be defined.

The results of the chemical analyses performed on the soil samples do not show significant soil impact on the Project Area. Some presences may be due to natural and anthropogenic causes as the Project Area is located within an industrially developed province.

<sup>12</sup> Helvacı, Cahit, "Relationships between boron and arsenic elements in nature", Dokuz Eylül Uni., Geological Engineering Dept., International Medical Geology Symposium, 2008



Based on the characteristics described above, soil and subsoil characteristics are a component with a low sensitivity.

### 8.1.4 Hydrology and Surface water quality

Study area for this component is presented in Figure 6.

Information regarding hydrology had been collected through desktop studies and available reports.

Surface water quality baseline conditions have been assessed from desktop studies, literature data review and also baseline studies including surface water sampling.

#### ■ Main sources reviewed are listed below:

- The website of The Republic of Turkey, Ministry of Culture and Tourism;
- Süzal Aysin et al., “Dissolved Nutrient Behaviour along the Estuarine Salinity Gradient at the Gediz River Mouth (Aegean Sea, Turkey)”, Turkish J. Eng. Env. Sci. 32 (2008) , 67 – 84, August 2008;
- Şimşek, Celalettin, “The GIS-Integrated Surficial Aquifer Potential Mapping and Its Importance for Aquifer Protection, Küçük Menderes Basin/ West Turkey”, Dokuz Eylül University;
- İzmir Provincial Environmental Status Report, 2013;
- Regulation on Surface Water Quality” originally published in the Official Gazette number 28483, dated 30 November 2012 and amended in the Official Gazette number 29327, dated 15 April 2015.

#### ■ Surface water sampling

- A desktop study was carried out to identify water bodies in the 1,000 m buffer around the project footprint;
- Grab surface water samples were collected from the identified water bodies;
- During sampling the collected samples were observed for any visual and olfactory signs of contamination;
- During sampling the photographs were taken at the each surface water sampling location;
- The samples were stored in a sealed plastic/glass jar and preserved in cooler boxes at around 4°C for shipping to the chemical analysis laboratory;
- After the samples were collected the locations were recorded using a hand-held GPS instrument;
- The surface water samples that would be analysed for the coliform parameters were directly transported to the laboratory with in the 6 hours period to avoid any disturbance;
- Prior to commencing sampling at each location the gloves were replaced with the new ones and the bottles were washed with water from the sampling water body in order to prevent cross contamination of the samples.

#### 8.1.4.1 Baseline

No streams or any other natural surface water bodies were observed during the site visit within the Project Area. There is one artificial pond located 150 m north of the Project Area. The pond was constructed by the Regional Directorate of Forestry for firefighting purposes. Additionally, one small creek (Laka Creek) was observed within the Laka Village. The creek is 100 m of the Project Area.

The Project Area is notably steep with slopes over 22%. The Project Area has a trapezoidal shape and a very sharp elevation difference (190 m) between the lowest point (127 m) in its south-eastern corner and the highest



(317 m) in its north-western corner. There would be rain water runoff flowing along the slope direction. It is planned to excavate during the construction the entire Project Area to depths varying between 0.45 m to 37.14 m.

In order to describe the baseline surface quality, 2 surface water samples were collected from the Laka Creek and the artificial pond during the site visit conducted on 2 - 3 February 2015. (See APPENDIX L for details).

The assessment of surface water in Turkey is based on the "Regulation on Surface Water Quality" originally published in the Official Gazette number 28483, dated 30 November 2012 and amended in the Official Gazette number 29327, dated 15 April 2015. Table 5 in the Appendix 5 of the Regulation on Surface Water Quality gives the limit concentration values for the water quality classes. The summary of the definitions of the classes are given below. The results of the analyses were compared with the values stated in the Regulation on Surface Water Quality and are given in the APPENDIX L.

- Class I – High Quality Water:
  - Surface water with high potential for drinking water use;
  - Suitable for recreational purposes (dermal contact, including swimming);
  - Suitable for trout farming;
  - Suitable for animal husbandry and farming.
- Class II – Slightly Contaminated Water:
  - Surface water with a potential for drinking water use;
  - Suitable for recreational purposes;
  - Suitable for fish farming except for trout farming;
  - Suitable for irrigation, provided the irrigation water quality criteria are met.
- Class III – Contaminated Water:
  - Can be used for industrial water supply with proper treatment except for industries such as food, textile etc. that require high-quality water.
- Class IV – Heavily Contaminated Water:
  - Lower quality water where the quality parameters do not meet the Class III criteria and can be used only upon treatment to achieve higher quality classification criteria.

The concentrations of the parameters analysed in the sample collected from the Laka Creek (SZ-1) are below the Class I Surface Water limits, except for Nitrite, Total Kjeldahl Nitrogen, Phosphorus, Faecal and Total Coliform. The resulting water classification for the sample collected from the Laka Creek is Class IV - Heavily Contaminated Water. Animal farming is the main source of the income for most of the residents of Laka Village. Animal faeces were observed along the banks of the Laka Creek during the sampling and the creek is highly impacted from the anthropogenic and livestock activities.

The concentrations of the parameters analysed in the sample collected from the artificial pond (SZ-2) are below the Class I Surface Water limits, except for colour, Total Kjeldahl Nitrogen, Aluminium and Total Coliform. The resulting water classification for the sample collected from the Artificial Pond is Class II - Slightly Contaminated Water. The slight contamination is assumed to be a result of anthropogenic activities at the region.



Based on the characteristics described above, hydrology and surface water quality characteristics are a component with a low sensitivity.



## **8.1.5 Hydrogeology and Groundwater Quality**

### **8.1.5.1 Study area**

Study area for this component is presented in Figure 6.

Hydrogeology and groundwater quality baseline conditions have been assessed from desktop studies and literature data review.

■ Main sources reviewed are listed below:

- İzmir Provincial Environmental Status Report, 2013;
- İzmir-Bayrakli Integrated Health Campus Geological – Geotechnical Investigation Report Phase I, January 2015.

### **8.1.5.2 Baseline**

A geotechnical investigation (mentioned before) had been carried out at the Project Area. Nineteen boreholes with 832.40 m of total depth were drilled and 23 test pits were excavated during the investigation. According to the Geological-Geotechnical Investigation Report, groundwater was not encountered in the borings drilled down to depths varying from 32 m to 55 m. It is expected that the regional groundwater level is deeper than 55 m.

However; it is expected that localized perched groundwater and groundwater originating from fractures may be encountered at the Project Area during rainy seasons.

It is planned to excavate the entire Project Area during the construction between 0.45 m to 37.14 m.

Based on the characteristics described above, hydrogeology and groundwater quality characteristics are a component with a low sensitivity.

## **8.1.6 Meteorology and Climatology**

This section presents the baseline data collection methods and summary of the Meteorological and Climatic Features of the study area. No impact assessment is conducted for this component; however the data are used for the impact assessment conducted for other components.

Data concerning wind, temperature and rainfall recorded by İzmir Meteorological Station, for the 1960-2014 periods, were used for determining general meteorological and climatic conditions of the project area and surroundings. The İzmir Meteorological Station, a body of General Directorate of Meteorology (“MGM”), is situated in Konak District which is approximately 15 km away from the Project Site.

### **8.1.6.1 Baseline**

The subject area is classified as a low-precipitation area in the Mediterranean Basin. The Mediterranean climate is characterized by warm to hot, dry summers and mild to cool, wet winters.

Mediterranean climate can vary in areas due to factors like altitude, distance from the sea, and pressure. Winter precipitation is more influential on plant growth owing to less evaporation in the areas with Mediterranean climate. Average temperature in Mediterranean climate is below 15°C in winters. Duration of temperature falling below 0°C is very significant for plant growth. However this duration is below 3% of all cold days in a year in the subject area. Precipitations results show that the sites away from rocky spaces remain green throughout the year. Annual precipitation values are 275 mm at the coast and 350 mm inland; and these values are sufficient for meeting the need for humidity in winter for vegetation.

The precipitation regime in the area is central Mediterranean 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. This climate type is characterized by original Mediterranean vegetation series.





### 8.1.7 Air Quality

Study area for this component is presented in Figure 6.

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.

Methodologies used for the ambient air quality measurements are listed below:

- Particulate matter sampling was conducted according to the gravimetric method in compliance with EPA 40 CFR Part 50 National Ambient Air Quality Standards for Particulate Matter as recommended by World Bank and Ministry of Environment and Urbanization.
- Settled dust measurements were conducted by using the BS: 1747 Air Quality Measurements Methods Chapter 5, Settled Dust by 4 Directions.
- The SO<sub>2</sub>&NO<sub>2</sub> diffusion tubes were analysed at the Gradko U.K. laboratory by UV Spectrophotometry and Ion Chromatography for NO<sub>2</sub> and SO<sub>2</sub>, respectively.

#### 8.1.7.1 Baseline

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<sub>x</sub>) and sulphur dioxide (SO<sub>2</sub>).

#### *Ambient Air Quality*

The existing ambient air quality has been evaluated at and around the Project Site for dust and nitrogen oxide (NO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>).

The ambient air quality measurements were conducted by an accredited firm named Disten for the Project. Settled dust and first campaign of (4 of the total 12) SO<sub>2</sub>&NO<sub>2</sub> diffusion tubes measurements were conducted between February 18 and April 18, 2015 and PM<sub>10</sub> measurements were conducted between February 18 and 19, 2015. Rest of 8 diffusion tube measurements were conducted between March 15 and May 15, 2015.

As a total within the ESA studies, the field measurements listed below were conducted to support the baseline data:

- 24 hour PM<sub>10</sub> measurements at 4 locations.
- Settled dust measurements at 4 locations.
- SO<sub>2</sub>&NO<sub>2</sub> measurements at 12 locations.

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

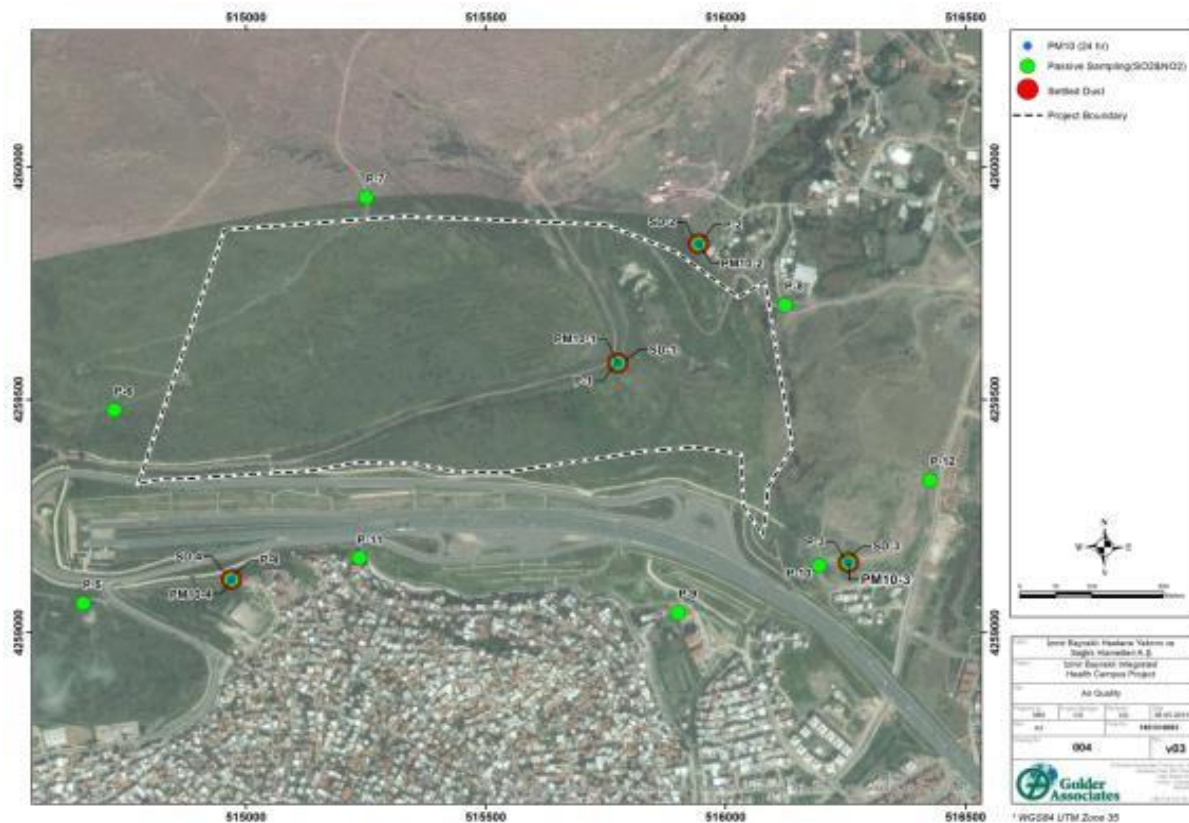


Figure 9: Measurement Locations

Measurement results with respect to the relevant Turkish and International standards limits for ambient air quality are summarized in APPENDIX L.

As seen from the measurement summary tables, PM<sub>10</sub>, settled dust and SO<sub>2</sub>&NO<sub>2</sub> measurement values comply with limit values of both national and international standards except from NO<sub>2</sub> values for P-2 and P-3 due to the heavy vehicular traffic close these measurement points on the stabilised road during the measurement period

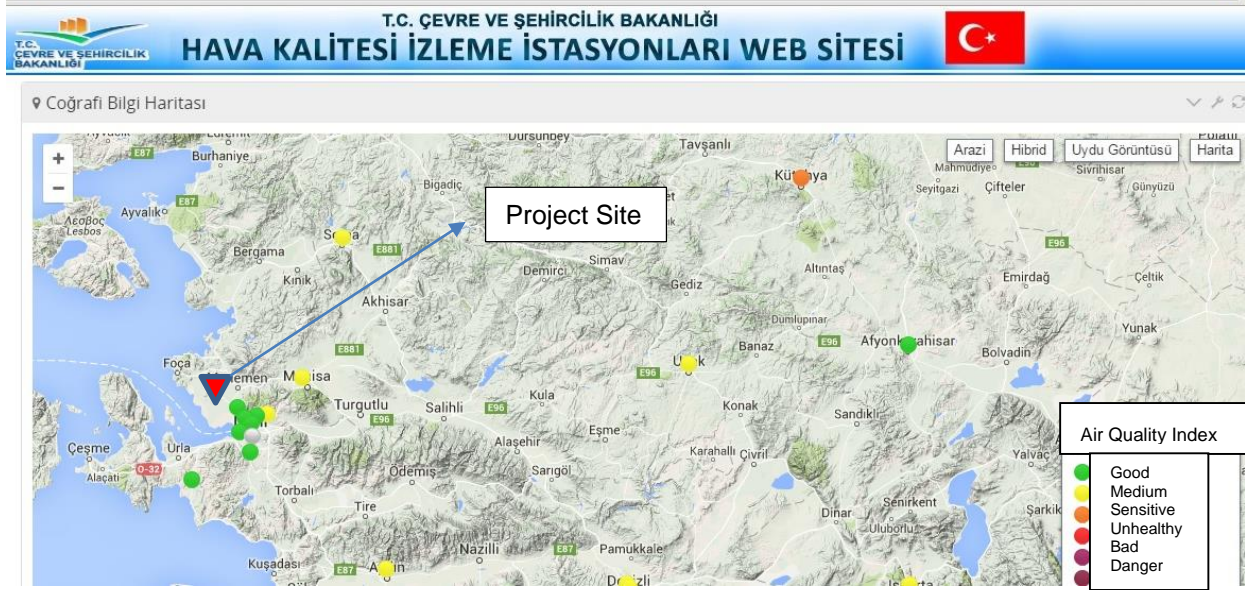
National Air Quality Monitoring Network, which is operated by the Ministry of Environment and Urbanization, has monitored air quality data<sup>13</sup> in order to assess the “air quality index” of the region. There are 18 stations in Aegean Region. 8 of them are located in İzmir. The locations of those stations are shown in below figure.

<sup>13</sup> PM10, SO2&NO2, NOx, O3, CO parameters.9



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

w.havaizleme.gov.tr/Default.ltr.aspx



According to the National Air Quality Monitoring Network, the air quality in İzmir Bayraklı is in “good” condition.<sup>14</sup>

The closest stations to the Project Site are İzmir Bayraklı and İzmir Bornova Stations.<sup>15</sup> Both station has no O<sub>3</sub> and PM<sub>2.5</sub> measurements. The closest station to project site which has O<sub>3</sub> measurements is Manisa Soma Station (about 80 km northeast direction from the Project site). The average O<sub>3</sub> measurement values for last 2 months at the station is shown below table. As seen from the below table, all values are in compliance with both European and IFC limit values.

Date	O <sub>3</sub> (µg/m <sup>3</sup> )	Date	O <sub>3</sub> (µg/m <sup>3</sup> )	Date	O <sub>3</sub> (µg/m <sup>3</sup> )	Limit Values (µg/m <sup>3</sup> )
01.02.2016	6	01.03.2016	9	30.03.2016	46	120 (for EBRD) <sup>16</sup> 100 (for IFC) <sup>17</sup>
02.02.2016	4	02.03.2016	8	31.03.2016	57	
03.02.2016	5	03.03.2016	11	01.04.2016	55	
04.02.2016	9	04.03.2016	11	02.04.2016	50	
05.02.2016	10	05.03.2016	8	03.04.2016	59	
06.02.2016	8	06.03.2016	7	04.04.2016	56	
07.02.2016	7	07.03.2016	7	05.04.2016	65	
08.02.2016	3	08.03.2016	6	06.04.2016	53	
09.02.2016	4	09.03.2016	7	07.04.2016	67	
10.02.2016	9	10.03.2016	10	08.04.2016	56	
11.02.2016	9	11.03.2016	10	09.04.2016	63	
12.02.2016	8	12.03.2016	5	10.04.2016	40	
13.02.2016	11	13.03.2016	7	11.04.2016	66	
14.02.2016	10	14.03.2016	9	12.04.2016	37	
15.02.2016	8	15.03.2016	30	13.04.2016	47	

<sup>14</sup> <http://index.havaizleme.gov.tr/Index/Station/117>

<sup>15</sup> <http://www.havaizleme.gov.tr/Default.ltr.aspx>

<sup>16</sup> <http://ec.europa.eu/environment/air/quality/standards.htm> & <http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.12188&MevzuatIlski=0&sourceXmlSearch=hava%20kalitesi>

<sup>17</sup> <http://www.ifc.org/wps/wcm/connect/532ff4804886583ab4d6f66a6515bb18/1-1-2BAir%2BEmissions%2BAnd%2BAmbient%2BAir%2BQuality.pdf?MOD=AJPERES>



Date	O3 (µg/m³)	Date	O3 (µg/m³)	Date	O3 (µg/m³)	Limit Values (µg/m³)
16.02.2016	5	16.03.2016	62	14.04.2016	53	
17.02.2016	3	17.03.2016	62	15.04.2016	61	
18.02.2016	4	18.03.2016	44	16.04.2016	64	
19.02.2016	4	19.03.2016	41	17.04.2016	70	
20.02.2016	7	20.03.2016	46			
21.02.2016	8	21.03.2016	44			
22.02.2016	6	22.03.2016	43			
23.02.2016	6	23.03.2016	74			
24.02.2016	4	24.03.2016	84			
25.02.2016	6	25.03.2016	55			
26.02.2016	5	26.03.2016	53			
27.02.2016	10	27.03.2016	58			
28.02.2016	7	28.03.2016	61			
29.02.2016	6	29.03.2016	44			

During the ESA studies, PM2.5 measurements were not conducted. PM10 (24 hr) measurements reflect the particulate matter situation of the Project Site. However, the special experiment conducted in South Korea by Dr. Sarath K. Guttikunda<sup>18</sup> presents the following conversion table could be used<sup>19</sup>:

Measured PM10 AQI	5	10	15	20	25	30	35	40	45	50	55	60	65	100
Deducted PM2.5 AQI	9	26	40	54	61	68	76	83	92	99	116	132	149	175

According to the table, PM2.5 values (with range) at the baseline PM10 measurement locations are summarised in below table:

Measurement No:	Measurement Location (UTM ED-50, X, Y)	Measurement Date	Measurement Results (µg/m³)	Measurement Results (PM2.5) (µg/m³) <sup>20</sup>
PM10-1 (µg/m³)	515776 – 4259578	18.02.2015-19.02.2015	18,1	40-54
PM10-2 (µg/m³)	515944 – 4259834	18.02.2015-19.02.2015	18,8	40-54
PM10-3 (µg/m³)	516256 – 4259149	18.02.2015-19.02.2015	19,2	40-54
PM10-4 (µg/m³)	514970 – 4259113	18.02.2015-19.02.2015	19,1	40-54

As seen from the table, estimated PM 2.5 values are in compliance with the interim target of IFC which is 75 µg/m³.

Based on the characteristics described above, air quality characteristics are a component with a medium sensitivity.

<sup>18</sup> <http://www.dri.edu/directory/4902-sarath-guttikunda>

<sup>19</sup> <http://aqicn.org/experiments/south-korea-pm25-air-quality/>

<sup>20</sup> The first interim target limit value of pm2.5 for IFC is 75 µg/m3



**8.1.8 Noise and Vibration**

Study area for this component is presented in Figure 6.

During the baseline studies, baseline noise measurements were conducted at 8 points inside and around the project area. Information on the location of measurement points is presented in Table 12 and the location map of the measurement points is presented in Figure 10.

**Table 12: Noise measurement points**

Location No	Duration of the Measurement <sup>21</sup>	UTM ED 50 Zone 39		Justification for selection
		X	Y	
N(15)-1	15 minutes	516036	4259438	Project Area
N(15)-2	15 minutes	515845	4259857	Close distance to Laka Village
N(15)-3	15 minutes	515563	4260155	Close distance to Laka Village
N(15)-4	15 minutes	516025	4259819	Close distance to Laka Village
N(15)-5	15 minutes	515635	4259704	Project Area
N(15)-6	15 minutes	515042	4259535	Project Area
N(15)-7	15 minutes	514742	4259252	Close distance to highway
N(15)-8	15 minutes	516178	4259865	Close distance to Laka Village
N(24)-1	24 hours	515776	4259578	Project Area
N(24)-2	24 hours	515944	4259834	Close distance to Laka Village
N(24)-3	24 hours	516256	4259149	Close distance to nearby settlements
N(24)-4	24 hours	514970	4259113	Close distance to nearby settlements

<sup>21</sup> 21. Noise baseline measurements were 24-hour and 15-minute Leq values in line with the methodologies of Ministry of Environment and Urbanisation and EPA, USA. 15 minute measurement interval is defined in line with the national and ISO 1996-2 requirements considering the measurement location characteristics. 24 hr measurements are taken at selected locations to validate the 15 minutes measurement results. The results are found to be in correlation and used for comparison with national and IFC noise limits.



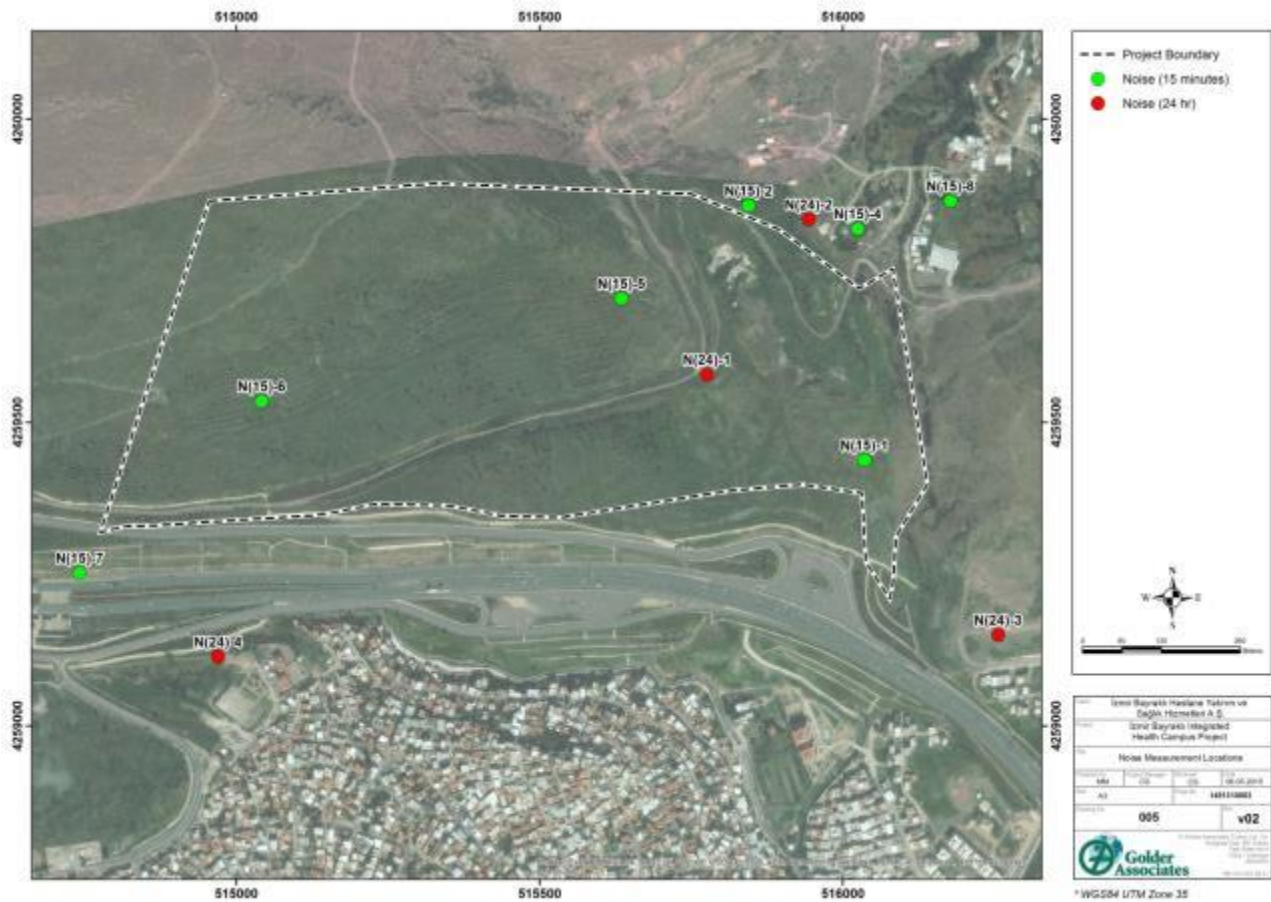


Figure 10: Locations of noise measurements points

The following methodology was applied:

- all measurements are performed at different periods and all of them are in the direction of project area.
- 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 8000 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.

Noise measurements were conducted using a Svan 957 device with HP filter.

### 8.1.8.1 Baseline

The measurement points and the results of the measurements are presented in Appendix L.

The Project Site itself is classified within “noise sensitive areas where education, culture and health facilities and recreational areas are densely located” in Turkish limits. As it is seen in Appendix L, day time noise levels are between 45.2 – 67 dBA and except the result in N(15)-1, measured noise levels are lower than 60 dBA according to 15 minutes measurements; however according to the 24 hour measurements, day time noise levels are vary between 64.3 – 71.7 dBA which are higher than the limit. Evening and night time measurements





are between 64.7 – 70.0 dBA and 62.7 – 68.6 dBA respectively and these results are above the Turkish limits of 55 dBA and 50 dBA given in Table 13.

**Table 13: Turkish Ambient Noise Standards**

Receptor Areas	L <sub>day</sub> (dBA)	L <sub>evening</sub> (dBA)	L <sub>night</sub> (dBA)
Noise sensitive areas where education, culture and health facilities and recreational areas are densely located	65	60	55
Areas where commercial buildings and noise sensitive areas are located but residential houses are densely located	65	60	55
Areas where commercial buildings and noise sensitive areas are located but business buildings are densely located	68	63	58
Industrial areas	70	65	60

**Source:** Regulation on Assessment and Management of Environmental Noise

The Project Site is classified within “residential areas” in IFC limits. The baseline measurements indicated that day time noise levels are between 45.2 – 67 dBA and except the result in N(15)-1 and N(15)-7, measured noise levels are lower than 55 dBA (IFC day time limit) according to 15 minutes measurements. Day time and night time baseline measurements according to 24 hours measurements vary between 65 – 71.1 dBA and 62.2 – 68.1 dBA respectively and these results are higher than the IFC standards of 55 dBA and 45 dBA, given in Table 14.

**Table 14: 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 main noise source at N(15)-1, N(15)-5, N(15)-6, N(15)-7, N(24-1), N(24-3) and N(24)-4 points is vehicle movements on the main road at south border of the project area.

Based on the characteristics described above, noise and vibration characteristics is defined to be medium sensitivity.

**8.1.9 Traffic and Infrastructure**

Traffic baseline data is collected to be used in the traffic impact assessment.

Sources that were used during the baseline data collection are:

- Available information in the literature
- Special traffic study were conducted by the SPV
- Special traffic study were conducted by Golder



The main existing access road that was assessed for the Project Site is the highway O-30 which runs along the south border, separating the Project area from the Bayraklı District. The O-30 highway runs east-west direction of the road connecting to the close neighbourhoods of Bornova and Karşıyaka with Bayraklı. There is a service road which allows drivers to change the direction. The access to the Project would be from this service road. According to the traffic study that was conducted by the Client, accesses to the project site were proposed through two different points, placed in the south-east and south-west points (APPENDIX A).

The Study Area for the traffic and infrastructure is defined as roads approaching to the project site and the surrounding area including İzmir Province. Study area for this component is presented in Figure 6

### 8.1.9.1 Methodology

The traffic study has been made in order to assess the traffic impact of Project to the current infrastructure and traffic. The scope of the study is:

- Research and observation of existing transportation, infrastructure and traffic condition on Project site.
- Determination of the traffic load of Project
- Projection of traffic volume in the future
- Geometric analysis of the car parking.
- Recommendations on the improvements on the transportation infrastructure, if required.

On February 01<sup>st</sup>, 2015, a specific study was conducted to assess the vehicular traffic at two connecting service roads (Route 1 and Route 2). Information on actual traffic flow data based on the vehicle category (light vehicle or heavy vehicle) was collected; the number of average hourly passages was counted on roadways on the two different locations indicated in the figure below.

The study was conducted between 15:00 and 16:00.



Figure 11: Traffic routes

### 8.1.9.2 Baseline Results

The literature data reviewed for the recorded vehicle movements on the O-30 highway. Turkish Highway Directorate records the traffic movement on the main roads and the recorded traffic loads on these sections are shown in the following figure.

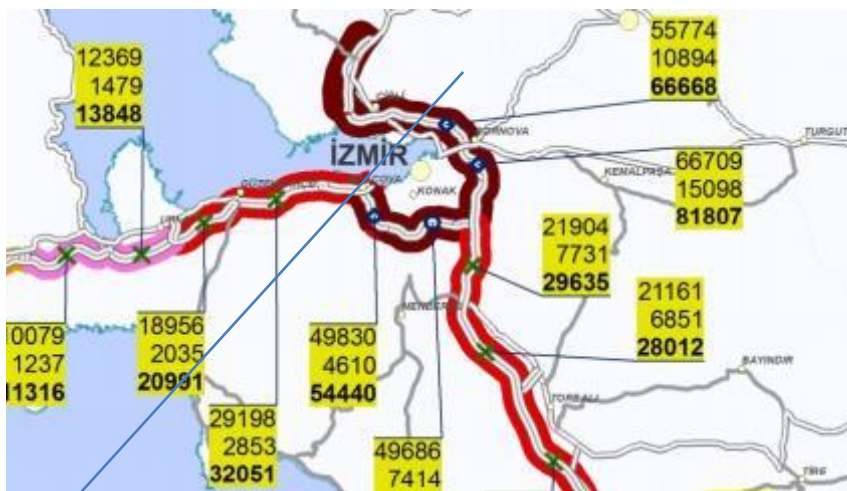


Figure 12: Vehicle Movements on O-30 Highway

Where:

Average number of vehicles recorded per day on O-30 highway	
55774	Light vehicle
10894	Heavy vehicle
66668	Total

There is a service road connecting to the O-30 highway for accessing to the Project site. Number 1 and 2 which is shown in above traffic routes figure are single-lane, paved roads in good condition. During the construction and operation period of the Project the existing roads will be used.

The land traffic in the construction phase will be generated by the machinery, equipment, material and staff to be transported to the Project Site. During the construction phase an increase especially of trucks is expected.

Based on the specific study conducted on February 01<sup>st</sup>, 2015 the traffic flow of study area is estimated as 60 heavy vehicles and 180 light vehicles per hour for the route 1, 72 heavy vehicles and 186 light vehicle per hour for the route 2.

Based on the characteristics described above, traffic and infrastructure are a component with a medium sensitivity.

### 8.1.10 Conclusions

The following points can be concluded on the physical environmental characteristics of the project area;

- The Andesite-Agglomerate unit which is observed as the dominant formation in the Project Area.
- Project site is in 1<sup>st</sup> earthquake zone
- The results of the chemical analyses performed on the soil samples do not show significant soil impact on the Project Area. Some presences may be due to natural and anthropogenic causes as the Project Area is located within an industrially developed province.
- In order to describe the baseline surface quality, 2 surface water samples were collected from the Laka Creek at 100 m of the Project Area and the artificial pond located 150 m north of the Project Area during the site visit conducted on 2 - 3 February 2015. . The resulting water classification for the sample collected from the Laka Creek is Class IV - Heavily Contaminated Water. Animal farming is the main source of the income for most of the residents of Laka Village. Animal faeces were observed along the banks of the Laka Creek during the sampling and the creek is highly impacted from the anthropogenic and livestock



activities. The resulting water classification for the sample collected from the Artificial Pond is Class II - Slightly Contaminated Water.

- According to the Geological-Geotechnical Investigation Report, groundwater was not encountered in the borings drilled down to depths varying from 32 m to 55 m. It is expected that the regional groundwater level is deeper than 55 m.
- PM<sub>10</sub>, settled dust and SO<sub>2</sub>&NO<sub>2</sub> measurement values at and around project site comply with limit values of both national and WHO standards except from NO<sub>2</sub> values for P-2 and P-3 due to the heavy vehicular traffic on the stabilised road during the measurement period. Annual monitoring of ambient NO<sub>2</sub> levels will provide a robust description of the baseline conditions for the ambient levels of NO<sub>2</sub> in air in the project area of influence.
- The baseline measurements indicated that day time noise levels are between 45.2 – 67 dBA and except two results measured noise levels are lower than 55 dBA (IFC day time limit) according to 15 minutes measurements. Day time and night time baseline measurements according to 24 hours measurements vary between 65 – 71.1 dBA and 62.2 – 68.1 dBA respectively and these results are higher than the IFC standards of 55 dBA and 45 dBA. The recorded exceedances are estimated to be result of traffic and pedestrian movements close to the sampling points.
- Considerable traffic movement is present on the southern access route to the project area.
- Traffic routes providing connection to the Project Site are single-lane, paved roads in good condition. During the construction and operation period of the Project the existing roads will be used.

## 8.2 Biological components

Study area for this component is presented in Figure 6.

A **literature research** was performed focused on the RSA area in order to document species and habitat types potentially present in the study area. Scientific literature and “grey” literature were considered in order to give an overview of the vegetation occurring in the area. The literature survey output is presented in Appendix H.

A **field survey** was conducted on March 25<sup>th</sup> (2015) in the LSA in order to confirm the habitats and identify the presence of flora and fauna species with particular regard for characteristic, exotic, threatened or protected species. Analysis of flora species assemblages helped to confirm the habitat classification and the potential for hosting fauna species. A list of flora species was created from these field surveys and their global and national conservation status

Studies on fauna were supported by literature research and incidental field observations during the field survey. in Appendix H. includes the findings of the field survey.

### 8.2.1 Baseline

### 8.2.2 Terrestrial Flora and Vegetation

Studies on terrestrial flora and vegetation are supported by literature research and incidental field observations during the field survey that took place in March 27<sup>th</sup> (2015).

No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) were observed or in the study area. The species present are influenced by anthropogenic disturbances (grazing, discharge of construction waste, pollution, reforestation with exotic species).

Based on the characteristics described above, terrestrial flora and vegetation is a component with a low sensibility.



### 8.2.3 Terrestrial Fauna

Studies on fauna are supported by literature research and incidental field observations during the field survey that took place in March 25th (2015).

No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) were observed or are expected to be present in the LSA. The only threatened species potentially present is the common tortoise (*Testudo graeca*) listed as vulnerable (VU) by IUCN. Numerous species potentially present in the region are also listed in Appendix II and III of Bern Convention and Appendix I, II or III of M.A.K. decisions.

It should be noted that populations or individuals of the fauna species that could occur in or visit the study area are already impacted by anthropogenic disturbances such as urbanization, grazing, discharge of construction waste, pollution and reforestation with exotic species. Therefore the stable presence of sensitive species in the situ is considered improbable.

Based on the characteristics described above, terrestrial fauna is a component with a medium/low sensibility.

### 8.2.4 Habitats and Biodiversity

The following habitat types were defined in the LSA:

- re-forested Mediterranean maquis;
- Mediterranean maquis;
- pond;
- stream;
- garden and agriculture;
- urbanized.

The habitat types present in the LSA were mapped based on satellite imagery and on the data collected during the site survey performed on March 25<sup>th</sup> 2015. The area of each habitat type identified in the LSA was calculated and are presented in Table 15 and Figure 14.

**Table 15: area of each habitat type for the footprint area, the buffer area and the total LSA**

Habitat Type	LSA (ha)	LSA (%)
re-forested Mediterranean maquis	163.53	23
Mediterranean maquis	241.84	34
artificial pond	0.38	<0.1
stream	11.37	2
garden and agriculture	38.03	5
urbanized	261.00	36
<b>Total</b>	<b>716.14</b>	<b>100</b>





Figure 13: Habitat types mapped within the LSA

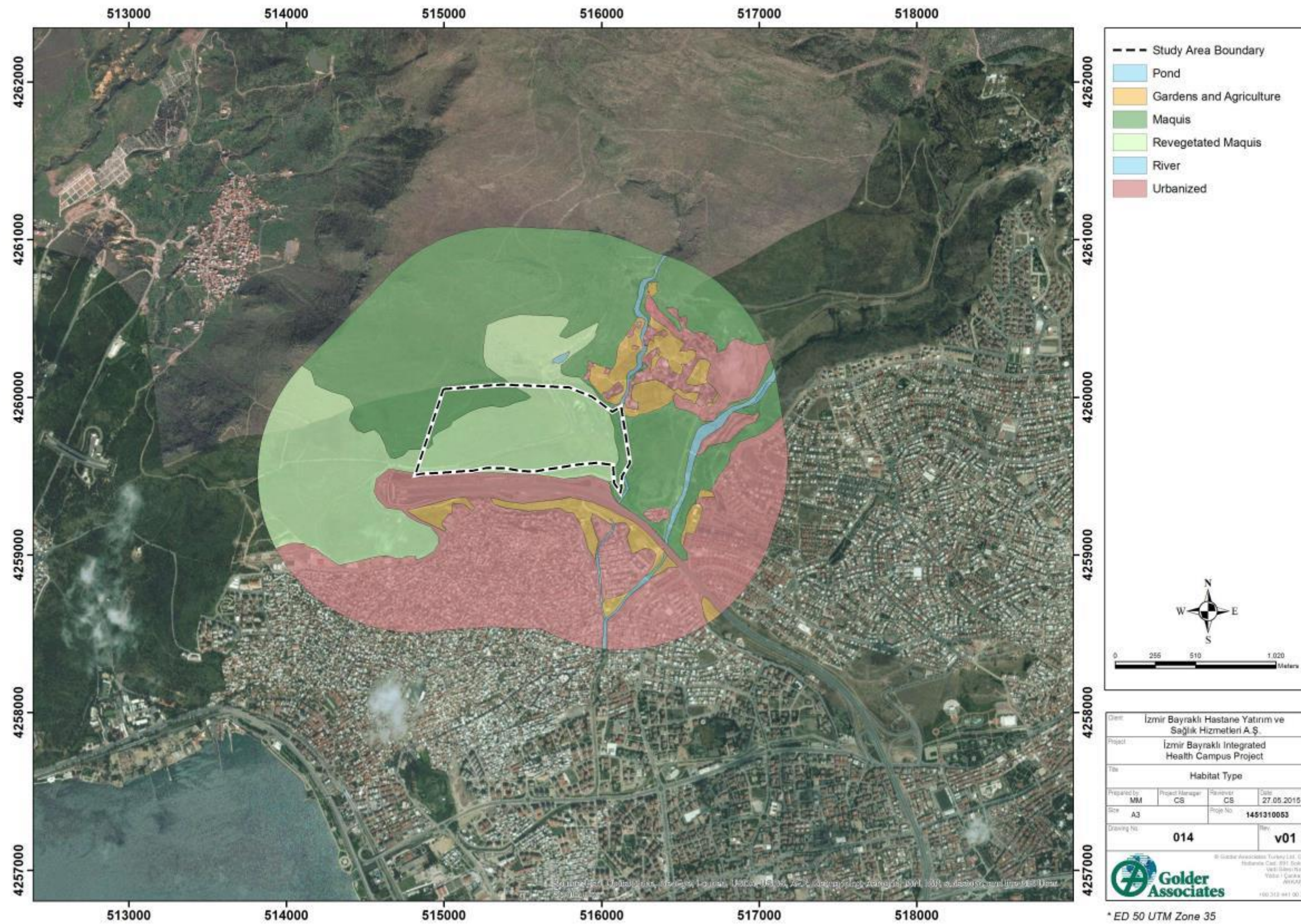






Figure 14: Mediterranean maquis (top left), artificial pond (top right), re-forested Mediterranean maquis (bottom left), degraded stream at the margins of an urbanized area (bottom right)

The main habitat present within the LSA in Mediterranean maquis (57% of the LSA characterized by rock outcrops and rocky slopes). The areas at lower elevation are heavily grazed by cattle. Better preserved and less grazed maquis with more diverse and natural vegetation is present on the hill top, in the buffer area north of the planned footprint.

Part of the maquis vegetation present in the LSA (23% of the LSA) was reforested in 2012 using the exotic species eucalyptus (*Eucalyptus* sp.) together with *Cupressus sempervirens* and *Pinus* sp. Eucalyptus is still extensively used in reforestation since it is a robust fast growing species that guarantees the success of the afforestation even in difficult and arid conditions. However, the introduction of Eucalyptus could have negative effects on the local environment, e. g., inducing soil degradation, decline of groundwater level, and decrease of biodiversity. Eucalyptus plantations are effective in reducing groundwater level because of high rate of transpiration and evaporation (White et al. 2002). In general, Eucalyptus uses more water than native species (Zahid et al. 2010). The increased water use by Eucalyptus depletes ground water and may lead to desertification (Zahid and Nawaz 2007).

The urbanized areas, gardens and agricultural areas are also an important component within the LSA (36 and 5 % of the LSA respectively). The project site is situated in the suburbs of Izmir and the area is used not only for cattle grazing and bee keeping but also for recreational purposes.

A small artificial pond is present in the north west part of the LSA, uphill from the project. The Pond is used for water buffalo *Bubalus bubalis* but it has developed some natural wetland vegetation (ex. *Salix* sp., *Phragmites australis*) and it is an important area for wildlife.



The two streams present in the LSA are degraded due to the removal of natural vegetation and pollution caused by illegal dumping of waste and construction material. Cattles farms present in the area also contribute to the eutrophication of the streams.

The biodiversity level of the area is highly impacted by the anthropogenic disturbances described; however Mediterranean seminatural maquis habitats in good conservation conditions are present in the buffer area at higher elevations. The site is also situated in the proximity of key biodiversity areas (section 8.2.5).

Based on the characteristics described above, habitat and biodiversity has a medium sensibility

### 8.2.5 Protected areas

A National Park and a Natural Park are present a within a buffer of 20 km from the Project site

**Örnekköy Tabiat Nature Park** (119 ha) is situated at about **5 km** from the site. Nature Parks are areas that contain characteristic vegetation and wildlife features and are particularly suitable for recreational activities.

The **Spil Dagı (Spil Mountain) National Park** is found at about **20 km** north east from site in Manisa province. This National Park was established in 1968 for its wide variety of flora and fauna and its mythological and historical heritage. The area is characterized by canyons, caves and steep valleys. The main species of trees here include pine, juniper, poplar, walnut, elm and oak. The Manisa tulips, which gave their name to a period of the Ottoman Empires, is the iconic species of the park. Species of wildlife living in the park include bears, jackals, roe deer, foxes, badgers, wild goats, vultures and eagles.

In addition to those two protected areas, the presence of four areas identified for their biodiversity value as **key biodiversity area (KBA) and Important Bird area (IBA)** should also be mentioned since they can be considered as “priority biodiversity features” (EBRD 2014). These areas are listed below:

- Yamanlar Dagı key biodiversity area (KBA) in the proximity of the Site the Nord –East;
- Gediz Delta Important Bird area (IBA) is situated about 8 km West of the site;
- Nif Dagı (Nif Mountain) key biodiversity area (KBA) about 9 km South-East of the site
- Spil Dagı (Spil Mountain) key biodiversity area about (KBA) 10 km East of the site

In addition to the protected areas described, three key biodiversity areas (KBA) called Yamanlar Dagı, Nif Dagı and Spil Dagı were identified in the proximity of the Project. These areas are not strictly “protected areas” but they are recognized internationally as important for their biodiversity value.

**Yamanlar Dagı** (362 km<sup>2</sup>) is situated in the proximity of the Site Nord –Est. This particular site is characterized by Phrygana-maquis formations, Coniferous forests (*Pinus brutia* and *P. nigra*), deciduous forests (*Castanea sativa*) and rocky lands. 18 IUCN red list species are present in this area (Eken et al., 2006) including striped hyena (*Hyaena hyaena*), lynx (*Lynx lynx*), and caracal (*Caracal caracal*) all considered endangered (EN) at National level.

The key biodiversity area (KBA) **Nif Dagı (Nif Mountain)** is about **9 km** South-East of the site. Its extension is of about 214 km<sup>2</sup> and it is characterized by Phrygana-maquis formations, Coniferous forests (*P. brutia* and *nigra*) and mountain pastures. I contains up to 30 IUCN and National/Regional red list species including large carnivores such as striped hyena (*Hyaena hyaena*), lynx (*Lynx lynx*), and caracal (*Caracal caracal*).

**Spil Dagı (Spil Mountain)** key biodiversity area about (KBA) 10 km East of the site and it surrounds the Spil Dagı (Spil Mountain) National Park

A Ramsar Region, also recognized as Important Bird area (IBA) called **Gediz Delta** (175 km<sup>2</sup>) is situated about **8 km** West of the site. The Gediz Delta Ramsar Area (The List of Wetlands of International Importance, 1 March 2012) has an extension of 14,900 ha. The site is an extensive coastal wetland with bays, salt and freshwater marshes, large salt pans, and four highly saline lagoons located at the mouth of the Gediz River near Izmir. The site supports dry grasslands, arable land, and some woodland. The globally threatened pelican *Pelecanus crispus* breeds at the site, since this is an important area for breeding, feeding, wintering, and



sheltering of internationally important numbers of species of water birds. The Gediz River is of vital importance for agriculture in the region, but is becoming significantly polluted; human activities include fishing, agriculture, cattle grazing, and the largest salt production centre in the country is present here.

Based on the characteristics described above, protected areas are a component with a high sensitivity.



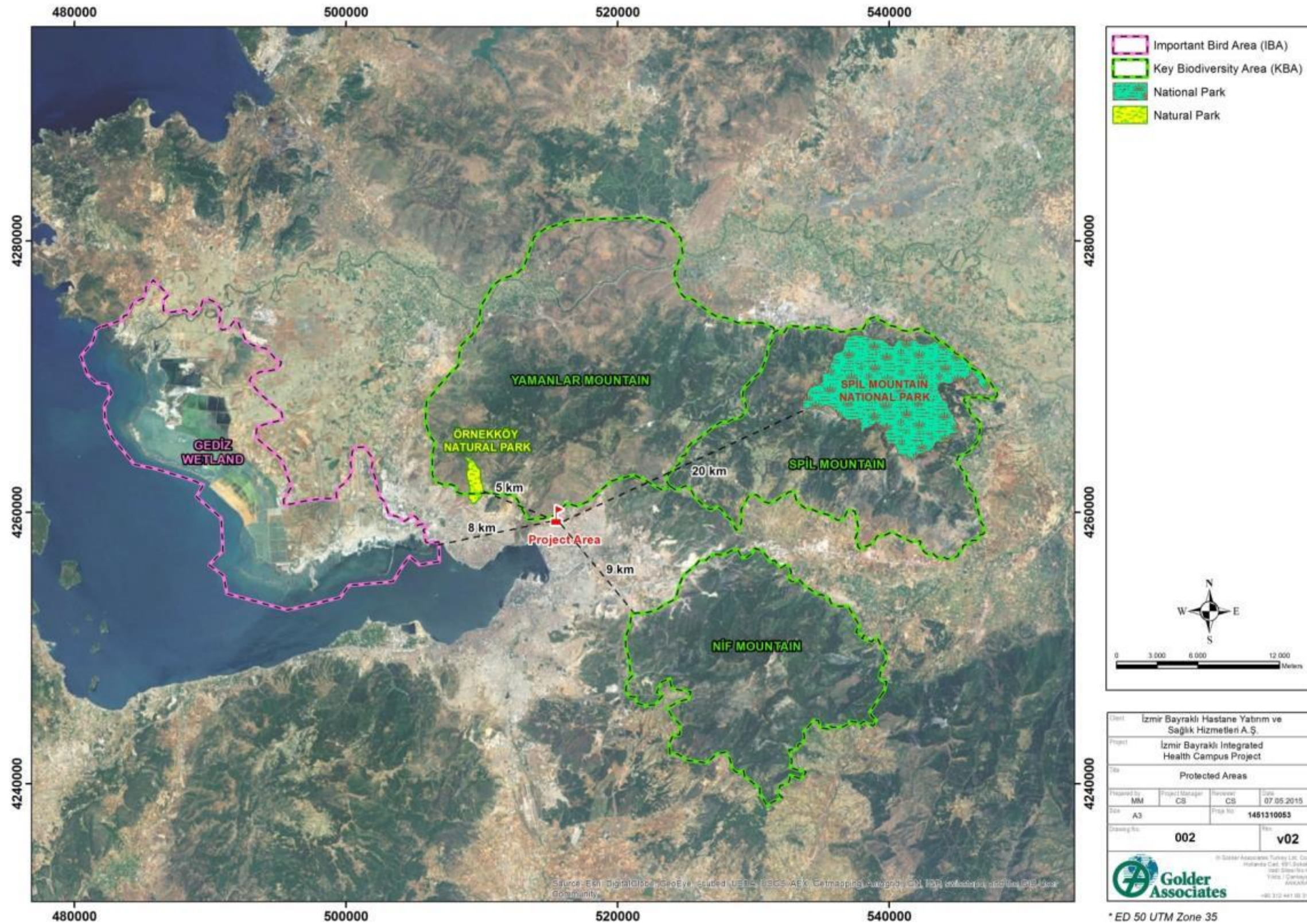


Figure 15: Protected Areas





### 8.2.6 Conclusions

The following points can be concluded on the biological environmental characteristics of the project area;

- No Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species (IFC 2012) were observed or in the LSA. The species present are influenced by anthropogenic disturbances (grazing, discharge of construction waste, pollution, reforestation with exotic species).
- The only threatened species potentially present is the common tortoise (*Testudo graeca*) listed as vulnerable (VU) by IUCN. Numerous species potentially present in the region are also listed in Appendix II and III of Bern Convention and Appendix I, II or III of M.A.K. decisions. The populations or individuals of the fauna species that could occur in or visit the LSA are already impacted by anthropogenic disturbances such as urbanization, grazing, discharge of construction waste, pollution and reforestation with exotic species. Therefore the stable presence of sensitive species in the LSA is considered improbable.
- The biodiversity level of the area is highly impacted by the anthropogenic disturbances described; however Mediterranean seminatural maquis habitats in good conservation conditions are present in the buffer area at higher elevations. The site is also situated in the proximity of key biodiversity areas.
- **Yamanlar Dagi** (362 km<sup>2</sup>) is situated in the proximity of the Site Nord –Est. This particular site is characterized by Phrygana-maquis formations, Coniferous forests (*Pinus brutia* and *P. nigra*), deciduous forests (*Castanea sativa*) and rocky lands. 18 IUCN red list species are present in this area (Eken et al., 2006) including striped hyena (*Hyaena hyaena*), lynx (*Lynx lynx*), and caracal (*Caracal caracal*) all considered endangered (EN) at National level.

### 8.3 Social Components

The study area for social components is decided based on the administrative units, considering that statistical information is usually aggregated and presented according to these boundaries. Study area for this component is presented in Figure 6.

In the case of the present project information has been collected on an area that extends to Greater İzmir with a specific focus on the neighbouring settlements around the project site for primary data collection and is determined as follows:

- Greater İzmir Municipality area
- Bayraklı District
- Laka Village
- R. Şevket İnce Quarter
- Doğançay Quarter
- Osmangazi Village

The project site is located in Laka Village of Bornova District in İzmir province<sup>22</sup>. Though the project site is inside Bornova District administrative unit, Bayraklı district centre is in the close vicinity of the project site. Therefore baseline data collection is focused on Bayraklı District Center but not Bornova District Center.

When available, information is also collected at a national level, to allow comparisons between the local context and the overall situation in Turkey.

<sup>22</sup> The rural areas of Laka village is part of Bayraklı District while the settlement area is part of Bornova District.



A portion of baseline socioeconomic data was collected through desktop, as significant amount of literature secondary socio-economic data on the study area can be found through these means.

In particular most of the information was found through;

- Turkish Statistical Databases,
- Izmir Chamber of Commerce and
- Izmir Development Agency Reports.
- <http://www.bornova.bel.tr>
- <http://www.izmir.bel.tr>

Desktop research is primarily focused at gathering hard data and statistics that will then be validated through the collection of qualitative information from the field studies.

Considering the social context and the nature of the project and in addition to the secondary data the qualitative primary baseline information has been collected at district and village/quarter level by using four different means of site data collection. During the socioeconomic baseline data collection following engagement activities were conducted with the project stakeholders between 7<sup>th</sup> and 11<sup>th</sup> of April, 2015

#### Key informant interviews with various stakeholders;

Interviews have been performed with the following groups of stakeholder using a customized in-depth questionnaires. (See APPENDIX C)

Bayraklı Municipality Environmental Protection Directorate

- Bayraklı Municipality Development Directorate
- Bayraklı District Health Directorate
- Izmir Greater Municipality Development General Secretariat
- Northern Hospital Association

#### In-depth interviews focused on economic activities

In depth interviews have been carried out with stakeholders engaged with economical activities in the local study area.

The stakeholders contacted in Laka village are;

- Husbandry owners
- Shop owners
- Workshop owner

#### Community level interviews with village people,

Information on the socioeconomic status at local study area has been collected through interviews with the following local stakeholders using community level questionnaires

- Laka Village Mukhtar
- Osmangazi Village Mukhtar
- Osmangazi Village Mukhtar
- Laka Village Council Member





- Laka Village Religious Head
- Head of Laka Municipality Sports and Cooperation Association

During the interviews the concerns of the stakeholders on the potential impacts of the project have also been collected.

### Focus groups.

Focus group meetings where the attending stakeholder can interactively engage to the meeting, have also been conducted with the following groups. (See questionnaire for focus group discussions.(See APPENDIX C):

- Laka Village women
- Laka Village men
- Bayrakli City Council

### Engagement with the project sponsor

SPV has been requested through a filling a specific questionnaire to provide information on the recruitment policy and the social and environmental management plans to be prepared to minimize the impacts of the project.

### **8.3.1 Socio-economic conditions and employment issues**

Izmir is the third most populous city of Turkey and has the country's largest port after Istanbul. It lies on the coast of The Aegean Sea. Bayrakli is one of the 30 districts of İzmir province.

The population density in Bayrakli District is 12,257 which is considerably higher than the İzmir Province average of 322. This makes Bayraklı District the second most populated district after Konak (with a population density of 17,130).

Bayrakli district is the sixth most populated district of İzmir. (İZKA, 2013). Referring to Turksat 2014 figures of Address Based Population Registration System (ABPRS) the total population of Bayraklı district is 310,765. The change in population figures through the years and the gender distribution , the annual population increase rate are presented in APPENDIX L.

The average age among people in İzmir is 34.1 (higher than national average of 30.1). The average age of people in Bayrakli district is 32.8 which is higher than national average while lower than province average. (İZKA, 2013). The population distribution over age groups in Bayraklı District is presented APPENDIX L

The district has the fifth highest average household size figure of 3.35 in the overall İzmir (TÜİK, 2013).

The total population in Laka village is 381; 198 of which is male and 183 are female and the population density is 60.(2011, <http://www.bornova.bel.tr>)

As stated by the Laka village mukhtar;

There are 120 household in the Laka village. Nearly 50% of the village population is elementary school graduate and 25% of the village population is high school graduate. There is not significant change in the village population in the last five years.

There are three handicapped persons and 8 woman household heads in the village that can be categorized as vulnerable groups.

Laka has taken the village status in 1994 and the mukhtar of Laka village has not changed since 1994.

#### **8.3.1.1 Economic Structure**

Bayraklı district is rather developed as a residential area than a trading, industrial or agricultural region. The economic structure is based on the tradesmen and small sized businesses. The large scale food manufacturing



facilities such as Piyale, Tariş Cottonoil, Altınbaşak Flour Factory and Turyağ are demobilising or have demobilised since the District is becoming more and more residential. The lands of these facilities will be part of Business Centre Areas to be built as part of the new city centre development plan . (İZTO,2008)

Lands available for agricultural activities are nearly extinct in Bayraklı District. Majority of the agricultural land is occupied with residential buildings and the rest is not cultivated.

The milk production in the district is 105 tonnes/year, and honey production is 36 tons/year. 465 sheeps/goats and 119 cattles produced per year in the district. There is not poultry animal breeding in the district. With these figures the income from animal husbandry in the district is below the province average. (TÜİK, 2013)

Though the district is cited to host historic settlement like Smyrna (Tepekule) of 3000 ages, the cultural tourism has not developed in the Bayraklı. (İZTO, 2008).

### Laka Village

There was apiculture activity observed in Laka Village during social surveys before the construction phase. The beehive owners did not reside in Laka Village. According to the social survey, beehive owners are living in Giresun (north of Turkey) and were using the lands seasonally around the project . Their bee hives were located outside the project site, which was north-east direction of the Site and they abandoned the sites before the start of the construction activities.

There are 400 stalled cattles and 1000 stalled sheeps/goats owned in Laka Village as stated during the site survey interviews with the mukhtars and the livestock owners. They do not use the Project area as a grazing land. Besides that nearly every household in the village has poultry coop serving for the household own consumption and also creating economic income for the household. Laka neighbourhood serves as the meat, milk and egg supplier to the nearby urbanised provincial areas. There are cultivated agricultural areas in the form of orchard, vineyards and gardens in the village also providing economic income at the household level.

30% of the population in Laka is retired. 20% of the population is self employed, 5% is tradesmen/craftsmen and the rest is occupied at agricultural activities. The average income per household is 1500TRL. There is workforce in the village with construction works experience that could be employed as :

- Logger
- Heavy vehicle driver
- Administrative and office personnel with computer literacy
- Welders, metal worker
- Drivers

### **8.3.1.2 Conclusions**

The presented baseline data for socioeconomic conditions and employment issues point out that;

- The project site is bounded by two settlements areas with different demographic and socioeconomic characteristics.
- Bayraklı District is a highly populated urban area whereas Laka –Village is a less populated area with rural characteristics
- The main economic activity in Bayraklı District is trading and small sized business whereas the main economic activity in Laka Village is agriculture and husbandry.
-



- The sensitivity of the socio-economic and employment context is reported to be medium.

### 8.3.2 Social Services and Facilities

#### 8.3.2.1 Education

The literacy rate in Turkey is %96 by the year of 2013. The literacy rate in İzmir is %97.7 and higher than national average. The literacy rate among total population of Bayraklı District is 97%. (TUIK, 2013)

The total number of illiterate people in Bayraklı District is 5,828 by 2013 where 4,904 of them are female and 924 are male. (TÜİK, 2013)

There are 26 public primary schools, 20 public middle schools and 9 public high schools , 1 community education centre and 1 counselling research centre and three pre-schools in the District. There are many private education facilities in the District.

The average number of students per classroom in İzmir General area and Bayraklı District are given in APPENDIX L . As can be seen in APPENDIX L the student numbers per classroom in Bayraklı are higher than the figures for İzmir. The situation is similar in middle schools and high schools; Bayraklı District has the fifth and third in İzmir Province with the highest number of students per classroom in middle schools and high schools respectively.

Based on the statistics of İzmir Development Agency, Bayraklı District has lower schooling rate than General İzmir Province has, in relation to the preschool, elementary school and middle schools as seen in (See APPENDIX L)

However the district has better positioning among İzmir districts and at national level in relation to percentage of people with higher education in the general population.

The percentage of people with higher education in Bayraklı district is %15,79. The percentage of people with higher education in İzmir Province is %14,81 (İZKA, 2013).

The total number of cultural facilities in the district is 47. There are two libraries in the district and in addition there are three cultural centres, one open air theatre, one exhibition venue and one movie theater.

There are no preliminary, middle of high school in Laka Village. There are 30 students in the village. Since the location of the village is in close distance to the other settlement areas, the resident students in the village can go the schools in neighbouring settlement areas. 50 % of the village population is primary school graduate.

Any educational facility has not been identified in the impact area of construction activities. The nearest school is Trade Stock-Exchange High School which has 500ms of air distance from construction site and located at south of main İzmir Highway O-30.

#### 8.3.2.2 Health

Substantial information on the existing health services in İzmir Province in general is provided in Section.1.2.

More specifically, there is a district polyclinic of Alsancak State Hospital located in Bayraklı. There is one private healthcare facility with 89 beds. There are 23 Family Health Center, 96 Family Medicine Units, 1 Family Planning Unit, 6 private dialysis centre, 17 private practices and 46 dental private practices in Bayraklı District. (İZKA; 2013).

In the case of the present project, specific information has been collected during socioeconomic survey activities on the status, adequacy and availability of health services in İzmir Province and in the Bayraklı District and summarized as below;

- It has been stated during the focus group meeting with Bayraklı City Council that there is requirement for a general hospital in the region or capacity increase of existing hospitals.



- It has been stated by the representative of North Hospital general Directorate that though the population İzmir has increased in the last 20 years, however the rate of increase in the available health care services has not been able to meet the increase rate in population. Another concern stated by the representative was that new health care services established in the last 20 years has difficult access.
- The Health District Directorate stated there are 325000 people registered under family medicine system in Bayraklı and the existing health services capacity in the district is not adequate to respond the needs of this population.
- Majority of the Laka Village residents use Ege University Hospital which has approximately 4,5 kms of air distance to Laka Village.

### 8.3.2.3 Conclusions

The presented baseline data for social services point out that;

- Literacy rate in Bayraklı District is close to İzmir general average and higher than the national average.
- Although there are various number of educational facilities at different levels the schooling rate in the district is lower than general İzmir average
- There are no educational facilities in Laka village. The students are travelling to the educational facilities in nearby settlements.
- There are various health care facilities in Bayraklı District and no health care facility in Laka village. The officials interviewed states that there is requirement for a general hospital in the region or capacity increase of existing hospitals.
- There is not an educational or health services facility in the direct impact area of the project.
- The sensitivity of the social services context is reported to be low.

### 8.3.3 Infrastructure

#### 8.3.3.1 Transportation

The transportation system in İzmir Province is composed of public transportation system and the highway and road network.

The public transportation system has the following service components:

- Maritime services
- Railway services
- Bus services
- Dolmuş services<sup>23</sup>

Access to project area from various locations in İzmir by using the public transportation is only possible via a combination of these systems.

The closest maritime port is Bayraklı Port as seen in Figure 16.

<sup>23</sup> Private public transportation means similar to bus services by individual minivan drivers







Except from Bornova railway station; access by bus services requires changing bus service lines at intermediate stations.

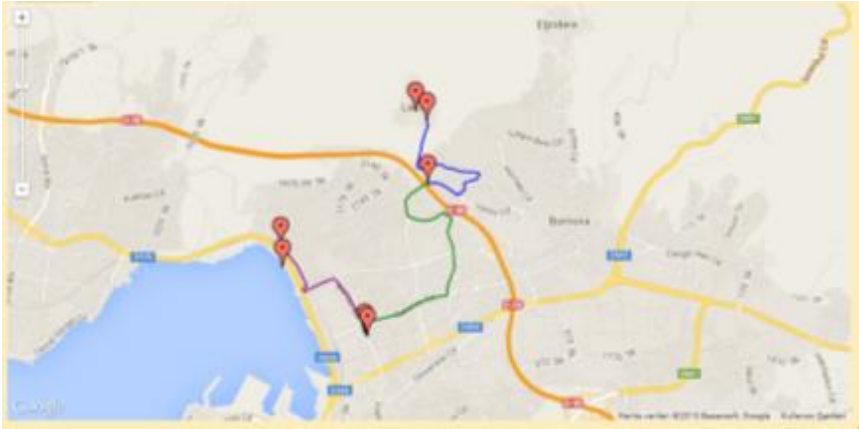


Figure 18: Bus services from Bayraklı to Laka Village-project site

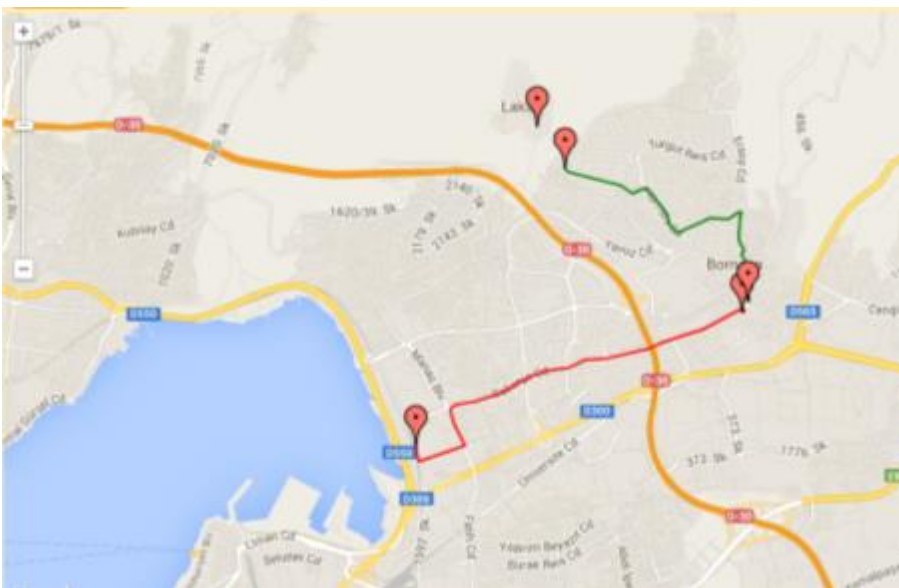


Figure 19: Bus services from Salhane to Laka Village-project site



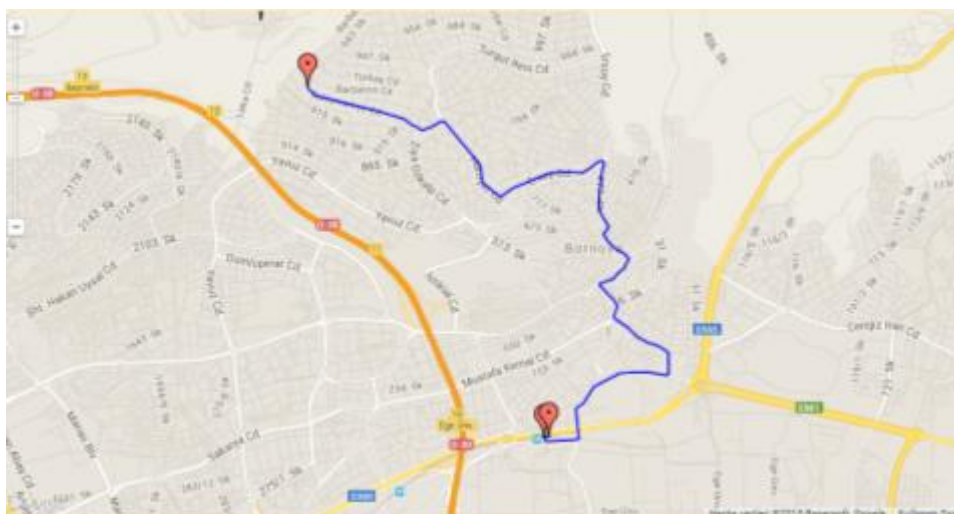


Figure 20: Figure 8: Bus services from Bornova to Laka Village-project site

The project site is close to Izmir Highway E87(O30) and to Laka street. There is no direct connection from existing road network to the project site at the moment as seen in Figure 21:



Figure 21: Road network close to project site

### 8.3.3.2 Others

In 2010 the ratio of the population with access to drinking and consumption water network to the general population in İzmir municipality service area has become equal to the national average of 99%. The infrastructure of electricity and communication is also developed in the general municipality area. The electricity consumption is 3774kWh per capita which is above the national average of 2344kWh. (Turstat, 2013).

The waste management system in İzmir municipality area has the following components;

- Collection at source and transportation of waste to the transfer stations which is under the responsibility of the district authorities.



- Transportation of waste from the transfer station to the final disposal area by the municipality authority.

There are two waste disposal facility serving Izmir Municipality area:

- Harmandalı Landfill Area for domestic wastes, non-hazardous industrial wastes, waste sludge
- Bergama Landfill Area for domestic wastes

The total amount of waste produced in Izmir city is 4500 tonnes/day and the amount of medical waste produced in Izmir city is 12tonnes/day. (<http://www.izmir.bel.tr>)

The medical waste produced by any facility in the city of Izmir is transported to Manisa Medical Waste Sterilisation Facility licenced by Manisa Municipality. (<http://www.izmir.bel.tr>).

As per the situation in the Laka village the Table 16 summarizes the general infrastructure conditions at the village.

**Table 16 Infrastructure in Laka Village**

Infrastructure	Yes	No	Remarks
Water (well, springs)	X		
Electricity	X		
Waste collection	X		By the municipality
Shopping	X		
Roads	X		
Internet	X		
Telephone line	X		
Transportation	X		Bus service: Three in the morning, three at night as a total six per day
Irrigation		X	

### 8.3.3.3 Conclusions

In the light of the baseline information presented above on infrastructure following conclusions can be drawn;

- Though public transportation network is fairly developed in Izmir and Bayraklı direct access to Laka village is only by bus.
- The project site is close to Izmir Highway E87 and to Laka street. There is no direct connection from existing road network to the project site at the moment.
- Other infrastructure; electricity network, communication, water and wastewater is available in Laka Village
- There is already a management system for the disposal of medical wastes in Izmir.
- The sensitivity of the socio-economic and employment context is reported to be medium.

### 8.3.4 Land use

The rural areas of Laka village is part of Bayraklı District while the settlement area is part of Bornova District.

The total amount of land owned by the villages is 190 ha. Since stock-farming is done in the village, the land is not used for routine animal grazing as stated by the village mukhtar.

As stated by the District Municipality representatives, the land where the proposed project is to constructed is forestation area. However when Bayraklı is given the district status in 2009 it has been estimated that the



urbanisation will extend towards this area. The representative stated that the soil quality in the project land is not suitable for forestation. The foresters in the region has also stated that it will not be possible to perform a successful forestation on this land.

The sensitivity of the socio-economic and employment context is reported to be low.

### 8.3.5 Cultural Heritage

Study area for this component is presented in Figure 6.

In order to collect baseline data on possible archaeological or immovable cultural assets within the project area, the following studies were conducted;

- desktop studies
- field works, and
- meetings with related public authorities.

The archaeological publications regarding the area were reviewed. Consequently, an academic background on the archaeological potential of the area was established. Indication of any previously identified and registered cultural assets were searched by contacting the İzmir Regional Preservation Board for Cultural Assets. Before the field works, REGIO Site Team has analysed the aerial photographs of the project area together with the GIS Team (Map1). In addition, a 1/25000 scale map with corner coordinates of the project area were produced for the field work (Map 2).

Archaeological sites identified during the desktop studies were marked on the map to form an association with the project area. Desktop studies were implemented in parallel with the field works. Resources used during the desktop studies are:

- Academic Publications
- Historical maps
- Reports on previous Cultural Heritage Works and Field Survey Results
- Inventory Archives of the Ministry of Culture and Tourism.

A study plan for field works has been developed considering the geographical context of the project area. According to the methodology, the project area was divided into grids on the east-west direction and the survey was conducted by walking across the grids in order to scan archaeological assets within the area. The survey carried out by 2 archaeologists experienced on construction and infrastructure projects<sup>24</sup> (Figure 22).

No negative factor (trees and bushes) that prevents the effective observation during the archaeological survey were found on the project area. With the methodology, it is aimed to observe, register and evaluate the visible archaeological traces (potsherds, architectural remains, burials, tumuli, etc.) with respect to geological and archaeological features of the region. In the areas where the archaeological potential is high, archaeological studies were conducted to identify any archaeological assets to the extent permitted by the surface conditions.

<sup>24</sup> Halim ÖZATAY, Serkan AKDEMİR.



Figure 22: Archaeological Team in the Project Area

### 8.3.5.1 Baseline Study Results

The field work was conducted on 05.03.2015. During the field works, no movable or immovable cultural assets have been identified within the project area. However, it is understood that there are some historical and archaeological sites in the vicinity of the project area based on the inventories of the relevant preservation board and the literature survey,. Two of these sites are Kale Tepee and Küçükale Tepe archaeological sites.

Kale Tepe is located approximately 1060 m west of the Project area. Küçükale Tepe is located on 750 m northeast of the Kale Tepe and approximately 920 m west of the Project area (Image 2). The Preservation Board stated that each of these sites is an acropolis.



Figure 23: Archaeological Sites in the Vicinity of the Project Area

### 8.3.5.2 Conclusions

The following conclusions can be drawn in the light of the collected baseline information in the area;





- History of old İzmir is dated back to much earlier periods and there are widespread cultural heritage and archaeological remains in general İzmir Area.
- No movable or immovable cultural assets have been identified within the project area.
- The closest archaeological site to the project area is at 920 m west of the Project area.

## 9.0 IMPACT ASSESSMENT

Conformance Table - Impact screening and definition of the valued environmental and social components		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<i>Environmental and social assessment/</i> Consider the potential risks and impacts of the project based on current information, including an accurate project description (all components) and appropriate baseline data	PR 1	PS 1
<i>Environmental and social assessment/</i> The assessment process covers direct and indirect environmental and social issues	PR 1	PS 1
<i>Identification of Risks and Impacts</i> Environmental and social risks and impacts are identified in the context of the project's area of influence.	PR 1	PS 1
<i>Mitigation</i> Define mitigation measures in line with mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, affected communities, and the environment.	PR1	PS 1
<i>Biodiversity Conservation</i> Identify and characterise, the potential direct and indirect project-related risks and impacts on biodiversity.	PR 6	PS 6
<i>Land Acquisition and Involuntary Resettlement and Economic Displacement</i> Avoid or minimize physical and/or economic displacement, when displacement cannot be avoided, displaced communities and persons will be offered compensation	PR5	PS5
<i>Cultural Heritage</i> Cultural heritage sites are identified through consultation, literature survey and site studies, protection measures are identified	PR 8	PS 8

### 9.1 Physical components

#### 9.1.1 Geology and Geomorphology

##### 9.1.1.1 Impact Analysis

##### 9.1.1.1.1 Construction phase

According to geotechnical investigation results, as the dominant rock unit is Andesite/Agglomerate and Tuff, and the groundwater was not encountered in the geotechnical borings, issues related to liquefaction and horizontal spreading are not expected at the Project Area.





In case the stresses transferred from superstructure to foundation level do not exceed the bearing capacity values for the structures to be seated on Andesite/Agglomerate and Tuff which are given in the Geological-Geotechnical Investigation Report<sup>25</sup>, settlement related problems are not expected to occur at the Project Area.

Additionally, because Andesite/Agglomerate and Tuff have no swelling potential, swelling related problems are not expected to occur at the Project Area.

The major geo-hazard, expected during the all phases of the Project, would be an earthquake. The earthquake zoning map of İzmir Province according to the Map of Turkey Seismic Zones is given in Section 8.2. Based on the seismic zone classification of Turkey, İzmir Province is in the 1<sup>st</sup> degree seismic zone which is the most active zone in Turkey where numerous historical earthquakes were recorded.

In the event of earthquakes, during the all phases of the Project, significant impact on the community and the workers' health and safety, such as accidents, fire etc., may arise. Additionally, an earthquake may cause adverse impacts on the environment, such as spills, leaks and erosion.

During the construction operations in the Project Area, the project design and engineering will comply with the provisions of the "Regulation on the Buildings to be Constructed on Earthquake Zones" (06.03.2007 O.G. No: 26454). The Regulation requires certain parameters to be determined prior to the construction. These parameters, determined via the geological and geotechnical investigations for the Project Area are:

- Building significance coefficient (I): 1.5
- Soil Type: B
- Local soil class: Z<sub>2</sub>
  - Ground spectrum periods: T<sub>A</sub>= 0.15 T<sub>B</sub>= 0.40
- Effective ground acceleration coefficient (A<sub>0</sub>): 0.40 (1<sup>st</sup> degree earthquake zone)

The Project design and construction operations will take into account the above mentioned parameters and also other specific regulatory requirements related to construction and seismic design at 1<sup>st</sup> degree earthquake zone.

During the construction phase, impacts will be mainly associated to the following **impact factor**: changes in the local morphology.

The **project actions** related to the abovementioned impact factor are the following: surface levelling and grading, temporary stockpiling of material and construction of the plants and facilities.

The impact is mainly related to the changes inflicted on the current morphology of the area due to the earthworks and excavations, and for the site preparation (scarified, excavated, filled with proper material, and flattened) and the construction of the buildings' foundations.

### 9.1.1.1.2 Commissioning and operational phase

As a result of the impact screening no impacts on the geology and the geomorphological components are expected during the commissioning and operational phases.

### 9.1.1.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project Area and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also the foundations of the structures would be removed. The impacts during decommissioning phase

<sup>25</sup> Geological-Geotechnical Investigation Report Phase I, January 2015



are likely to be similar to the construction phase. The same considerations described for geology and geomorphology during the construction phase would be applicable to the decommissioning phase as well.

9.1.1.2 Mitigation measures

The mitigation measures, for the impacts on the geology and geomorphology are listed below for the construction and the commissioning/operational phases:

- Measures incorporated in the Project Design:
- The Projects design and construction operations will take into account the parameters, for design at a 1st Degree Earthquake Zone, mentioned in Section 8.1.2.
- The Projects design and construction operations will take into account all relevant regulatory requirements for construction and seismic design at a 1st Degree Earthquake Zone.
- The foundations' footprints and depths have been properly dimensioned; hence the excavations and the consequent physical-mechanical disturbances will be minimized.
General mitigation measures:
- The flattening and excavation operation will be minimized to the extent possible in order to limit the morphological disturbances;

Part of the removed material might be re-used as fill at the Project Area, provided that it presents the suitable geotechnical characteristics, in order to limit the use of raw material.

9.1.1.3 Residual Impacts

The residual impacts on the geology and seismology component after the application of the abovementioned mitigation measures are (See Section 9.1.1.2 for details).;

Table 17: Residual impacts on geology and seismology components

Table with 2 columns: Construction phase, Commissioning and operational phase. Both cells contain the word 'negligible'.

9.1.1.4 Monitoring

No specific monitoring activities are required for this component.

9.1.2 Soil and subsoil characteristics

9.1.2.1 Impact Analysis

9.1.2.1.1 Construction phase

During the construction phase, impacts on the soil and subsoil characteristics component will be mainly associated to top soil and lower soil removal, pollutant emissions to the soil and the occupation of land.

The project actions related to the abovementioned impact factors are surface levelling and grading, rock fragmentation, temporary stockpiling of material, transport of construction material, construction of the facilities and disposal of waste deriving from construction (including excavated soil).

In the construction phase, activities related to civil engineering will involve excavation and removal of top and lower soil. It is planned that the entire Project Area would be excavated at varying depths between 0.45 m to 37.14 m during the construction. The main impact will be due to the soil removal for the dismantling and lowering of the natural areas prior to the construction of new facilities. The total amount of excavated material



is estimated to be **2,703,180 m<sup>3</sup>** (See section 4.3 for the amount of excavated material.). 90% of the amount will be used at site for refilling.

Potential pollutant emissions to the top soil can be caused by; pollution from vehicles such as oil spills, accidental spill of any chemicals or hazardous materials that might be used during the construction, pollution caused by temporary storage of hazardous materials and/or wastes, emissions from truck traffic and transport of construction materials and excavated materials. Hazardous waste would include 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. The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly conducted, could induce a release of pollutants into the ground. Also, accidental leakages from machinery and vehicles, potentially polluted water that is not properly collected or managed can also pollute the top soil/soil.

A temporary occupation of land during the construction activities will be necessary for the camp area and to stock excavation or construction material. The planned camp and temporary stockpiling areas will be located within the boundaries of the Project Area. The construction of new roads is not planned; instead existing infrastructures will be used with the enlargement of the roads.

### 9.1.2.1.2 Commissioning and operational phase

During the commissioning and operational phases, impacts will be mainly associated to the following **impact factors**: occupation of land, pollutant emissions to the top soil and increase of artificial land use.

The **project actions** related to the abovementioned impact factors are the following: temporary storage and disposal of waste (including medical and radioactive wastes), presence of fuel storage tanks and operations of the facilities. Details of medical and radioactive waste management are provided in Appendix B.

The presence of buildings and facilities will increase the artificial surfaces, as the structures are planned to be constructed on undeveloped land. Occupation of land will occur due to the construction of new infrastructure and road enlargement.

Impacts on soil/topsoil might arise from pollution due to accidental leakages of hazardous materials/products from equipment or chemicals and hazardous wastes/materials storage areas. There will be diesel/fuel storage tanks located in the Project Area. The generators and boilers will be fed by these tanks in case of any shortage. The total amount of the stored diesel/fuel will be designed to suffice the IHC's needs for three days. The pollutant emissions in the soil can also be caused by the leakage from the diesel/fuel storage tanks if the tanks are not properly constructed or maintained or damaged by geo-hazards.

### 9.1.2.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project Area and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

In general, the decommissioning activities would comprise the removal of the plants and the associated facilities. Also the foundations of the structures would be removed. The site is expected to be restored for its future use. The impacts during the decommissioning phase are likely to be similar to the construction phase and the same considerations described for soil and subsoil during the construction phase would be applicable to the decommissioning phase as well.

The transfer of construction and excavated materials by trucks will cause emission of dust and pollutants on soil. The dust emissions will be increased during the demolition of the buildings, surface levelling, grading and temporary stockpiling of the material.

At the end of the decommissioning phase, the soil restoration in the areas, once occupied by buildings and infrastructures might have an overall positive impact on the component.



### 9.1.2.2 Mitigation measures

The mitigation measures are listed in the following for the construction and the commissioning/operational phases:

- Measures incorporated in the Project Design:
  - The foundations' footprints and depths have been properly dimensioned, hence the excavations and the consequent physical-mechanical disturbances will be minimized;
  - In order to minimize the earthworks, allow the traffic and pedestrian access, the buildings have been located in the most accessible part of the site, tiered in the dominant dip direction. The buildings have been arranged so that their highest level is parallel in the direction of the topography;
  - The Project will comply with relevant legal and project safety requirements to avoid leakages from hazardous chemicals and liquids storage facilities on-site;
  - The areas, where the diesel tanks located, will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);
  - The temporary storage areas will be constructed based on the Regulation on Landfills (Regular Storage of Wastes) issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.
- Specific mitigation measures for soil:
  - If soil contamination is suspected during construction related excavation, a detailed assessment should be conducted in order to determine if there are any contaminants sources present within the site or in the near vicinity and the provisions of "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, and became effective as of 08 June 2015, should be implemented;
  - In case that results of a soil assessment show the compliance with site-specific soil quality limits set by the regulation, materials coming from levelling 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, follow the provision of the abovementioned regulation 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 water bodies or unconfined aquifer zones with high groundwater elevation.
    - if some construction areas need to be located onto vegetated and uncontaminated land, the topsoil will be temporarily removed and properly stockpiled to be returned to the stripped area upon completion of the works;



- In order to reduce loss of top soil due to project actions during the construction phase, removed topsoil could be stored in an appropriate area in the Project Area, to be used for landscaping after the construction (As required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406);
- if some vegetated/uncontaminated land is expected to be permanently removed (e.g. onto the new buildings' footprints), the topsoil should be properly stored (As required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406) and re-used for reclamation of nearby artificial sites.

### ■ General mitigation measures:

- Construction site will be minimized to the smallest extent possible in order to meet Project's works and activities;
- Excavations and soil/subsoil abstractions will be minimized as possible in order to meet the building design and construction requirements;
- Part of the removed/excavated material might be re-used for fillings when it presents the proper geotechnical characteristics in order to limit the use of raw material;
- Regular maintenance of vehicles and equipment engines will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
- Use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
- Impervious (concrete etc.) surfaces will be designated for the refuelling of the machinery/vehicles;
- Portable spill containment and clean-up equipment will be made available and easily accessible at the construction site;
- Training on spill response, use of containment and clean-up equipment will be provided;
- Adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel storage and for the storage of other fluids and hazardous substances to prevent loss into the soil;
- Although the connection road from the Project Area exists and is paved; it is assumed that during the construction phase the road could be extended and could be partially unpaved. Concerning potential emission of dust and generation of pollution in top soil due to settled dust and traffic emissions, during the 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.

### 9.1.2.3 *Residual Impacts*

#### 9.1.2.3.1 **Construction phase**

The residual impacts on the soil component after the application of the above mentioned mitigation measures are (See Section 9.1.2.2 for details).;

**Table 18: Residual impacts on soil component**





<b>Construction phase</b>	<b>Commissioning and operational phase</b>
<u>Low to negligible</u>	<u>Low to negligible</u>

**9.1.2.4 Monitoring**

Following monitoring activities are foreseen to ensure the implementation and effectiveness of the proposed mitigation measures:

- Routine site inspections will be carried out and reported to identify any possible leakages;
- Training programs for spill response will be provided;
- Routine maintenance programme will be set-up and maintenance records will be kept;
- Soil quality monitoring:
  - Monitoring sites would be selected among areas in which critical actions or activities are planned;
  - Monitoring frequency will be high during construction to plan corrective actions at the initial stage of pollution;
  - During the operational phase monitoring would be conducted if deemed necessary.

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 hazardous and medical wastes are in line with the industry practices and regulatory requirements.

**9.1.3 Hydrology and Surface water quality**

**9.1.3.1 Impact Analysis**

**9.1.3.1.1 Construction phase**

Impacts on the hydrology and surface water quality component during the construction phase are related to hydrological change, surface water pollution and surface water run-off.

Impacts could be due to increase of water needs, wastewater generation, disposal of waste deriving from construction (including excavated soil), suspended sediments in surface water run-off and construction of the facilities.

During the construction phase; drinking and potable water for the usage by workers would be provided from the city water network or external sources. In addition to these, there will be water needs for the construction activities such as dust suppression. Construction of a groundwater well and groundwater abstraction for the Project is not planned.

The wastewater generation during the construction phase will consist of the domestic wastewater from the construction camp and wastewater from the construction works. During the construction phase, domestic wastewater would be collected in impermeable septic tanks and disposed according to the provisions of the 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 tanks and the septic tanks would be emptied periodically by a vacuum truck and disposed of to the wastewater sewage system.

The wastewater generation and water requirements during the construction are provided in Appendix B.

The surface runoff patterns in the Project Area would be impacted by the Project with the changes in the characteristics of the surface and the topography.



The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly conducted, could induce a release of pollutants onto the ground. Accidental leakages from the use of hazardous substances or refuelling or maintenance operations of machineries are also potential hazards. During the construction, such pollution can migrate with surface water run-off and reach the surface water body close to the Project Area.

Even though there are no plans to construct a groundwater well, drilling at a depth below the water table or dewatering or increase of water demand during the construction and operational phases 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.

### 9.1.3.1.2 Commissioning and operational phase

Impacts on this component during the commissioning and operational phases will be same as the construction phase and are related hydrological change, surface water pollution and surface water run-off.

Impacts could be due to increase of water needs, wastewater generation and disposal of waste deriving from construction (including medical and radioactive wastes).

Abovementioned three project actions for the operational phase are same as the construction phase. The main difference is the generation of medical and radioactive wastes and medical wastewater during the operation phase.

The increase of water needs and wastewater generation is detailed in the previous section (construction phase). The only difference is that, there would be a storm water (rain water) collection system constructed at the Project Area separate from the domestic wastewater network, once the hospital is commissioned. The storm water will be collected to reservoirs where it would be stored, filtered and reused for irrigation.

Medical and radioactive wastes and medical wastewater would be generated during the commissioning and operational phase. The generation of these wastes could cause pollution if they are not managed, stored and discharged or disposed of properly in accordance with the legislation and the IFC requirements.

IFC requirements for Process Wastewater (medical wastewater) from Healthcare Facilities are as follows:

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).

There will not be an incineration plant within the scope of the Project. The waste water will be generated during the operation of the project as detailed in Appendix B.

If wastewater is to be discharged to sanitary sewage treatment systems, the healthcare facilities would:

- ensure that the wastewater characteristics comply with
  - all applicable permits (regulations on surface water and groundwater pollution control, waste management, etc.)
  - as well as the requirements set forth by the receiving facility and,

ensure that the municipal facility is capable of handling the type of effluent discharged, as discussed in the General EHS Guidelines of IFC.



### 9.1.3.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project Area and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

Decommissioning phase activities are likely to be very similar to the construction phase. Decommissioning 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.

### 9.1.3.2 Mitigation measures

The mitigation measures are listed for the construction and the commissioning/operational phases:

- Measures incorporated in the Project Design:
  - The Project will comply with safety requirements to avoid leakages from hazardous chemicals and liquids stored on-site;
  - At the construction areas without cover, ground will be seeded and the areas with highest slopes will be terraced to prevent erosion and sediment transport with surface run-off water;
  - The areas where the diesel tanks located, will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);
  - The temporary storage areas will be constructed based on the Regulation on Landfills (Regular Storage of Wastes) issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.
- General mitigation measures:
  - During the construction phase, the surface drainage and site runoff, particularly heavy rain will be properly managed;
  - During the operational phase, the grids of the drainage system will be controlled and cleaned on a periodical basis, in order to prevent possible blockages during rain events;
  - Regular maintenance of vehicles and equipment engines will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
  - Use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
  - Impermeable surfaces (concrete etc.)will be designate for the refuelling of the machinery/vehicles;
  - Portable spill containment and clean-up equipment will be made available and easily accessible at the construction site;
  - Training on spill response, use of containment and clean-up equipment will be provided;

Adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel storage and for the storage of other fluids and hazardous substances to prevent loss into the soil.

### 9.1.3.3 Residual Impacts

The residual impacts on the hydrology component after the application of the above mentioned mitigation measures are (See Section 9.1.3.2 for details).;

**Table 19: Residual impacts on hydrology component**



Construction phase	Commissioning and operational phase
<u>negligible</u>	<u>negligible</u>

9.1.3.4 Monitoring

Following monitoring activities are foreseen to ensure the implementation and effectiveness of the proposed mitigation measures:

- Design checks to ensure the measures listed above are in place will be undertaken;
- Routine site inspections will be carried out and reported to identify any possible leakages;
- Training on spill response, use of containment and clean-up equipment will be provided;
- Routine maintenance programme will be set-up and maintenance records will be kept;
- Monitoring actions to verify compliance of wastewater with regulatory requirements will be required. A monitoring plan will be set-up to verify the contents of wastewater; samples will be collected per the regulation;
- Monitoring and resource management plan will be prepared to prevent impacts on water and wastewater due to additional wastewater production and usage water needs. Plans will be prepared for minimizing the use of water during construction and operation and for 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 hazardous and medical/radioactive wastes are in line with the industry practices and regulatory requirements.

9.1.4 Hydrogeology and Groundwater Quality

9.1.4.1 Impact Analysis

9.1.4.1.1 Construction phase

Impacts on this component, during the construction phase are related to the hydrogeological change and groundwater pollution.

Impacts could be due to: increase of water needs, wastewater generation, disposal of waste deriving from construction (including excavated soil) and construction of the facilities.

During the construction phase; drinking and potable water for the usage by workers would be provided from the city water network or external sources. In addition to these, there will be water needs for the construction activities such as dust suppression. Construction of a groundwater well and groundwater abstraction for the Project is not planned.

Even though there are no plans to construct a groundwater well, drilling at a depth below the water table or dewatering or increase of water demand during the construction and operational phases could have potential impacts on the local hydrogeology.

The wastewater generation during the construction phase will consist of the domestic wastewater from the construction camp and wastewater from the construction works. During the construction phase, domestic wastewater would be collected in impermeable septic tanks and disposed according to the provisions of the 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 tanks and the septic tanks would be emptied periodically by a vacuum truck and disposed of to the wastewater sewage system.

The wastewater generation and water requirements during the construction are not quantifiable at this stage.



During the construction phase, groundwater pollution is a potential impact. The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly managed could induce a release of pollutants onto the ground. Accidental leakages from the use of hazardous substances or refuelling or maintenance operations of machineries are also potential hazards. During construction, pollution may reach groundwater. 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 and the material is spilled over a period of time.

It is planned that the entire area would be excavated with varying depths between 0.45 m to 37.14 m during the construction. It is expected that the regional groundwater level is deeper than 55 m and no major pollution risk is foreseen.

In case groundwater is encountered during the construction, groundwater should be abstracted from the work area; treatment, storage and disposal should be done according to the regulatory requirements after necessary analyses have been performed and relevant permits are obtained.

### 9.1.4.1.2 Commissioning and operational phase

Impacts on this component during the commissioning and operational phases will be same as the construction phase and are related to the following **impact factors**: hydrogeological change and groundwater pollution.

Impacts could be due to the following **project actions**: increase of water needs, wastewater generation and disposal of waste deriving from operation (including medical and radioactive wastes).

The increase in water demand and waste water generation, and the actions to be taken are detailed in the previous section (construction phase).

Medical and radioactive wastes and medical waste water would be generated during the commissioning and operational phase. The generation of these wastes could cause pollution if they are not managed, stored and discharged or disposed of properly in accordance with the legislation and the IFC requirements.

IFC requirements for Process Wastewater (medical wastewater) from Healthcare Facilities are described in Section 3.4.

### 9.1.4.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and since the future use of the Project Area and the surrounding areas is unknown, it is not possible to discuss the details of the decommissioning activities at the closure phase. Once closure timing and the objectives are clearer, decommissioning can be addressed.

Decommissioning phase activities are likely to be very similar to the construction phase. Decommissioning 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.

### 9.1.4.2 Mitigation measures

The mitigation measures are listed for the construction and the commissioning/operational phases:

- Measures incorporated in the Project Design:
  - The Project will comply with safety requirements to avoid leakages from hazardous chemicals and liquids stored on-site;
  - The areas where the diesel tanks located, will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems etc.);
  - The temporary storage areas will be constructed based on the Regulation on Landfills (Regular Storage of Wastes) issued on March 26, 2010, at Official Gazette no:27533 and Regulation on Waste Management issued on April 02, 2015 Official Gazette no: 29314.





■ General mitigation measures:

- Regular maintenance of vehicles and equipment engines will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
- Use of machinery/vehicles will be strictly limited within the construction sites and along the appropriate access roads;
- Impermeable surfaces (concrete etc.) will be designate for the refuelling of the machinery/vehicles;
- Portable spill containment and clean-up equipment will be made available and easily accessible at the construction site;
- Training on spill response, use of containment and clean-up equipment will be provided;

Adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume will be provided for fuel storage and for the storage of other fluids and hazardous substances to prevent loss into the soil.

**9.1.4.3 Residual Impacts**

The residual impacts on the hydrogeology component after the application of the abovementioned mitigation measures are (See Section 9.1.4.2 for details).;

**Table 20: Residual impacts on the hydrogeology component**

Construction phase	Commissioning and operational phase
negligible	negligible

**9.1.4.4 Monitoring**

Following monitoring activities are foreseen for ensuring the implementation and effectiveness of the proposed mitigation measures:

- Design checks to ensure the measures listed above are in place will be undertaken;
- Routine site inspections will be carried out and reported to identify any possible leakages;
- Training on spill response, use of containment and clean-up equipment will be provided;
- Routine maintenance programme will be set-up and maintenance records will be kept;
- Monitoring actions to verify compliance of wastewater with regulatory requirements will be required. A monitoring plan will be set-up to verify the contents of wastewater; samples will be collected per the regulation;
- Monitoring and resource management plan will be prepared to prevent impacts on water and wastewater due to additional waste water production and usage water needs. Plans will be prepared for minimizing the use of water during construction and operation and for 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 hazardous and medical/radioactive wastes are in line with the industry practices and regulatory requirements.



## 9.1.5 Meteorology and Climatology

### 9.1.5.1 Impact Analysis

#### 9.1.5.1.1 Commissioning and operational phase

This section presents the assessment of the impacts that the project is envisioned to generate on meteorological and climatic characteristics by the emission of greenhouse gases during the operation phase.

Greenhouse gases (GHGs) include atmospheric gases that absorb and emit radiation in the thermal infrared spectrum, thus causing a warming effect on earth (greenhouse effect).

The greenhouse effect is primarily from CO<sub>2</sub> and water vapour, along with other trace gases in the atmosphere. A number of gases are typically considered as anthropogenic GHGs, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons (e.g., CF compounds), and sulphur hexafluoride. Changes in the atmospheric concentration of GHGs may affect the energy balance between the land, the seas, the atmosphere, and space. A measure of such changes in the energy available to the system from a gas is termed “radiative forcing”, and, holding everything else constant, atmospheric increase of a GHG produces positive radiative forcing.

GHGs can contribute to the greenhouse effect both directly and indirectly. A “direct” contribution is from a gas that is itself a greenhouse gas, while indirect radiative forcing occurs when the original gas undergoes chemical transformations in the atmosphere to produce other greenhouse gases, when a gas influences the atmospheric lifetimes of other gases, and/or when a gas affects processes that alter the atmospheric radiative balance of the earth.

Effects of GHG emissions are generally not relevant on a local scale, except in cases of massive uncontrolled or fugitive emissions, but are rather global in nature as the various gases are rapidly dispersed in the atmosphere where they reside for varying periods of time, from months to thousands of years, and they continue to exert their effects.

Global Warming Potential (GWP) is the index that has been developed to compare different GHGs on a common reporting basis. CO<sub>2</sub> is used as the reference gas to compare the ability of a particular gas to trap atmospheric heat relative to CO<sub>2</sub>. GWP is defined as the ratio of the time-integrated radiative forcing from the instantaneous release of 1 kg of a substance relative to 1 kg of the reference gas (i.e., GWP is weight-based, not volume-based). Thus, GHG emissions are commonly reported as CO<sub>2</sub> equivalents (e.g., tonnes of CO<sub>2</sub>eq, where a tonne is 1000 kg). Since GWP is a time-integrated factor, the GWP for a particular gas is dependent upon the time period selected. A 100-year GWP is the standard that has been broadly adopted (see table below).

**Table 21: Global Warming Potentials (100 Year Time Horizon, 1996 Intergovernmental Panel on Climate Change - IPCC)**

Gas	GWP
Carbon dioxide (CO <sub>2</sub> )	1
Methane (CH <sub>4</sub> )	21
Nitrous oxide (N <sub>2</sub> O)	310
HFC-23	11,700
HFC-32	2,800
HFC-125	1,300
HFC-134	3,800
HFC-236	6,300
CF <sub>4</sub>	6,500



Gas	GWP
C <sub>2</sub> F <sub>6</sub>	9,200
C <sub>4</sub> F <sub>10</sub>	7,000
C <sub>6</sub> F <sub>14</sub>	7,400
SF <sub>6</sub>	23,900

There is a Turkish Regulation on the Monitoring of Greenhouse Gases (RMGG) (Official Gazette date/no: 25.04.2012/28274) was released.

This regulation defines the monitoring, reporting and verification procedures for GHG emitted from facilities and activities listed in Annex-I of this regulation.

The main source of GHG in the project will be combustion of fossil fuels during construction and operation phases.

The regulation excludes the combustion emissions from vehicles. Based on the fuel consumption of the vehicles, there may be indirectly and insignificant emission source from the vehicles.

The regulation includes combustion activities with a 20 MWt and higher capacities. During the operation phase there will be trigeneration unit operation combusting natural gas to produce heat for the consumption of the project facilities. The capacity of the unit will be 4 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 11.2 MWt (thermal power). There will be 5 boilers. According to this, the total capacity will be 15.2 MWt (11.2 + 4) which is below 20 MW.

Nevertheless a calculation for GHG production for trigeneration and boiler operation (being the only major sources of GHG emission for the project) has been provided indicatively for CO<sub>2</sub> using Intergovernmental Panel on Climate Change (IPCC) emission factors. The unit and boilers will be operated on natural gas. Below calculation is presented for the worst case scenario of natural gas combustion (under the assumption of trigeneration and boilers are operated at the same time).

It is estimated that total daily natural gas consumption for both trigeneration unit and boilers will be 16967 kg/day:

- Default Emission Factor for natural gas: 56,100 kg natural gas/TJ
- Fuel Consumption = 0.897 TJ/day
- CO<sub>2</sub> Emissions = (0.897 TJ/day x 56,100 kg/TJ x 365) / 1,000 = 14,939 ton/year of CO<sub>2</sub> (the contribution of other GHG gases to amount will be trivial)

This calculated figure is below 25,000 tons of CO<sub>2</sub> equivalent above which IFC Performance Standard 3 states a need to quantify the direct and indirect emissions annually.

### 9.1.6 Air Quality

#### 9.1.6.1 Impact Analysis

Air quality emission and dispersion modelling tools have been used for the impact analysis.

Ozone emissions are not included in the modelling studies since the ozone is not a direct emission possible during the project activities. Ozone is a chemical that would be formed in air under certain conditional of meteorology and existence of other chemicals such us VOC. These conditions are not known and thus the amount of ozone to be formed in air as a result of project activities are not known and not included in modelling studies. However considering the project characteristics and the long term ozone level measured in the region



(Refer to 8.1.7.1) it can be concluded the impact of project activities on the ambient ozone levels will be trivial and will not need further analysis.

**9.1.6.1.1 Construction phase**

During the construction phase impacts will be mainly associated to air pollutants and dust emission.

The project actions related to the abovementioned impact factor are the following: surface levelling and grading, temporary stockpiling of the material, disposal of grading material, transport of construction material.

Construction activities will affect air quality mainly through emissions of dust from the excavation and storage of soil, vehicles traffic on unpaved roads, the emission of particulate from vehicle exhausts and the emission of particulate from stationary sources like power generators. Emissions of gaseous pollutants, particularly NO<sub>x</sub> and SO<sub>2</sub>, will be mostly related to the vehicle and machinery exhausts and emissions from stationary sources like power generators. Type and number of engineering vehicles, horse power and the emission factors were provided by the Project. Emission values from engineering vehicles have been calculated by using the Exhaust Emission Factors for Non-road Engine Modeling (Report No. NR-009A) of United States Environmental Protection Agency (EPA). In addition a modelling study has been performed as detailed in APPENDIX M for the dust emissions from excavation and rock fragmentation activities. Air pollutant diffusion graphs are produced and presented in APPENDIX M.

The contribution of ambient PM<sub>10</sub> and settled dust back ground measurements to the model results were studied. PM<sub>10</sub> was simulated annually and daily s. Ambient PM10 air quality measurements were conducted for 24 hours. Therefore, 24 hour PM10 measurements are converted to the annual values by using the England Environmental Agency Annex-F. Converted measurement results are shown in APPENDIX M.

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

**Table 22: Cumulative Values of PM10 and Settled dust**

Measurement No:	AERMOD Conc.		Background Measurements	Cumulative Value	Limit Values	
PM10-1 (µg/m <sup>3</sup> )	Controlled daily	1.24	18.1	19.34	90 (µg/m <sup>3</sup> )	
	Uncontrolled daily	2.48		20.58		
PM10-2 (µg/m <sup>3</sup> )	Controlled daily	0.98	18.8	19.78		
	Uncontrolled daily	1.96		20.76		
PM10-3 (µg/m <sup>3</sup> )	Controlled daily	1.36	19.2	20.56		
	Uncontrolled daily	2.72		21.92		
PM10-4 (µg/m <sup>3</sup> )	Controlled daily	1.42	19.1	20.52		
	Uncontrolled daily	2.85		21.95		
PM10-1 (µg/m <sup>3</sup> )	Controlled annual	0.18	15.3	15.48		56 (µg/m <sup>3</sup> )
	Uncontrolled annual	0.35		15.65		
PM10-2 (µg/m <sup>3</sup> )	Controlled annual	0.07	15.9	15.97		
	Uncontrolled annual	0.14		16.04		
PM10-3 (µg/m <sup>3</sup> )	Controlled annual	0.08	16.2	16.28		
	Uncontrolled annual	0.17		16.37		
PM10-4 (µg/m <sup>3</sup> )	Controlled annual	0.11	16.1	16.21		
	Uncontrolled annual	0.21		16.31		
SD-1 (mg/m <sup>2</sup> -day)	Controlled settled dust	9.96	62.3	72.26	390 (mg/m <sup>2</sup> -day)	
	Uncontrolled settled dust	19.9		82.2		



Measurement No:	AERMOD Conc.		Background Measurements	Cumulative Value	Limit Values
SD-2 (mg/m <sup>2</sup> -day)	Controlled settled dust	3.60	65.6	69.2	
	Uncontrolled settled dust	7.20			
SD-3 (mg/m <sup>2</sup> -day)	Controlled settled dust	5.90	51.5	57.4	
	Uncontrolled settled dust	11.80			

As seen from above table, cumulative values for both controlled and uncontrolled situations are below the limit values.

**9.1.6.1.2 Commissioning and operational phase**

In order to evaluate impacts on air quality due to the project during the commissioning and operational phase in comparison to existing ambient air quality conditions and to set the most suitable stack heights for combustion releases, an air dispersion model has been developed.

The Project is already located at nearby the highway. In relation to the impact of increase in traffic emissions during operation following point could be considered:

- The road is a divided highway, which means that the direction of the traffic flow is both from east – west and west – east. Thus, the hospital can be accessed from both directions which will divert the traffic increase into both directions rather than concentrating to one traffic flow direction,
- There has already been public transportation services to the Project area which would be a limiting factor on traffic increase,
- Emission sources from traffic vehicles are not point source.

Considering these issues, the impact of the traffic increase on the current air quality around the project site will be incremental.

The exact number, speed and type of the vehicles to be accessing to the hospital together with the access frequency are not certain and will be changing. This will be a significant limitation for exact quantification of the traffic emissions during operation of the hospital.

In the light of the above mentioned, the air emissions from traffic increase during the operation of the hospital are not included into the air quality emission and dispersion modelling.

Nevertheless, there will also be monthly air quality monitoring at sensitive receptors during the operation phase. In case of any exceedance of limit values, as a stakeholder the Metropolitan Municipality will be informed and SPV will coordinate with the Municipality to increase the public transportation numbers or additional services.

Regarding air pollutants measured within the impact zone of the Project, those used as impact descriptors are represented by nitrogen oxides ("NOx"), sulphur dioxide ("SO<sub>2</sub>").

Air dispersion modelling has been conducted using AERMOD. For each pollutant, concentration values at ground level were calculated needed to make comparisons with the expected air quality standards. The details of the modelling and pollutant diffusion graphics are provided in APPENDIX M.

The contribution of background SO<sub>2</sub>&NO<sub>2</sub> measurements to the modelling ground level pollutant results were studied. SO<sub>2</sub> and NO<sub>2</sub> were simulated annually and daily separately. Ambient SO<sub>2</sub>&NO<sub>2</sub> air quality measurements were conducted for two periods between February and April.

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

**Table 23: Annual Cumulative Values of SO<sub>2</sub> and NO<sub>2</sub>**





Measurement No:	AERMOD Conc.		Background Measurements		Cumulative Value		Limit Values	
	SO2	NO2	SO2	NO2	SO2	NO2	SO2	NO2
P-1 (µg/m³)	0.13	0.09	2.74	23.45	2.87	23.54	20	40
P-2 (µg/m³)	0.17	0.12	2.68	49.44	2.85	49.56		
P-3 (µg/m³)	0.09	0.06	2.19	46.07	2.28	46.13		
P-4 (µg/m³)	0.04	0.03	1.83	17.62	1.87	17.65		
P-5 (µg/m³)	0.11	0.08	1.62	26.68	1.73	26.76		
P-6 (µg/m³)	0.08	0.06	-	37.67	-	37.73		
P-7 (µg/m³)	0.1	0.07	2.23	21.89	2.33	21.96-		
P-8 (µg/m³)	0.13	0.09	1.8	16.5	1.93	16.59		
P-9 (µg/m³)	0.12	0.08	2.10	29.73	2.22	29.81		
P-10 (µg/m³)	0.1	0.07	1.46	14.27	1.56	14.34		
P-11 (µg/m³)	0.04	0.03	1.59	15.7	1.63	15.73		
P-12 (µg/m³)	0.1	0.07	1.46	10.88	1.56	10.95		

As seen from above table, cumulative values for both SO<sub>2</sub> and NO<sub>2</sub> concentration results are below the applicable limit values except from the NO<sub>2</sub> results for P-2 and P-3. This results from the heavy vehicular traffic on the stabilised road during the measurement period. The mitigation measures are provided in chapter 9.1.6.2.

**9.1.6.1.3 Decommissioning/Closure phase**

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Impacts during decommissioning phase are likely to be similar to construction and the same considerations describe during construction are applicable here as well.

**9.1.6.2 Mitigation measures**

The following mitigation measures are considered relevant during construction phase to mitigate dust dispersion during construction activities:

- wetting and covering powdery materials transported on trucks;
- reduce trucks and vehicle speed;
- washing facilities, such as hose-pipes and ample water supply, should be provided at site exits, including mechanical wheel spinners where practicable;
- if necessary, all vehicles should be washed down before existing the construction site;
- periodic wetting of the stockpiled material to maintain the humidity percentage at about 5%;
- periodic wetting of the construction areas;
- use of working machinery with low emissions; and good levels of maintenance;
- vehicles will be maintained in good condition to ensure they are no louder than other, similar vehicles on the roadways;
- use of diesel with low sulphur content;



- periodic maintenance of machinery with combustion engine.
  - Fragmentation areas will be moistened before any fragmentation activity will occur.
  - There will not be any fragmentation after 18:00 of the day.
  - Fragmentation areas will be controlled twice for avoiding any incidents at the area before the rock fragmentation activity.
- The nearest settlement areas will informed before rock fragmentation activities

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.

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.

During the operation phase, the emissions related to heating purposes would be controlled periodically and it would be complied with the applicable environmental emission standards.

A programme will be in place for the monitoring of NO<sub>2</sub> levels at the points where air dispersion modelling shows exceedances.

**9.1.6.3 Residual Impacts**

The residual impacts on the air quality component after the application of the above mentioned mitigation measures are (See Section 9.1.6.2 for details).;

**Table 24: Residual impacts on air quality component**

Construction phase	Commissioning and operational phase
<u>negligible</u>	<u>negligible</u>

**9.1.6.4 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.

A monitoring programme of NO<sub>2</sub>, SO<sub>2</sub>, emissions from the trigeneration and the boiler stacks will be in place.

A monitoring programme of NO<sub>2</sub>, SO<sub>2</sub> at the residential area before construction and during the commissioning and operational phase will be in place.

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.

**9.1.7 Noise and Vibration**

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 and operation phase is emission of noise.



### 9.1.7.1 *Impact Analysis*

#### 9.1.7.1.1 **Construction phase**

Construction activities will affect the ambient noise levels mainly through emissions of noise from the construction equipment and vehicles traffic.

Exact number of construction machinery cannot be estimated at this phase of the project. For the purpose of assessment for the worst case, maximum amount of machinery and equipment is located in the project area and this scenario is modelled where all noise sources are working at the same time. The noise modelling details are given in APPENDIX M.

Based on the calculations, the highest noise level in the residential region is about 62 dBA at north of the project area as shown in below figure. This result complies with the 70 dBA limit. The actual noise levels at Project Site is expected to be lower than the calculated value since all equipment/machinery will not be operated at the same time in the project area and natural noise barriers like trees, vegetation or meteorological conditions will prevent noise to be dispersed.

As described under the baseline results in section 8.1.8 and APPENDIX M, N(24)-4 is the nearest measurement location to the point where the highest noise level is calculated. Day time noise levels measured at this location are 67.5 dBA (09:00 – 17:00) and 67.4 dBA (07:00 - 22:00). Hence, calculated noise level is not greater than the baseline level and will not create additional noise higher than the regulatory limit.

#### 9.1.7.1.2 **Commissioning and operational phase**

Only project unit having possibility to create noise is the trigeneration plant with an estimated maximum installed capacity of 4 MWt, described in Section 4.2.1. Estimated noise level of the trigeneration plant is 92 dBA according to the from library of SoundPLAN Essential 3.0 software<sup>26</sup>. As compared to the construction phase model results, operation phase noise level in the surroundings will be much lower and no exceedances in relation applicable standards are expected in the ambient noise levels.

The noise to be generated during Project operation is expected to be caused by the emergency generators, helicopter movement and ambulance movements, in case of an emergency situation and the Regulation on Assessment and Management of Environmental Noise provides noise limits for health areas as presented in Table 13 and ambient noise level standards in IFC General EHS Guidelines is given in Table 14. As it is observed in, baseline results are mostly higher than these limits and it can be concluded that any long term noise effect to the baseline will not be observed in the residential areas because of above mentioned project activities.

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.

#### 9.1.7.1.3 **Decommissioning/Closure phase**

Exact decommissioning time and details of the work are not known at this phase of the project. It is assumed that decommissioning phase of the project will not generate higher noise levels than calculated noise levels in the construction phase of the project. Similar machinery with construction phase will be used in decommissioning activities; therefore the noise impact of the decommissioning will be similar to impact of construction phase.

### 9.1.7.2 *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:

<sup>26</sup> Power Stations (Generator Turbine Room)



- 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.

No additional mitigation measures are proposed during the operation phase.

9.1.7.3 Residual Impacts

9.1.7.3.1 Construction phase

The residual impacts on the noise component after the application of the above mentioned mitigation measures are (See Section 9.1.7.2 for details).;

Table 25: Residual impacts on noise component

Construction phase	Commissioning and operational phase
<u>negligible</u>	<u>negligible</u>

9.1.7.4 Monitoring

A monitoring programme (which will also include the weekend day measurements) of noise at the closest sensitive receptors during construction and the commissioning and operational phase will be in place.

9.1.8 Traffic and Infrastructure

9.1.8.1 Impact Analysis

9.1.8.1.1 Construction phase

During construction phase impacts will be mainly associated to the impact factor increased road traffic.

The project actions related to the abovementioned impact factor are the surface levelling and grading, the transport of construction material, the construction of the facilities and the disposal of waste deriving from construction.

The activities related to the construction phase will require the movement of trucks entering and leaving the project area for the transportation of machinery, equipment, construction material (e.g., concrete, building materials) and staff.



The expected traffic increasing on the access roads to the project area will be of 40 trucks per day for 24 months. Another key factor to take into account is the size of containers and the maximum size of abnormal loads that will access the site via the existing access roads. Although the exact number of abnormal loads is not known at the writing time, it is assumed that they will be kept to a minimum as far as reasonably practicable and therefore their impacts are judged to be of minor significance.

The traffic road increasing could cause the boost of crashes and the congestion of the access roads especially closeness to the adjacent intersections. It is assumed that the routes which will be used for the road passages will mainly use O-30 highway.

Furthermore the road traffic increasing could lead to accidental wildlife losses, especially reptiles crushing.

The trucks and vehicles for the transportation of machinery, equipment, material and staff will leads to the potential for nuisance to nearby settlements due to the increase of air pollution (e.g. emissions of particulate matter, nitrogen oxides). Moreover, the new flows of trucks and vehicles will cause the increase of noise along the access roads to the project area.

### 9.1.8.1.2 Commissioning and operational phase

Further to the transportation of raw materials, products and personnel during the commissioning and operational phase is expected an increase of traffic.

The operation of the Project will generate solid waste which will be collected by a licenced waste carrier for disposal. It has conservatively been estimated that approximately 30 vehicles per month will transport the waste generated during operational phase.

The access to the İzmir Bayraklı IHC will take place by its south side, the lower elevation, from the service road of the O-30 highway. In each access point, it should be required to make the roundabouts with two-lane for both directions on this service road, since it is a four-lane road.

In general commissioning and operational activities could have an impact on traffic and infrastructures similar to the construction phase. Therefore the traffic road increasing could cause increase in traffic incidents, the congestion of the access roads and their adjacent intersections, road safety interference, air pollution and noise and potential for collisions with wild animals, especially reptiles.

### 9.1.8.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

### 9.1.8.2 Mitigation measures

The mitigation measures listed in the following will be effective for both the construction and the commissioning/operational phases:

- Scheduling of traffic to avoid peak hours on local roads;
- Adopting best transport safety practices with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public;
- Adopting traffic control and operations devices (e.g. Add traffic signals to reduce speed limit, flashing arrow signs, add deceleration/acceleration lanes, improve sight distance) to guide drivers clearly and safely along the access roads to the project area. Effective traffic control increases safety and capacity and reduces stress for drivers;
- Reducing and make safely the pedestrian road crossing;
- Emphasizing safety aspects among project drivers, specifically ensure drivers respect speed limits through built areas and urban centres;





- Regular maintenance of vehicles should be undertaken to ensure that vehicles are safe and emissions and noise are minimized;
- Ensure contractors regularly maintain vehicles to minimize potentially serious accidents caused by for example, brake failure commonly associated with loaded construction trucks. Fuel systems of the vehicles that will be used within the scope of the project shall be controlled permanently and should comply with the national and international good practices.
- 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.
- Further mitigation measures are discussed in 10.5.3.1.

9.1.8.3 Residual Impacts

The residual impacts on the traffic component after taking into account the application of the abovementioned mitigation measures are (See Section 9.1.8.2 for details).;

Table 26: Residual impacts on traffic component

Construction phase	Commissioning and operational phase
negligible	low

9.1.8.4 Monitoring

Monitoring activities are required to verify the effectiveness of the mitigation measures proposed. They are listed below and are provided in the ESMP with frequency and timing:

- Investigation of the incidents and accidents and use of lesson’s learned to improve traffic mitigations.
- Driver education monitoring to ensure it takes place.
- Comments and/or complaints received from ongoing consultations or from grievances to improve traffic mitigations.
- Feedback from local stakeholders regarding to any perceived changes in noise impacts and air quality changes linked to heavy traffic.

Monitoring should in particular be designed to identify failure or ineffectiveness of mitigation measures in terms of road safety and nuisance prevention.

9.2 Biological components

9.2.1 Terrestrial Flora and Vegetation

9.2.1.1 Impact Analysis Results

The vegetation present in the LSA was assessed as a low sensitivity component, considering that most of the areas are urbanized or disturbed by anthropogenic activities, in addition no endemic or protected flora species were found in the area.

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.

### 9.2.1.1.1 Construction phase

The vegetation present within the footprint will be cleared for the construction of the facilities. This direct impact on vegetation will be important but localized and concentrated in a short time. The impact is considered reversible since, if left to itself, in the long term, the area will likely be recolonized by Mediterranean maquis vegetation.

Activities like rock fragmentation and surface levelling and grading during site preparation, temporary stockpiling of resulting material, transportation of soil and construction materials will cause emission of dust and pollutant (mainly NO<sub>x</sub> e CO<sub>2</sub>) in the air. Dust and pollutant will than precipitate on the surrounding area. Although local and reversible in the short term, this impact is likely to affect the surrounding vegetation with a medium intensity, in absence of any mitigation measures.

In particular dust emission, could impact vegetation directly by covering leaf surface and indirectly by through effects via the soil (Farmer A.M., 1993). Dust can block stomata of leaf surface, affect the photosynthesis, respiration, transpiration, and may cause leaf injury symptoms. As a result of that the productivity of the plants could decline and with the consequent reduction in vegetation growth, abundance and species loss.

The great majority of the excavated material will be reused on site only about 10% will be disposed of site in Gökdere or Belkahve region.

### 9.2.1.1.2 Commissioning and operational phase

The presence of the facilities will cause a loss of potential habitat for flora species within the project footprint during operation. The impact will be limited to the facilities since the surrounding areas temporary occupied by stockpiles, yards etc. will be restored after construction.

Dust and air pollution deriving from road traffic and operation of the facility, including the gas Trigeneration plant and the backup generators, could impact the terrestrial flora present in the surrounding area. In this phase the intensity of this impact factor is expected to be negligible, since all the areas not covered by the facility will be re-vegetated and the traffic limited to the normal operation activities of the hospital.

### 9.2.1.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Decommissioning activities could impact terrestrial flora. However, the impacts are expected to be limited, since the area will be already urbanized, and depend on the future use of the area. Potentially, if the site is restored to natural vegetation, this phase is expected to have an overall positive impact on terrestrial flora.

## 9.2.1.2 Mitigation measures

The mitigation measures here listed will be effective both for the construction and the operational phase:

- Project footprint will be minimized to the smallest extent possible in order to meet and support the Project works and activities;
- inadvertent disturbance to the adjacent vegetated areas should be avoided through clear demarcation of the Project Site boundaries, particularly in Mediterranean shrubland habitat types;
- dust control measures will be implemented along roads, in areas of excavation and earthworks and for stockpiles and spoil heaps, as described in Section 9.1.6;



- progressive reclamation of areas cleared during construction but not subjected to the placement of facilities will occur, with the goal of producing a stable vegetative cover to minimize erosion from air and water and to produce visual and ecological advantages;
- Suitable areas of the site should be re-vegetated after construction is completed. Grass and decoration plants should be used in locations such as the office and directorate building and evergreen young plants could be used in more distant locations away from buildings. Existing flora of the region should be considered in selecting plant species to be used and species known for their potentiality to become invasive will not be used.

9.2.1.3 Residual Impacts

The residual impacts on the flora and vegetation component after the application of the abovementioned mitigation measures are (See Section 9.2.1.2 for details).;

Table 27: Residual impacts on flora and vegetation

Construction phase	Commissioning and operational phase
low to negligible	negligible

9.2.1.4 Monitoring

Periodic surveys will be performed during construction to ensure that:

- areas characterized by natural vegetation around the construction site are not inadvertently impacted by equipment, temporary disposal of construction material or soil erosion due to nearby cleaned areas;
- progressive reclamation of areas cleared during construction but not subjected to the placement of facilities is performed ant it is coherent with the plan.

9.2.2 Terrestrial Fauna

9.2.2.1 Impact Analysis Results

According to the baseline study this component has a medium sensitivity. The area has some natural habitat with high fauna value (natural Mediterranean maquis) and it is situate in proximity with key biodiversity areas and an Important bird area. Populations or individuals of the fauna species that could occur in or visit the LSA are already impacted by anthropogenic disturbances, therefore the stable presence of sensitive species in the LSA is considered improbable. In addition, no Critically Endangered (CR) and/or Endangered (EN) endemic and/or restricted-range species were observed in the area (IFC 2012).

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 a are:

- occupation of land;
- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations.

9.2.2.1.1 Construction phase

The local fauna will be directly or indirectly impacted by the vegetation clearing and top soil disturbance activities performed during site preparation. In particular, species characterized by low mobility are not able to



move ahead of construction (e.g. insects, amphibians, and tortoise). The removal of vegetation will also involve the destruction of suitable habitats for many fauna species.

Emission of dust and pollutant (mainly NO<sub>x</sub> e CO<sub>2</sub>) in the air and its consequent fell to the ground could affect vegetation communities and therefore indirectly also the fauna species that depend on them for food and refuge.

The emission of noise is expected to be of particular high intensity during construction, especially in correspondence of rock fragmentation activities, although limited in time. All construction activities such as operation of diesel engines, transportation of construction materials etc. are also expected to produce noises. The emission of noise could impact local fauna, and in particular sensitive taxa like birds, especially during nesting season. Most of fauna species, including birds tend to habituate to constant steady noise levels, even of a relatively high level, in the order of 70 dBA. However sudden and discontinuous loud noises will scare away many fauna species from the area surrounding the construction site. The impact is expected to reversible in the short time, since fauna species will likely return once the noises are ceased.

### 9.2.2.1.2 Commissioning and operational phase

Previous fauna habitats will by occupied by the project facility and infrastructures during the operational phase. Moreover impacts such as dust, air pollution and noise emission could affect local fauna also outside the immediate project footprint.

In particular, dust and air pollution during the operation of the project could derive mainly from road traffic and operation of the facility, including the gas Trigeneration plant and the backup generators. During this phase the intensity of this impact factor is expected to be negligible, since all the areas not covered by the facility will be re-vegetated and the traffic limited to the normal operation activities of the hospital

Noise emission deriving from operational activities, including road traffic, operation of the facilities could have an impact on terrestrial fauna. However, considering the expected noise levels and the fact that most of fauna species, including birds tend to habituate to constant steady noise levels, even of a relatively high level, the impact is expected to be of relatively low intensity.

### 9.2.2.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Decommissioning activities could impact terrestrial fauna. However, the impacts are expected to be limited, since the area will be already urbanized, and depend on the future use of the area. Potentially, if the site is restored to its natural state, this phase is expected to have an overall positive impact on terrestrial fauna.

### 9.2.2.2 Mitigation measures

The mitigations described in the flora assessment to minimize impacts to natural vegetation (paragraph 9.2.1.2), will also indirectly have a positive effect on fauna, by protecting fauna habitat (e.g. minimization of the footprint to the smallest extent possible, dust control measures, avoid inadvertent disturbance to the adjacent vegetated areas, progressive reclamation of areas cleared during construction but not subject to the placement of facilities).

In addition, during construction an ecologist appointed by the contractor in charge of construction will briefly survey areas of natural vegetation prior to rock fragmentation and vegetation clearing. The survey will focus on nesting species that fall into protection categories and on fauna species with limited mobility the cannot move ahead of construction (e.g. tortoise). If any of these species is noted, specific mitigation measures will be implemented to ensure that all applicable regulations are complied with (e.g. translocation of the individual/nest to nearby undisturbed similar site).

Rock fragmentation activities will be performed outside the pick season for nesting birds that in the area goes from March to May.



Awareness will be developed among employees and contractor working on site about the protected species potentially present in the area, in order to ensure a constant monitoring and promote the reporting of incidental observations.

Moreover, with specific reference to the possible presence of nationally listed species during construction, instructions will be given to employees and contractors in order to prevent harming fauna species that might be present. In particular, BERN Convention conservation measures and provisions of 6th article, specified in Appendix II, will be considered and remembered to contractors during the construction:

“In respect of specially protected fauna species (Article 6), following acts are strictly forbidden:

- all forms of deliberate capture and keeping and deliberate killing;
- the deliberate damage to or destruction of breeding or resting sites;
- the deliberate disturbance of wild fauna, particularly during the period of breeding, rearing and hibernation, insofar as disturbance would be significant in relation to the objectives of this Convention;
- the deliberate destruction or taking of eggs from the wild or keeping these eggs even if empty”.

9.2.2.3 Residual Impacts

The residual impacts on the fauna component after the application of the abovementioned mitigation measures are (See Section 9.2.2.2 for details);

Table 28: Residual impacts on fauna

Construction phase	Commissioning and operational phase
low to negligible	negligible

9.2.2.4 Monitoring

No specific monitoring activity is considered necessary for terrestrial fauna.

9.2.3 Habitats and Biodiversity

9.2.3.1 Impact Analysis Results

The main habitat present within the LSA is Mediterranean maquis (57% of the LSA in total) characterized by rock outcrops. Other types of habitats present are garden and agriculture and urbanized areas. A small pond and two streams are also present. The habitats and biodiversity are impacted by the anthropogenic disturbances, however, considering the condition of the overall areas and the proximity of key biodiversity areas, the component is considered as medium sensibility.

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;
- introduction of alien species.

Impact factors that could possibly affect the presence of terrestrial habitat types during the operational phase are:

- occupation of land;





- pollutant and dust emission in the atmosphere;
- emission of noise and vibrations.

**9.2.3.1.1 Construction phase**

The habitat present within the project footprint will be directly impacted by vegetation clearing and disturbance of terrestrial top soil. Habitat present in the buffer area outside the project footprint could also be impacted by emission of dust and pollutant and indirectly by emission of noise (through changes in fauna communities).

The dominant habitat present within the footprint is in the Mediterranean maquis (79% of the footprint re-forested maquis, plus 20% natural maquis). These habitats are all heavily disturbed by and urbanization, grazing, discharge of construction waste, pollution. In addition most of the area within the footprint has been reforested with the exotic species eucalyptus (*Eucaliptus* sp.) together with *Cupressus sempervirens* and *Pinus* sp.

The best preserved Mediterranean maquis present in the LSA is found within the 1 km buffer area at higher elevation, north of the Project site. The artificial pond and the one of the streams are also found on the buffer area outside the project footprint.

**Table 29: Habitat types within the footprint, buffer and their sum (total LSA)**

Habitat Type	Footprint (ha)	Footprint (%)	Buffer (ha)	Buffer (%)	Total LSA (ha)	Total LSA (%)
re-forested Mediterranean maquis	49.49	79	114.04	17	163.53	23
Mediterranean maquis	12.43	20	229.41	35	241.84	34
pond	-	-	0.38	<1	0.38	<1
stream	0.39	1	10.98	2	11.37	2
garden and agriculture	-	-	38.03	6	38.03	5
urbanized	0.24	<1	260.77	40	261.00	36
<b>Total</b>	<b>62.55</b>	<b>100</b>	<b>653.59</b>	<b>100</b>	<b>716.14</b>	<b>100</b>

Another potential impact is the accidental introduction of invasive alien species, and in particular of flora species. Soil disturbance and reduced forest cover facilitate invasion by exotic (non-native) species. During construction, temporary stockpiling of the material and movement of top soil could create favourable condition for the spreading of exotic plant species. This species tend to have an advantage in disturbed ecosystem, and if they penetrate in an habitat they can potentially change it functionality and species composition.

**9.2.3.1.2 Commissioning and operational phase**

During the operational phase, part of the areas disturber within the footprint will be restored and re- vegetated, however some areas will occupied by project facilities for the long term.

Dust and air pollution during the operation of the project is expected to be negligible, since all the areas not covered by the facility will be re-vegetated and the traffic limited to the normal operation activities of the hospital.

Noise emission during operation of the facilities could have an impact on terrestrial habitats, particularly in regards to fauna and bird habitats. However, considering the expected noise levels and the fact that most of fauna species, including birds tend to habituate to constant steady noise levels, even of a relatively high level, the impact is expected to be of relatively low intensity.



9.2.3.1.3 Decommissioning/Closure phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

Decommissioning activities could impact habitat and biodiversity. However, the impacts are expected to be limited, since the area will be already urbanized, and depend on the future use of the area. Potentially, if the site is restored to its natural state, this phase is expected to have an overall positive impact on the component.

9.2.3.2 Mitigation measures

Mitigations measures described in the previous assessments for terrestrial flora (9.2.1.2) and fauna (9.2.2.2), will directly or indirectly contribute to mitigate the impacts on habitats as well.

In addition, during the construction phase, the presence and diffusion of invasive flora species will be regularly monitored during construction and with particular attention to temporary disturbed areas during the first stages of reclamation.

In case the diffusion of invasive species is observed, an eradication program will be put in place.

9.2.3.3 Residual Impacts

9.2.3.3.1 Construction phase

Table 30: Residual impacts on fauna component

Construction phase	Commissioning and operational phase
low	negligible

9.2.3.4 Monitoring

The presence and diffusion of invasive exotic flora species will be monitored in disturbed area/s annually by an ecologist appointed by the contractor in charge of construction during the construction phase and during the first 2 years during the operational phase. Findings of the monitoring and incidental observation will be included in an annual report, in order to identified possible critical situation. If necessary, additional mitigation measures will be put in place.

9.2.4 Protected areas

9.2.4.1 Impact Analysis Results

The protected areas present within 20 km from the site are Örnekköy Tabiat Nature Park situated at about 5 km from the project site and Spil Dagi (Spil Mountain) National Park found at about 20 km Nord East. In addition also 3 key biodiversity area (KBA) and one Important Bird area (IBA) are present. The closest KBA is Yamanlar Dagi is situated in the proximity of the LSA Nord –Est. The IBA called Gediz Delta is situated about 8 km West of the site. The sensitivity of the component is considered high.

The main impact factor that could affect protected areas during the construction phase is:

- emission of noise and vibrations.

No impacts are expected during the operational phase.

9.2.4.1.1 Construction phase

The emission of noise due to rock fragmentation performed during site preparation activities is expected to be of particular high intensity. For this reason it could potentially affect highly sensitive receptors such as KBA and IBA (priority biodiversity features, EBRD 2014) even outside the boundaries of the LSA. The duration of the impact will be very limited duration but its influence could exceed the LSA. The effect of this impact could potentially impact particularly sensitive taxa like birds, leaving in protected areas within the RSA.



Sensitive taxa leaving in the Örnekköy Tabiat Nature Park situated at about 5 km from the project site could be potentially impacted, while the Spil Dagi) National Park at about 20 km is considered too far to experience any disturbance.

In addition the Important Bird Area (IBA) Gediz Delta is situated about 8 km West of the site could also be affected.

### 9.2.4.1.2 Commissioning and operational phase

No impacts are expected during this phase

### 9.2.4.1.3 Decommissioning/Closure phase

No impacts are expected during this phase.

### 9.2.4.2 Mitigation measures

Mitigations measures described in the previous assessments for terrestrial flora (9.2.1.2) and fauna (9.2.2.2), will directly or indirectly contribute to mitigate the impacts on habitats as well.

In particular, rock fragmentation activities will be performed outside the pick season for nesting birds that in the area goes from March to May.

### 9.2.4.3 Residual Impacts

Considering the application of mitigation measures, emission of noise and vibrations will have a negligible impact on protected areas.

### 9.2.4.4 Monitoring

No specific monitoring activity is considered necessary for this component.

## 9.3 Social Components

### 9.3.1 Socio-economic conditions and employment issues

#### 9.3.1.1 Impact Analysis results on Project Affected People

##### 9.3.1.1.1 Construction phase

Based on the qualitative analysis of the Project actions, impacts on the socio-economic conditions will be mainly due to the need of workers, primarily during the construction phase and to a lesser extent during the operation phase thus resulting influx of people to the project area and surroundings. The main reasons, impacts and management influx are discussed below.

The project construction is planned to last three years. The project will be executed by Special Purpose Vehicle (SPV) established jointly by GAMA Holding A.Ş. and Türkerler A.Ş.

The number of employees during construction will be changing over the construction period. The minimum number of employees will be 156 and maximum number of employees at peak level will be approximately 4000. The manpower histogram over the construction period is provided in Figure 24

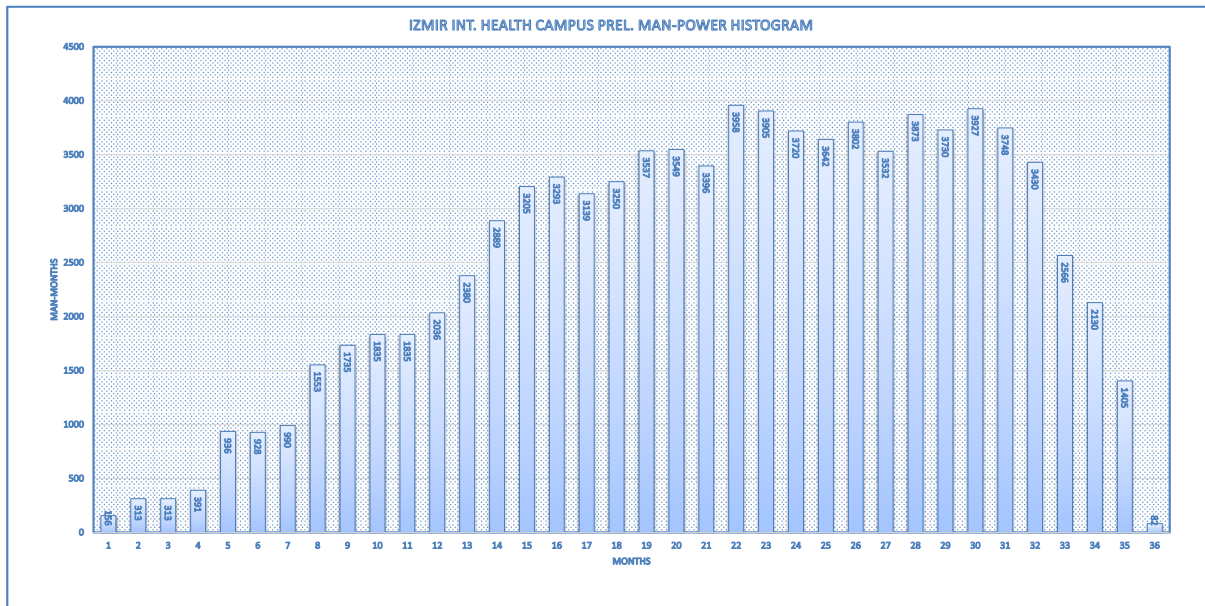


Figure 24: Manpower Histogram for construction phase

As part of the construction schedule there will be ongoing construction activities in the 537,546 m<sup>2</sup> of 622,530 m<sup>2</sup> the total project area for three years which will create potential impacts at the Laka Village and neighbourhood. These impacts would be related to;

- Provision of workforce and need for local procurement;
- Increase in real estate;
- Accommodation requirements for workers coming from outside Laka Village;
- Ongoing animal husbandry activities
- Dust and noise emissions;

### **Provision of workforce and need for local procurement**

The need of workers during the construction phase, which will peak at about 4000 as mentioned above, will lead both to positive and negative impacts on the socio-economic context of Bayraklı. It is expected that part of the works will need to arrive from other areas of the Region, therefore leading to additional population living temporarily in Bayraklı during the construction phase though significant portion of the additional population will be accommodated in the construction camp. .

In particular the need of workforce can be considered a positive impact, because it brings work opportunities to the local and regional population. In addition the presence of workers and of a new facility will imply a use of goods and services, partly purchased locally, therefore leading to increased expenditures within the local economy.

There will be a need for the accommodating of the employees residing in outside of Bayraklı district and İzmir. SPV will establish a construction camp for the accommodation of the employees.

The need of workforce and the consequent immigration of workers can also lead to negative impacts on the social context. The presence of additional population in the area can cause an increased use of existing infrastructures, such as water, wastewater, roads, education and health facilities, which may not be able or designed to sustain such use levels. In addition, an increase in the population implies a need of more housing, which may not be readily available, due to the technical times needed from the construction market to build additional houses, leading to a housing deficit in the short term. In addition the presence of a large construction project and of a new facility can create in the local population expectations of job opportunities that might not be fulfilled locally by the company, leading to frustration and resentment in the local population.



Concerns have been raised by Laka Village residents during the interviews in relation to the employees accommodating close to the village. The village residents do not want the village surroundings to be return into a construction yard and request clear boundaries to be in place between the construction site and the village.

As stated by the Laka village mukhtar after the information on the construction of a health care facility has become public; the real estates prices increased.

Osmangazi village stated the expectations on increase in real estate prices.

The construction activities may create negative impacts on the economic activities in the region.

Though the construction of the Project facilities may be expected to create negative impact on the ongoing animal husbandry at Laka Village,

The following factors will be limiting the impact on animal husbandry in the village(referring to interviews);

- The younger generation in the village do not foresee themselves to be engaged in animal husbandry ;
- The legal status of the village has been changed to quarter and husbandry is not allowed in locations with this status
- The animal husbandry activities are in the form of live feedstock and no animal grazing is being performed.

Any disturbance on the exiting transportation routes to the village may result in loss of connection between the residents in the region coming to village to buy milk and the milk producers in the village.

### 9.3.1.1.2 Operational phase

Operation of the Project facilities will create potential impacts that would be related to;

- Provision of workforce and need for local procurement;
- Increase in real estate prices;
- Ongoing animal husbandry activities

In particular the need of workforce can be considered a positive impact, because it brings work opportunities to the local and regional population. In addition the presence of workers and of a new facility will imply a use of goods and services, partly purchased locally, therefore leading to increased expenditures within the local economy.

The number of the administration personnel planned for the operation phase of the İzmir Bayraklı Integrated Health Campus Project is estimated to be 2,159 in light of the existing information available at this stage. The details of the employment are given in the table below. The number of the medical personnel (doctors, nurses, etc.) will be added when it is available.

**Table 31 Planned employment numbers**

	Number of Personnel
Laundry	39
Cafeteria	225
Laboratory	76
Imaging	153
Sterilization	33
Rehabilitation	167
Waste Management	11





	Number of Personnel
Cleaning- Room Cleaning	645
Hospital Information Management System (HBYS)	78
Security	235
Patient Guidance	301
Other Medical Support Services	25
Building and Land Services	64
Common Services	22
Furnishing	11
Garden Care Services	31
Disinfection	9
Parking Lot	34
<b>TOTAL</b>	<b>2,159</b>

It is expected that part of the employees (especially the unskilled and semiskilled) will be employed locally. Some part of the employees will come from outside of the Region, therefore leading to additional population living in Bayraklı and Laka village during the operation phase.

It has been stated during the interviews that there is already a workforce in the region employed at existing healthcare facilities. It is expected that these people will use the employment opportunities created by the Project during operation phase

The increase in the real estate prices estimated to happen with the start of the project is expected to continue during the operation phase

The information presented for the construction phase impacts on ongoing animal husbandry activities will be valid for the construction phase.

### 9.3.1.1.3 Decommissioning phase

Given that closure will not occur for at least 25 years and the future use of the Project site and surrounding areas is unknown, it is not possible to discuss the details of decommissioning activities at closure. This discussion will start in a second moment, once closure objectives are clearer.

### 9.3.1.2 Mitigation measures

The following mitigation measures will be in place in order to minimise the socio-economic and employment impacts originated by the project;

- Referring to Section 6.0 a continuous stakeholder engagement process and grievance mechanism will be in place
  - to exchange information on the project with the local community and other stakeholder and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders

on the migration (influx) to the area as a result of project activities

- Maximizing of local employment and procurement in order to increase the positive socio-economic impact of the project on the local community
- Coordination with the local community for the arrangements of accommodation and establishment of the construction camps



- Consider cooperation with local authorities and local community members on minimising the potential negative impacts of the project on animal husbandry in Laka village through measures such as but not limited to;
  - not disturbing the access routes of the buyers of food of animal origin to Laka Village
  - locating construction camp away from animal feedstock barns;
  - scheduling and planning of construction activities in such a way that nuisance to the animal feedstock is minimised ;
- Provide guidance to the migrating population during operation for accommodation and living arrangements through human resources policy and plans.
- Preparation of the plans for
  - Construction Camp Management
  - Human Resources Management
  - Grievance Mechanism including employees

### 9.3.1.3 *Residual impacts*

If the above mentioned mitigation measures are adopted, they can play an important role in reducing negative consequences of the Project on the socio-economic context, particularly during the construction phase, which will be the most impacting. Moreover the Project can benefit the local economy both by offering job opportunities and by maximizing beneficial effects on the local economy. In addition adopting clear and transparent hiring procedures and continuous engagement with the local community on the construction planning will benefit the company's reputation among individuals and the local community, improving the general profile and relationships with the local community.

The following will apply to residual impacts with the adoption of mitigation measures;

Direction: negative

Duration (D): medium-short

Geographic extent (G): regional

Intensity (I): low

Probability of occurrence (P): low

Sensitivity (S): medium

The overall residual impact is considered to be negligible.

### 9.3.1.4 *Monitoring*

The activities for the monitoring of the residual impacts on socioeconomic conditions and employment are;

- The monitoring activities listed for the management of noise and dust emissions during construction are valid for this component;
- Monitoring of the implementation of management plans. Examples of monitoring parameters are but not limited;
  - Recorded and responded grievances and complaints
  - Local employment ratio
  - Percentage of procurement from local sources in the total procurement figures



## **9.3.2 Social Services and Facilities**

### **9.3.2.1 Impact Analysis results**

#### **9.3.2.1.1 Construction phase**

Any educational facility has not been identified in the impact area of construction activities. The nearest school is Trade Stock-Exchange High School which has 500ms of air distance from construction site and located at south of main İzmir Highway O-30.

No nuisance is expected to be created by dust and noise emissions from construction and construction related transportation activities.

#### **9.3.2.1.2 Operation phase**

The operation of the Bayraklı IHC project is expected to create positive impact in the region in terms increased quality of health services and the increased number of population having a easy access to health services. The expected positive impacts of Bayraklı IHC on the local and regional community has been discussed in section 1.2

The opinions of the community members expressed during interviews and focus group discussions confirmed these expectations.

### **9.3.2.2 Mitigation measures**

Although no major negative impacts are identified for this component, following general mitigation measure will be in place;

- Referring to Section 6.0 a continuous stakeholder engagement process and grievance mechanism will be in place
  - to exchange information on the project with the local community and other stakeholder and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders

### **9.3.2.3 Residual impacts**

The residual impact on this component will be negligible.

### **9.3.2.4 Monitoring**

Following general monitoring activities will be in place;

- Monitoring of the implementation of grievance mechanism with recorded and responded grievances and complaints

## **9.3.3 Infrastructure**

### **9.3.3.1 Impact Analysis results**

#### **9.3.3.1.1 Construction Phase**

The construction transportation routes have not yet been finalized.

Concerns have been raised by the Laka Village residents during the site interviews on the impacts to be created with the construction and operation transportation routes.

It has also been stated that the project would benefit from improvement of existing transportation routes.

The existing public waste collection infrastructure can be used to handle the construction wastes.



### 9.3.3.1.2 Operation Phase

It has been pointed out during the meetings, interviews and focus group discussion that;

- It has also been stated that the project would benefit from improvement of existing transportation routes.

As discussed in section 8.3.3.1, access to Bayraklı IHC by public transportation is by limited bus services. The use of existing public transportation by the public to access Bayraklı IHC may create bottleneck points on the public transfer routes to the site.

The existing public waste collection infrastructure can be used to handle the operation wastes.

### 9.3.3.1.3 Decommissioning phase

Transportation of patients from the close vicinity will be provided due to the maintenance and repair of the infrastructure.

### 9.3.3.2 Mitigation measures

The following mitigation measures will be in place to minimize the impacts of the project on the infrastructure;

- The transportation routes for the construction phase will be finalised through;
  - evaluating the conditions of the road whether being able to handle the v-construction vehicles loads and the traffic loads
  - selecting the routes with minimum social impacts and if required defining additional mitigation measures
  - coordination with the local authorities and community leaders.
- Local waste management authorities will be contacted to ensure the allocation of existing municipality resources and structures for the construction waste management
- The project site is accessible through the E87 (030) highway. In addition a detailed traffic study will be performed to define the final transportation routes with minimum impact on the existing traffic load and suggesting measures to improve the accessibility to Bayraklı IHC during operation.
- SPV will be in contact with local authorities to provide input on any future planning of the road and transportation in line with the developments in the area and maximize the benefit from future transportation network developments in the region.
- Local authorities will be contacted during construction to confirm the utilisation of existing medical waste disposal facility for the operational medical wastes.

### 9.3.3.3 . Residual impacts

If the above mentioned mitigation measures are adopted, they can play an important role in reducing negative consequences of the Project on the existing infrastructure, particularly on waste handling and transportation. Moreover the Project can benefit from continuous engagement with the local community on the transportation planning and increase the company's reputation among individuals and the local community, contributing to the management of traffic related community health and safety issues, identifying sustainable transportation routes for construction and operation.,

The defining and confirmation of the waste disposal routes and arrangements with local authorities in a timely manner will contribute to the management of community health and safety issues arising from the disposal of construction and operation wastes especially medical wastes.

The following will apply to residual impacts with the adoption of mitigation measures;

Direction: negative

Duration (D): medium-long



Geographic extent (G): regional

Intensity (I): low

Probability of occurrence (P): certain

Sensitivity (S): low

The overall residual impact is considered to be negligible.

**9.3.3.4 Monitoring**

Monitoring plans that need to be produced at this stage would be reviewed under the authority of related ministries and grievance mechanisms. In order to establish of these plans, the list of environmental and social necessities need to be prepared. After, plans would be prepared are listed below:

- Environmental and Social Management Plan
- Camp Site Management Plan
- Occupational Health and Safety Management Plan
- Stakeholder Engagement Plan and Grievance Mechanism
- Construction Traffic Management Plan.

The applicability of these plan will be audited by independence third parties in 2 3 years.

The overall objective of the SEP is to explain how the SPV is planning to engage with stakeholders through the course of the Project.

Auditing of infrastructure works would be covered under the authority of related great or district municipality.

**9.3.4 Cultural Heritage**

According to the field work, no movable or immovable cultural assets were encountered within the Project area. However, there are two archaeological sites in the vicinity..

Although no cultural assets have been identified, in case of an encounter with a cultural asset during any physical intervention such as scalping, foundation excavation etc. in the Project area, it is recommended to cease all activities and inform the İzmir Archaeology and Ethnography Museum<sup>27</sup> as dictated by “**Article 4: Obligation to Inform of Law on Protection of Cultural and Natural Assets, Law No. 2863,**” and to proceed with the construction activities according to the decision of the Museum Directorate.

**10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM (ESMS)**

Conformance Table – Environmental and Social Management System (ESMS)		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<i>Environmental and Social Management Systems/</i> Establish and maintain a Social and Environmental Management System	PR 1	PS 1
<i>Environmental and Social Policy/</i> Establish and manage mitigation and performance improvement measures and actions that address the risks and impacts	PR 1	PS 1
<i>Organisational capacity and commitment/</i>	PR 1	PS 1

<sup>27</sup> Halil Rifat Paşa Cad. No: 4 Bahribaba Parkı içi Konak – İzmir, Tel: 232 489 07 96 - 232 483 72 54  
e-posta: izmirmuzesi@kultur.gov.tr





Establish, maintain and strengthen an organizational structure that defines roles, responsibilities and authority		
<i>Organisational capacity and commitment/</i> Designate specific personnel, including management representatives with clear lines of responsibility and authority	PR 1	PS 1
<i>Community Health and Safety</i> Risks and adverse impacts to the health and safety of the potentially affected communities are identified and assessed and protection, prevention and mitigation measures are defined	PR 4	PS4
<i>Labour and Working Conditions</i> Minimum standards are defined for ensuring labour and working conditions to be in compliance with project requirements	PR2	PS2
<i>Occupational Health and Safety</i> Minimum standards are defined for ensuring occupational health and safety to be in compliance with project requirements	PR2	PS2
<i>Health Services</i> Consider the impacts on employees, patients and the immediate community	Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal	Environmental, Health, and Safety Guidelines; HEALTH CARE FACILITIES

### 10.1 Environmental and Social Management System Structure

The Environmental and Social Management System (ESMS) will ensure that the Project:

- complies with all applicable Turkish legislation as well as relevant IFI guidelines provided in the ESA;
- implements Good International Industry Practices (GIIP) to minimize potential environmental and social impacts during the construction, operation and decommissioning phases;
- is executed in compliance with the commitments addressed in the ESA for the minimization of potential environmental and social impacts;
- works in accordance with high standards of safety;
- cares for the protection of own employees and public;
- promotes its policies through training, supervision, regular reviews and consultation;
- generate local socio-economic benefits by using local and regional labour forces;
- engages and communicates with the local community and other stakeholders through a stakeholder engagement programme.

The ESMS addresses more in detail the following environmental and social aspects:

- Environmental aspects
- Labour Issues and public Health & Safety aspects
- Stakeholder management and social aspects

The ESMS included here is intended to describe the framework for the general management issues. This ESMS will be further developed as the project progresses .



### 10.2 Overall Environmental and Social Management System

The following mechanisms will be in place for the implementation of the ESMS.

#### 10.2.1 Organization - Roles and Responsibilities

The **Project Management** will ensure that:

- the Project will be executed in line with the Environmental and Social Policy of the Project itself;
- the required resources are in place to implement the environmental and social mitigation measures identified in the ESA.

**The HSE Engineer(s)/HSE Manager** will supervise the overall environmental and social management activities associated with the Project at all phases of the Project. HSE Engineer(s) will be appointed in the beginning of pre-construction activities.

The role of the HSE Engineer(s)/HSE Manager will be to:

- supervise the implementation of the environmental and social mitigation measures identified in the ESA;
- ensure the ESMS and the associated management plans and procedures are further developed and detailed during the course of the project lifecycle;
- coordinate with Community Relations Officer the monitoring the stakeholder engagement activities being performed in line with the stakeholders programme and the public complaints are recorded and addressed.

**The Community Relation Officer (CRO)** is appointed for the overall implementation of the social management activities of the Project. He/she reports to the Management and is responsible for the implementation and operation of the SEP and in this respect acts as an interface between İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş., contractors, subcontractors and stakeholders. The CRO is responsible for implementing and organizing engagement activities described in this plan. The CRO is also responsible for monitoring the Plan implementation and for proposing corrective actions and reports to the Management. The CRO is furthermore responsible for:

- ensuring that this procedure is up to date and appropriate to the nature and scale of the Project;
- proposing to İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. management, if necessary, amendments and/or updates to this procedure and issuing revisions;

**Community Relation Assistant (CRA):** if deemed necessary, İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. will appoint one or more Community Relations Assistant(s), which will support the CRO in daily activities and duties. The CRA might be particularly important during the construction phase, as this is when Stakeholder Engagement related activities will peak. The CRA should be preferably employed from the local community, as this can ensure that he/she already has an established relationship with the community.

#### 10.2.2 Risk Assessment and Risk Register

In order to identify and manage the project risks, a risk assessment study will be conducted in the beginning of the construction / pre-construction works and will be repeated at the beginning of each phase. The findings of this study will be taken into consideration and a detailed risk register will be prepared identifying the potential environmental, health & safety and social risks associated with the individual work items. The project has prepared an HSE risk assessment as presented in APPENDIX İ. This will be a living document and be updated during the course of the project.

#### 10.2.3 Training and Awareness

The project will ensure that:

- All personnel, including contractor's personnel, will receive a level of environmental and social training appropriate to their job functions.



- A training programme will be in place to include as a minimum but not limited to:
  - awareness of Project policies;
  - regulatory framework and conformance to the ESMP;
  - the potential environmental impacts associated with their jobs;
  - occupational health and safety;
  - requirements of operational policies;
  - spill response and emergency response programs;
  - risk assessment.

### 10.2.4 Communication of Environmental and Social Issues

The system to communicate internally and externally regarding environmental and social issues are included in the stakeholder engagement activities.

### 10.2.5 Document and Record Controls

A document and record keeping procedure will be established to maintain the summary of all environmental and social activities and results. The records will include mitigation, monitoring and reporting needs, such as sampling, analytical data, incident reports, communications, etc.; and performance, training, communications and audits. These documents will be readily accessible for review and audit.

### 10.2.6 Corrective Actions

Procedures will be established to investigate any non-conformance with the requirements and necessary adjustment to correct and prevent further occurrence.

### 10.2.7 Inspections and Audits

A system will be established to conduct periodic audits of the environmental and social management plans, their effectiveness, implementation and maintenance.

### 10.2.8 Budget

Budgets will be established to meet the needs and requirements of the ESMS for the life of the Project. A refined budget will be established annually to address the tasks to achieve the requirements to address environmental and social management.

## 10.3 Environmental and Social Management Plan

### 10.3.1 Management Mechanism

A Site HSE Manager for the Project will be appointed in the beginning of the pre-construction activities to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

### 10.3.2 Construction Phase

#### 10.3.2.1 Contractor's Environmental and Social Management

#### Responsibilities of Contractors

The Contractor shall:

- comply with the relevant environmental requirements detailed herein and any other relevant local legislation;
- implement and demonstrate compliance with these requirements at all times;



- address the requirements of those applicable standards in the form of a Specific Project Work Instructions;
- prepare a construction ESMS in line with this ESMS (and associated management plans) and ESA and submit to the approval of İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. before the start of construction;
- ensure the subcontractors are aware and in compliance with the requirements of the ESA.

### Personnel and Resources

The Contractor shall appoint an Environmental Representative ("ER"). The ER shall as a minimum:

- supervise the implementation of the Contractor ESMS;
- ensure that the all the Contractor workforce is communicated on the ESMS requirements;
- implement a training programme for the workforce;
- ensure a routine auditing and inspection programme is in place;
- the Contractor's appointed ER is responsible for internal environmental site audits and inspections;
- the ER shall be competent in understanding:
  - the Contract requirements;
  - contents of the risk register;
  - Contractor's ESMS and Policies;
  - relevant environmental management procedures; and
  - legal and other requirements.

### Training and Communication

- A project site induction on Project environmental and social requirements shall be delivered to all Contractor employees.
- The Contractor's personnel shall receive environmental training appropriate to the environmental risks of the jobs/tasks they are delivering.

### Inspection and Audits

Non-conformances and hazards identified by the Contractor during inspections shall be documented, addressed with appropriate corrective and preventive actions and communicated to İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. in timely manner.

### Event Management

All Contractors shall report environmental events, near-misses and potential hazards within an agreed timeframe. The definition of the environmental events shall be documented and communicated to the Contractor's personnel. Environmental events shall include, as a minimum, actual events or near misses resulting in:

- a breach of legal & other requirements;
- environmental damage (e.g. over clearing);
- environmental pollution / contamination;
- impacts on flora, fauna, waters, heritage sites and atmosphere;
- unapproved discharge to air, land and water; and



- public complaints.

Corrective and preventive actions shall address the root causes of the event, and reduce the probability of event recurrence. Corrective and preventive actions shall:

- include the review and/ or revision of the risk register, relevant procedures and documentation;
- assess the effectiveness of corrective and preventative actions as part of the event investigation process, particularly for repeat events. The risk register shall be reviewed as part of this process.

### Emergency Response

The Contractor shall:

- identify the events with a potential of significant environmental impacts and prepare appropriate response plans for the mitigation of such impacts. As a minimum the emergency response plan shall address events and impacts of:
  - major hydrocarbon and chemical spills,
  - natural hazards,
  - fire;
- provide adequate equipment and materials to effectively manage emergencies;
- demonstrate that such plans are or will be effective through personnel training and testing of the plan;
- develop post emergency plans which include a review of the effectiveness of the plan, its implementation, and the need for revisions.

### Progress Tracking and Reporting

The Contractor shall:

- provide progress updates to Project Management on a weekly basis, as a minimum, which shall comply with reporting requirements as such:
  - environmental training topics and % employee attendance;
  - copies of ESM meeting minutes;
  - inspection / audit findings in the reporting period;
  - progress against completion of corrective actions;
- report the following items for the previous month, on the first day of each month:
  - performance against defined objectives and targets for management of significant risks;
  - amount of waste oil removed from the Site;
  - amount of contaminated soil generated and disposed;
  - amount and type of wastes generated and disposed;
  - area of land cleared;
  - visual water quality and depth to water level (where required);
  - volumes of wastewater generated;
  - any other reporting to local authorities.





- provide all environmental related documentation as requested.

### Record Keeping

The Contractor shall:

- keep all the records and other relevant documentation to demonstrate compliance to Project requirements for the duration of the Contract;
- make records available during inspections and audits by Project Management.

### 10.3.3 Operation Phase

The appointed construction site HSE Manager during the construction of the Project will preferably continue for the operation phases. If not, a new HSE Manager will be appointed in the beginning of the operations to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

The HSE Manager will be the point of contact for Project internal and external stakeholders.

In addition to the overall management system requirements described in Section 10.0, the Project will develop additional operational plan and procedures as part of the environmental management system. These will include the following, but not limited to ;

- Environmental Risk Identification and Assessment Procedure
- Compliance Management Procedure
- Waste Management Procedure
- Traffic Management Procedure
- Environmental Emission and Discharge monitoring procedure
- Hazardous Material Handling Procedure
- Resource Consumption and Resource Efficiency Monitoring Procedure

## 10.4 Social Management Plan

### 10.4.1 Management Mechanism

A Community Relation Officer (CRO) will be appointed at the beginning of the pre-construction activities to supervise the implementation of overall environmental and social mitigation activities defined by the ESMS.

### 10.4.2 Stakeholder Identification

Stakeholders are individuals or groups who can affect, or are affected by, or have a legitimate interest in the Project results and performance. Some stakeholders are obvious, such as government authorities responsible for permitting and local communities adjacent to the Project. However, stakeholder identification intends to include other groups, organisations and individuals that may not appear to be directly involved. Health professionals and educators, for example, may be directly involved in the Project development, and are also familiar with the existing community and socio-economic dynamics and can help improve the quality of impact analysis. Such consultation also helps ensure that mitigation and social investment are coordinated with existing initiatives. Expanding stakeholder identification beyond government and local residents increases the likelihood that a wide representation of interests and opinions will be considered in the development of the Project.

In the case of the present Project stakeholders will be recorded in the following categories:

- governmental authorities at the national, regional and local levels;



- multi-national and international organizations (i.e., United Nations, World Bank Group, bilateral donors, etc.);
- non-commercial, non-governmental and public organizations at the international, national, regional and local levels,
- interest groups, such as universities and their foundations, cooperatives, local business establishments, business associations, chambers of commerce and others (i.e., labour, youth, religious, businesses, etc.);
- local communities;
- local businesses and potential Project contractors and suppliers;
- project, contractor and subcontractor employees; and
- media.

### 10.4.3 Stakeholder Engagement

A Stakeholder Engagement Programme has been planned with the following main objectives:

- continuously informing the local community about the Project-related development activities;
- ensuring that the local community is informed about the hazards associated with construction, operation activities of the Project and mitigation measures implemented by İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. to reduce impacts where possible;
- minimizing potential disputes between Contractor's and Subcontractors' and the local community;
- incorporating local knowledge during the entire Project life cycle, by taking into account bottom up information and feedback provided by local communities; and
- timely and effectively responding to community concerns regarding the issues such as employment of the local workforce reserve in the construction and operation phases, disruption to daily activities, safety issues, disturbances due to noise or dust, and other environmental and social issues.

### 10.4.4 Grievance Mechanism

The purpose of establishing the Grievance Mechanism is to provide indications on the procedure to be followed for the management of grievances that could arise due to construction and operation activities of the Project. The Grievance Mechanism is part of a broader framework represented by the Stakeholder Engagement, which sets the guiding principles and provides implementation tools to build strong relations with local communities. In this sense the Grievance Mechanism is a the key tool that allows the company to identify problems and to discover solutions together with the affected communities. The Grievance Mechanism aims at demonstrating responsiveness to stakeholder needs and to facilitate a trustworthy and constructive relationship with the stakeholders, by developing appropriate mitigation strategies.

The principles underlying the Grievance Mechanism are the following:

- transparency in grievance receipt and registration system;
- accessibility and culturally appropriateness, ensuring ease of access to community members;
- predictability based on a clear and known procedure, with time frames for each stage; clarity on the types of process and outcome it can (and cannot) offer; and means of monitoring the implementation of any outcome, maintained through effective disclosure of the mechanism;
- equitability ensuring fairness among aggrieved parties;
- confidentiality: all grievances received will be treated confidentially and will not be shared outside the company. Submissions will not be used in any way to intimidate the person or organization submitting the complaint.



- The Community Relation Officer and Community Relation Assistant (mentioned in Section 10.2.1) will be responsible of grievance mechanism. This mechanism have also been covered the patients, health employees and contracted workers.

The objectives of the Grievance Process will be to:

- provide affected people with ways and means of stating their complaints during the course of the project;
- establish a transparent and mutually respectful relation with communities;
- ensure that corrective actions are identified and taken;
- verify that affected people are satisfied with the corrective actions taken;
- avoid the need for judicial operation sanctions.

### 10.4.5 Monitoring and Reporting

The outcomes of the grievance mechanism procedures will be regularly reported both internally and externally.

In order to increase success of the grievance mechanism, all management staff must be aware of role and objectives of the procedure, to ensure that effective support is given to the CRO in the identification and implementation of grievance resolution actions. It is therefore essential that management and general staff are regularly informed on the grievance mechanism outcomes and performances.

With regards to internal reporting, the CRO will be responsible for liaising with management on a regular and on need basis, to inform on general progress of grievance mechanism and to seek for advice when needed.

## 10.5 Labour Issues and Health & Safety Management Plan

### 10.5.1 Labour Conditions

İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş. will prepare a Labour and Health & Safety Management Plan that will ensure the compliance with applicable Turkish legislation, Equator Principles, IFC and EBRD Guidelines and standards.

A labour / human resources management system will be established to manage labour rights, security and health issues. An employee grievance mechanism will be established during construction and operation phases. The employees will be informed on the grievance mechanism during recruitment.

Considering the present project characteristics and the information collected through impact assessment process following points will be considered and included as a minimum into the management system to be developed;

- The SPV (İzmir Bayraklı Hastane Yatırım ve Sağlık Hizmetleri A.Ş.) will promote equality of treatment and prohibit harassment in the workplace
- Employment decisions, such as recruitment, dismissal, promotion, will be transparent and will not be made (directly or indirectly) on the basis of personal characteristics such as sex, race, nationality, etc, but rather on the ability to do the job.
- Be in coordination with the local health authorities and association on developing the recruitment process
- The employees will be provided with a written contract. The contracts as a minimum will include information on terms and conditions of employment, including the period of employment, wages, hours of work, overtime arrangements, procedures for termination of the contract and any benefits. The contract will be in the native language of the employee and it will be clear and understandable to the employee. A copy of contract will be given to the employee.
- The copies of relevant human resources policies and any collective agreements will be readily available to workers



- Include provisions in the employee contracts to detailing the employment arrangements after the operation by PPP model has been completed and the management is handed over to public authorities. This will enable to minimize any potential negative impacts on employee rights and benefits during the hand over process.
- There will not be forced labour and employees will be free to terminate their employment in accordance with national law
- The SPV management has not issued the subcontracts, yet. During the contracting process the existing corporate procedures of Gama A.Ş. and Türkerler A.Ş. will be referred to.
- The Health and Safety requirements and provisions will be included in the sub-contracts and employee contracts.
- The employees will be informed on the operation of PPP projects during recruitment process.
- The recruitment process will be transparent and will not have any discriminating
- Follow minimum age for employment of young persons in national legislation, and keep records of dates of birth verified by official documentation
- Young people will not be employed in hazardous work as defined by Turkish national legislation.
- SPV has a strict policy on not employing child workers.
- SPV and subcontractors must document and communicate terms of employment to workers, usually in the form of a written contract of employment
- In case of large redundancies a retrenchment plan will be prepared by the SPV.

In relation to the specific requirement for the accommodation provided in the construction camps following measures will, as a minimum, be in place;

- Policies and procedures on the quality and management of the accommodation and provision of basic services (either provided directly or by third parties) shall be established in line with IFC, EBRD WA GN<sup>28</sup> and implemented.
- Basic services requirements refer to minimum space, supply of water, adequate sewage and garbage disposal system, appropriate protection against heat, cold, damp, noise, fire and disease-carrying animals, adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting, and dedicated medical services.
- Good standards in living facilities will be ensured in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents as well as to maintain a good level of morale. Living facilities have to be built using adequate materials and always have to be kept in good repair, clean and free from rubbish and other refuse. A list of main standards to be met (albeit not exhaustive) is presented below:
  - Accommodation facilities will be provided with adequate heating, cooling and ventilation systems;
  - Facilities will be provided with both natural and artificial lighting (e.g. window surfaces of 5%-10% of flooring surface)
  - Workers will be guaranteed access to an adequate amount of free potable water for drinking and personal hygiene uses. Drinking water must meet national drinking water standards and its quality must be regularly monitored.

<sup>28</sup> Workers' accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009



- Wastewater, sewage water and other waste materials will be disposed of according to national legislation.
- The location of facilities is important to prevent exposure to wind, fire, flood and other natural hazards. Worker's accommodation has to be unaffected by the environmental or operational impacts of the worksite (for example noise, emissions of dust) but is sufficiently close that workers do not have to spend undue amounts of time travelling from their accommodation to worksite.
- Rooms and dormitory facilities will be designed and built so that workers can rest properly and maintain good standards of hygiene. Rooms/dormitories will be kept clean and in good conditions, exposure to noise and odour must be minimized. Room/dormitory design should strive to offer workers a maximum of privacy and all facilities must be single sex. A list of main standards to be met (albeit not exhaustive) is presented below:
  - Rooms/dormitories are kept in good condition and cleaned at regular intervals
  - With regards to density, minimal floor space must be of 4-5.5 m<sup>2</sup> per worker, with a minimum ceiling height of 2.1 m.
  - Each worker is provided with comfortable mattress, pillow, cover and clean bedding which are washed frequently.
  - Workers must be able to maintain a good standard of personal hygiene and contamination or spread of disease must be prevented through the use of adequate equipment and procedures. A list of main standards to be met (albeit not exhaustive) is presented below:
    - Sanitary and toilet facilities will be built in materials that are easily cleanable, and are cleaned frequently and kept in working conditions
    - An adequate number of sanitary and toilet facilities will be provided (at a minimum 1 unit for 15 people) and conveniently located in the same building as rooms and dormitories.
    - An adequate number of hand-wash and shower facilities will be provided (at minimum 1 unit for 15 people) and conveniently located in the same building as rooms and dormitories;
- Good standards of hygiene will be maintained in canteen/dining and cooking facilities. If caterers are contracted to manage kitchens and canteens, they must take into account and implement the same standards. A list of main standards to be met (albeit not exhaustive) is presented below:
  - Canteens will have a reasonable amount of space (minimum 1.5 m<sup>2</sup> per person) and will be adequately furnished;
  - Kitchens will be designed, built and equipped so to maintain an adequate personal hygiene and to permit food hygiene practices, including protection against contamination.
- Safe and nutritious food will be provided to workers, in order to guarantee their wellbeing and productivity. The WHO 5 keys to safer food or an equivalent process will be implemented. Food served to workers will contain an appropriate level of nutritional value and will take into account religious/cultural backgrounds and needs.
- Access to adequate medical facilities and services is provided to workers; an adequate emergency response system must be put into place. See also Workers' Health Management Plan on Communicable Diseases.
- Basic leisure and social facilities will be provided to workers, in order to increase workers' welfare and to reduce the impacts of the presence of workers in the surrounding facilities. Basic collective social/rest spaces will be provided (e.g. multipurpose halls, TV rooms, etc.). In addition the contractor should consider providing recreational/sport facilities. Communication systems such as internet connection will be provided at an affordable or free cost.





- Security will be guaranteed to workers and their property (personal belongings) on site, in line with indications in the Security Management Plan.
- The accommodation services will be provided in a manner consistent with the principles of non-discrimination and equal opportunity. Workers' accommodation arrangements should not restrict workers' freedom of movement or of association. Workers' gender, religious, cultural and social backgrounds must be respected. Workers must be made aware of their rights and obligations and must be provided with a copy of the internal accommodation rules, procedures and sanction mechanism.
- Workers must be made aware of the Worker's Grievance Mechanism and know that any concern or complaint regarding accommodation may be submitted through the Worker's Grievance Mechanism.
- During the workers' accommodation design and planning process the Annex Checklist provided in the IFC and EBRD Guiding Notes on Workers' Accommodation must be followed to ensure that the document's requirements are met.

### 10.5.2 Occupational Health and Safety

A health and safety management system employing site and work specific health & safety procedures and instructions will be established. The procedures will include but not be limited to the following issues:

- General Health & Safety Procedures
- Specific Health & Safety procedures for hospital structures
- Personal Protective Equipment Usage
- Working at Height
- Fall Protection
- Working in Confined Space
- Hot Works
- Electrical Works
- Portable Appliances
- Lock Out Tag Out
- Procedures Related to Working Environment and Industrial Hygiene (noise, vibration, heat, etc)

### 10.5.3 Community Health And Safety

The community may be exposed to potential risks of health and safety associated with hazards created through the project activities and equipment, vehicles and infrastructure allocated for project use.

The section 9.0 on the assessment of potential impacts of the project on the environmental and social components provides a detailed discussion on the prevention and control of impacts on human health and the environment due to the release of pollution.

As an overarching attempt to control and minimise the community health and safety impacts SPV will;

- Cooperate with the project stakeholders through the engagement process detailed in the Stakeholder Engagement Plan while defining and implementation of the mitigation measures for the control of risks and impacts created by the project on the community health and safety.
- Prepare and accident and incident investigation procedure. This procedure will include the investigation process for the potential accidental events, injuries or diseases that may occur during the lifecycle of the project as a result of project related facilities. This procedure will also define the process for documenting the findings of the investigation and adopting measures for the prevention of reoccurrence.



- Inform and consult community members on specific project activities such as crossings, fragmentation and similar, they will be informed on the health and safety precautions and procedures through consultation meetings.
- Make sure all contractor and subcontractors will be informed on the requirements for ensuring community health and safety.
- Recruit or subcontract security personnel in order to ensure the security of the working areas.
- A Grievance Mechanism will be in place as detailed in Stakeholder Engagement for communities and individuals to formally communicate their concerns, complaints and grievances and facilitate resolutions that are mutually acceptable by the parties.

More specifically in line with the location and characteristics of the present project the following community health and safety risks are identified;

- Transportation related safety risks
- Waste management related health risks
- Management of camp and construction and communicable diseases
- Health risks induced through provision of health care services
- Infrastructure, building, and equipment design and safety

### **10.5.3.1 Transportation related safety risks**

During both construction and operation of the project the transportation activities and thus the traffic load will be increased around Laka village and other settlements around the transportation routes.

A specific traffic study APPENDIX A has been prepared at the regional and project level for the definition of the best suitable traffic routes and the requirements of connections from existing roads to the project area.

An individual Traffic Management Plan will be prepared for construction and if required, operation phase of the project.

The Traffic Management Plan will include the measures for the minimisation of the transportation related safety risks. Nevertheless following mitigation measures as a minimum will be included in this Management Plan and will be implemented by SPV.

- Increased safety awareness among the Laka Village and other nearby settlement areas especially on the routes of transportation to the project area will reduce risk of accidents. Therefore, an awareness training will be delivered to community members including the adults and children in Laka Village and any other settlement area along the transportation routes for increasing the awareness on the project induced hazards (i.e. increased traffic, construction areas and similar).
- Community members will be informed and consulted for the location of the crossing points, they will be informed on the health and safety precautions and procedures through consultation meetings.
- Roads and intersections subject to intense construction traffic will be provided with additional mitigation measures such as traffic control, speed reduction systems, warning signals and informing drivers on such hotspots.
- Transport during night-time will be avoided to the extent possible in order to prevent road accidents.

### **10.5.3.2 Waste management related health risks**

- Wastes created during the construction and operation of the project would create health risks to the employees and community if not collected and disposed properly. An individual waste management plan has been prepared for the project and presented in Appendix XXX. As a minimum;
- All wastes will be segregated and recycling procedures will be set up;



- Domestic solid wastes will be disposed through licensed domestic solid waste disposal contractors identified through communication with the local authorities;
- Hazardous solid wastes will be disposed through licensed hazardous solid waste disposal contractors identified through communication with the local authorities;
- Medical wastes will be disposed through licensed medical waste disposal contractors identified through communication with the local authorities;
- Temporary site waste storage areas will be identified and arranged in compliance with local regulations.

### 10.5.3.3 Management of Camp and Construction Site

A construction camp will be established to accommodate the workers during construction. An individual Camp and Construction Camp Management will be prepared to include the mitigation measures for the minimisation of health and safety risks on the community through the operation of camp site.

As a minimum following measures will be in place during the operation of the camp sites;

- In order to avoid risks of accidents due to presence of construction site and construction activities, there will be fencing and additional warning signals to avoid trespassing. In addition local population will be informed about construction activities taking place through stakeholder engagement.
- Medical surveillance will be performed among its workers and ensure medical examinations are done for workers performing health critical activities (i.e. canteen workers and such).
- Bayraklı District Health Directorate and other relevant health authorities in the area will be liaised to agree on appropriate strategies and plans to mitigate the transmission of communicable diseases in settlements surrounding campsite.
- Campsites will be provided with health facilities equipped to deal with emergency procedures and routine medical operations.
- Workers will be subject to legal health screening before employment contracts are signed and if necessary will be provided with required immunisation treatments; all health information will be dealt with confidentially. They will be given health awareness trainings at routine intervals.

### 10.5.3.4 Infrastructure, building, and equipment design and safety

Based on the seismic zone classification of Turkey, İzmir Province is in the 1<sup>th</sup> degree seismic zone which is the most active zone in Turkey.(Refer to Section 8.1.2). This would increase the earthquake risk on the project area.

Project design and engineering should cautiously comply with the provisions of the "Regulation on the Buildings to be Constructed on Earthquake Zones" (06.03.2007 O.G. No: 26454). The parameters determined from geological and geotechnical investigations for the Project Area based on this regulation are:

- Building significance coefficient (I): 1.5
- Soil Type: B
- Local soil class: Z<sub>2</sub>
  - Ground spectrum periods: T<sub>A</sub>= 0.15 T<sub>B</sub>= 0.40
- Effective ground acceleration coefficient (A<sub>0</sub>): 0.40 (1<sup>st</sup> degree earthquake zone)

Other risks related natural hazards are addressed in Section 9.1.

The design, construction and operation of the structural components of the project will in compliance with national legislation and other applicable standards.

Before Bayraklı IHC is taken into operation a third part fire and safety audit/inspection will conducted by certified and competent experts.



### 10.5.3.5 Risks induced through provision of health care services

During the operation of Bayraklı IHC there will be production of medical and radioactive wastes.

If these wastes are not properly managed, they can pose significant health risks to the community. Specific waste management plan including medical/clinical wastes and radioactive wastes is presented in APPENDIX B

Operation of Bayraklı IHC will be in compliance with requirements of all the relevant regulations as described in section 3.0 and appropriate quality control and management systems will be implemented which would ensure the management of health and safety risks that would be imposed to patients, employees and community.

SPV will consider the assurance of emergency access to the IHC when developing the access routes to IHC and defining the emergency response and preparedness plan. As a minimum, there will be two possible access routes defined in case one of these routes is blocked or inaccessible in case of an emergency.

## 10.6 Treatment of Patients

An important consideration for the health services sector is the responsible and fair treatment of patients. In that respect to minimize the risks of malpractice, negligence and reputational damage the following issues should be ensured through the proper management mechanisms;

- Develop a comprehensive policy on governance and ethics covering all areas of risk (such as endorsement of drugs, non-discrimination of patients etc
- Ensure skills development of workers;
- Develop a comprehensive policy on governance and ethics covering all areas of risk (such as endorsement of drugs, non-discrimination of patients etc.);
- Develop a policy to address the concerns of the patient base
- Ensure state of equipment (age, level of maintenance, calibration) is fit for the services to be provided;
- Ensure the required capacity of the health care facility to provide services for the projected volume of patients;
- Develop a comprehensive system ensuring patient confidentiality.

### 10.6.1 Dual Management

Bayraklı IHC project has been executed as Public Private Partnership<sup>29</sup>. Though the SPV is the project sponsor and developing the project; during the operation phase there will be shared management responsibilities between the SPV (Project Company) and the Ministry of Health (Administration) defined by the Agreement between these parties. Dual management of Bayraklı IHC will result in shared responsibilities among these parties to ensure the above principles and requirements are in place.

The key points defined by this agreement relevant to the operation of the Bayraklı IHC are;

**Each party agrees to co operate, at its own expense, with the other party in the fulfillment of the purposes and intent of this Agreement. Nevertheless, neither party shall be under any obligation to perform any of the other's obligations under this Agreement.**

**The Project Company shall perform its duties under this Agreement which include the designing and construction of the Facilities, the provision of the Services and the carrying out of the Commercial**

<sup>29</sup> Public-private partnership (PPP) describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies.



Activities, at its own cost and risk without recourse to the Administration except as otherwise expressly provided in this Agreement.

The Project Company have full regard for the safety of all persons on the Site (whether on the basis of a lawful right or not) in execution of the Operations under the Agreement, and keep the Site, the Works and the Facilities in an orderly state from the Site Delivery Date, appropriate in accordance with the provisions of Prudent Tradesman, to avoid any jeopardy to such persons, and take any kind of measures to prevent such jeopardy. Moreover, the Project Company shall comply, and shall procure that any of the Subcontractors comply, with any provisions relating to health and safety during the design and construction of the Works and the provision of the Services and performance of the Commercial Activities applicable to this Agreement under Turkish law.

The Project Company has no other medical or administrative liability other than those hereunder and in scope of the Schedules hereto.

The Project Company, unless the Administration gives its prior written consent, in no way whatsoever, carry out any work, procedure, design amendment or other modification in violation of the designs approved by the Administration.

Liabilities of Administration will include “carry out the supervision of the construction of the Hospital Facilities by itself or through an independent supervisor.”

The Administration is responsible for procuring any kind of services which physicians, nurses and other personnel employed by the Administration are required to provide, including Clinical Services, and for their employment and payment of their remunerations and personal rights.

The Project Company shall in no way be responsible for the procurement of Clinical Services and their results. The Parties mutually agree upon interpretation of Schedule 14 (*Service Requirements*) in compliance with the principle which stipulates that the Project Company shall not be responsible for Clinical Services.

**The Project Company shall not be responsible for providing Clinical Services or other services which must be provided by physicians, nurses or administrative personnel affiliated to the Administration, or consequences of such services.**

**The Project Company is obliged to provide the following Services:**

a. Clinical Support Services:

- Laboratory Services,
- Imaging Services,
- Sterilisation and Disinfection Services,
- Rehabilitation Services,
- Other Clinical Equipment Support Services.

b. Support Services:

- Estates Services,
- Extraordinary Maintenance (Life Cycle Replacement),
- Utilities Management Service,
- Furniture Service,
- Grounds and Gardens Maintenance Services,
- Cleaning Services,

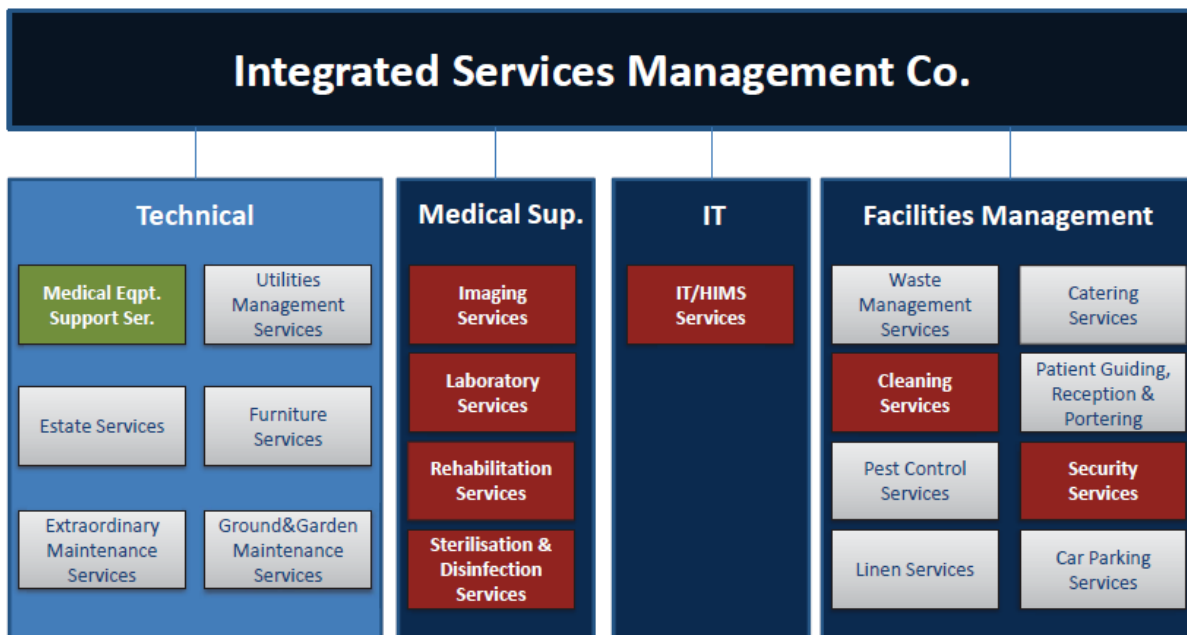




- Hospital Information Management System (HIMS) Implementation and Operation Service,
- Security Services,
- Patient Guiding and Accompaniment / Reception/ Help Desk / Porter Services,
- Pest Control Services,
- Car Parking Services,
- Waste Management Services,
- Linen Services,
- Catering Services.

### 10.6.2 Patient Data Security

The following diagram presents the services to be provided by the SPV in the Bayraklı IHC.



During the execution of these services patient private data will be processed through the Hospital Information Management System (HIMS) Implementation and Operation Service to be provided by the SPV.

SPV will provide the continuity for the conformance of the offered HIMS services to the following rules and regulations;

- Conformance of national/internationally accepted communication, classification and medical informatics standards and/or norms.
- Conformance with the requirements defined in the rules, law and legislations of MoH.

In order to ensure the security of patient private data the HIMS will have the following features;

- HIMS should have full/comprehensive security infrastructure to prevent unauthorized access to the system. Since a lot of users' access different kinds of data in the system, the system must control their authority of changing or adding data to the system.
- The data security and reliability at user and operation levels should be provided within the whole system.



- Authorisation levels to access to the patient data will be defined by the SPV and the Ministry of Health.

Moreover; patient data security will also be protected by;

- Contractual obligation (between SPV and Ministry of Health)
- Legislative obligation
- In case of any lack of local legislation, the related EU directives (like 95/46/EC Data Protection Directive) will be followed by the SPV.

The main objectives of SPV with regards to forensic unit are:

- To avoid or minimize the risk and impacts on the health and safety of the local community during the all phases of the project in all circumstances
- To ensure that the safeguarding of personnel is carried out in a legitimate manner that avoids or minimize risks to the community's safety and security
- To protect and promote the health and safety of workers by ensuring healthy and safe working conditions and implementing health and safety management systems

SPV will ensure the community's and workers safety by;

- Ensuring infrastructure and equipment safety
- Incorporate the health and safety considerations into the design, construction, operation and decommissioning of the project.
- Preventing and minimizing the potential for community exposure to hazardous material safety
- Preventing the community exposure disease safety
- Assess the emergency preparedness and response
- Identify, and monitor the traffic and road safety

SPV will follow the all requirements included in IFC Performans Standar 4 and EBRD Performance Requirement 4 as well as the local requirements provided below:

- Law about Private Security Services, Law No: 5188
- Turkish Private Security Standards, TS 12782, TS 15602

SPV will assess risks to, employees or contractors to provide security to safeguard its own personel and property, within and outside the project site posed by its security arrangements. In making such arrangements, the SPV will be guided by the principles of proportionality, good international practices in terms of hiring, rules of conduct, training, equipping and monitoring of such personnel, and applicable law (below requirements). The SPV will make reasonable inquiries to satisfy itself that those providing security are not implicated in past abuses, will train them adequately in the use of force (and where applicable, firearms) and appropriate conduct toward workers and the local community, and require them to act within the applicable law. The SPV will not sanction any use of force except when used for preventive and defensive purposes in proportion to the nature and extent of the threat. A grievance mechanism will also allow the affected community to express concerns about the security arrangements and acts of security personnel.

If government security personnel are deployed to provide security services for SPV, It will assess risks arising from such use, communicate its intent that the security personnel act in a manner consistent with above



paragraph, and encourage the relevant public authorities to disclose the security arrangements for the hospital to the public, subject to overriding security concerns.

### 10.6.3 Forensic Hospital Services

The operation of the forensic hospital services will have the following challenges that would need specific engineering design and management considerations to mitigate the associated environmental and social risks;

- Community health and safety risks associated the accommodation of the prisoners with mental problems accommodated in the unit;
- Management system challenges; there is going to be a designated management system at the campus where the MoH will assign special health staff to the campus, while the Ministry of Justice (“MoJ”) will only be responsible for the section of the forensic hospital where prisoners with mental problems will be accommodated.
- Management of security systems and services
- Treatment of prisoners with mental problems

In order to mitigate these risks the following measures will be in place;

- There will be security systems to eliminate the unauthorized entry and exit to the premises of the hospital. The systems would include;
  - Security forces
  - Building design with special security considerations; security zoning, high security, medium security and medical clinics
  - Security fencing ; a combination of walls, plants, doors and fences as appropriate with the security zoning
  - Electronic (Closed Circuit Television and similar) surveillance system
  - There will be Gendarme (10 personnel); outdoor security (they will not have an authorisation to enter the forensic hospital unit)
  - There will be 48 guardians (16 x 3 shifts); for prisoners (appointed by MoJ and unarmed)
  - There will be 48 private security guards (16 x 3 shifts); for check points and visitor information guidance. (they will not have an authorisation to interfere to the patients)
- There will be a stakeholder engagement and grievance mechanism system in place to ensure the information exchange between the community members in the neighbourhood, record and respond the concerns of these people.
- There will be communication mechanisms in place with community heads. The emergency response plan will include informing them in case of a security breach at the hospital.
- The hospital will be designed to accommodate 100 patients with mental problems. The hospital design will ensure the patient welfare and the security by allocating separate clinics for different gender types, open-air areas for patients and personnel, security provisions in line with security zoning, ensuring patient privacy when deciding on surveillance system design and similar.
- There will be close coordination and communication among Bayraklı IHC management, Ministry of Health, Ministry of Justice and Ministry of Interior for the operation of forensic hospital and provision of security forces.



### 11.0 CUMULATIVE IMPACTS

Conformance Table – Environmental and Social Management System (ESMS)		
Theme/Sub-Theme	EBRD PRs	IFC PSs
<p><i>Cumulative Impacts</i>            Cumulative impacts of the project are considered during impact assessment process in combination with impacts from other past, existing and reasonably foreseeable developments as well as unplanned but predictable activities enabled by the project that may occur later or at a different location.</p>	PR 1	PS 1
<p><i>Cumulative Impacts</i>            Potential adverse project impacts on existing ambient conditions are addressed            The project-related impacts and issues associated with resource use, and the generation of waste and emissions are assessed in the context of project location and local environmental conditions</p>	PR 3	PS 3

Cumulative impacts are defined as “... those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.” (IFC Good Practice Handbook: Cumulative Impact Assessment and Management).

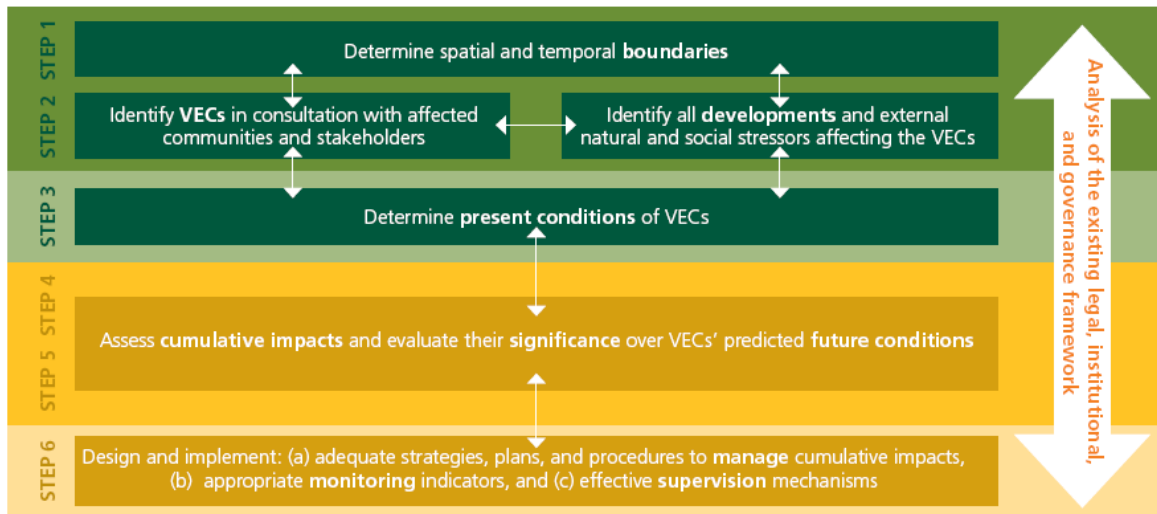
Cumulative impacts can result from various types of interaction among different impact factors:

1. Impacts arising from the accumulation of different impact factors at a specific location or over a specific receptor; as an example the concurrent presence of the emission of noise and emission of dust during construction at the same location;
2. Impacts arising from the same impact factor over the same receptor in a different geographic location; as an example the degradation of the same habitats in different locations may harm the population of associated species across their entire distribution area.
3. Impacts arising from the concurrent presence of impact factors caused by the Project and other development projects; as an example we can consider the emission of dust from the construction of the Project and the concurrent construction of a new road or industrial development at the same location.

In the context of the Bayraklı IHC ESAESA, the cumulative impacts mentioned at points 1 and 2 above have been accounted for in Chapter 9.0 addressing the potential impacts on the identified Valued Environmental and Social Components (VECs)<sup>30</sup>; this chapter describes the potential impacts identified in point 3 above.

The process followed for the assessment is consistent with the framework provided by IFC and illustrated in the figure below, as described in the following paragraphs.

<sup>30</sup> In the context of the discussion of cumulative impact assessments in this report Valued Ecosystem Components would correspond to environmental and Social Components as described in Section 7.2 of this report.



## a) Spatial and temporal boundaries

The analysis of projects with potential cumulative impacts has been extended within the Social components Study Area that extends to neighbouring settlements to the Project Area including Bayraklı District. The projects considered were the projects likely to have a construction phase overlapping with the Bayraklı IHC project.

## b) Valued environmental components identification

The VECs considered are the same considered for the Bayraklı IHC, as described in Section Appendix J and analysed in detail in Section 8.0 and 9.0.

## c) Present condition of the VECs

The present conditions of the VECs has been analysed in the course of the baseline studies, whose results are described in Section 8.0. The Area of Influence (AoI) considered is sufficient to determine the present conditions in the areas where there is potential interaction between the Bayraklı IHC project and the other projects considered.

## d) Significance of the Cumulative Impacts

The analysis of the potential cumulative effects has been carried out based on limited information collected from the relevant authorities, and public information and in particular without the knowledge of the construction timeline.

## e) Definition of the mitigation strategy

The mitigation strategy has been identified at a preliminary level, given the lack of specific information available on the various projects considered, and it is based on further studies to be conducted during the pre-construction of the Bayraklı IHC. In general the strategy has the objective to follow the mitigation hierarchy of avoid, mitigate and compensate, and it is based on the coordination of activities between Bayraklı IHC or organizations and the authorities in charge of the other projects.

## Çiğli Hospital

The construction of Çiğli Hospital in Çiğli District of İzmir is ongoing. The hospital will have 700 beds and expected to be in operation by the end of 2015. The hospital will be a public hospital. (<http://www.ikkh.gov.tr/Haberler.php?id=189>).

The construction area is away from Bayraklı IHC hospital and no concurrent impacts are foreseen in terms of construction impacts. Çiğli hospital is not expected to have a negative impact on the demand for the services





provided by Bayraklı IHC on the contrary is declared to be providing transitional support to the high demand on health care services in İzmir and surrounding region.

### **Bayraklı Urban Transformation Project Area**

In the recent years, sections of Bayraklı District is included in the scope of Urban Transformation Project. As part of Bayraklı Urban Transformation and Development Plan, Residential and trading areas will be established. Location of The Urban Transformation Area in relation to the Project Area location is presented in Figure 25

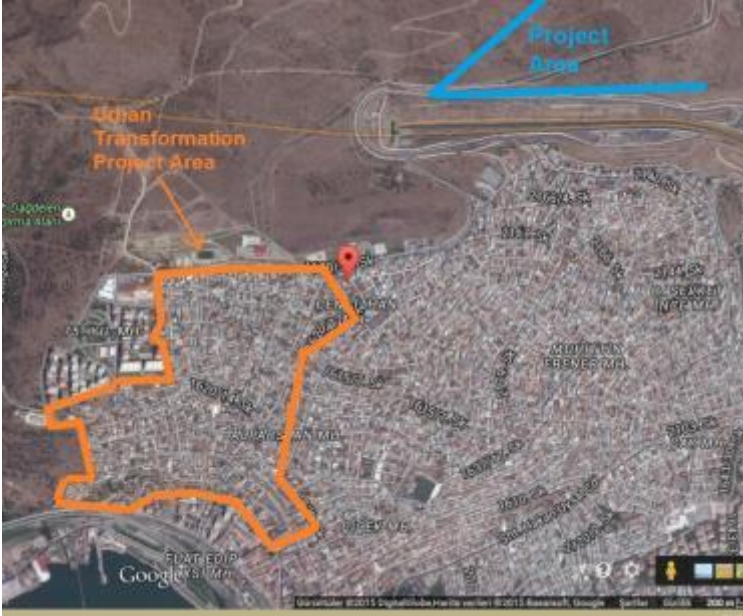


Figure 25: The Location of the Urban Transformation Project Area and the Project Area

The impact on the existing transportation infrastructure in terms of increased traffic load should be considered together with Bayraklı IHC project.

### **Katip Çelebi University Campus**

A new education campus of Katip Çelebi University is planned in the north of Bayraklı IHC to be starting educational facilities by 2018-2019.

Local authorities will be contacted while planning the construction activities to minimise the cumulative impacts of the construction of the educational campus and Bayraklı IHC<sup>31</sup>.

İzmir Katip Çelebi University is planned to provide support to Bayraklı IHC through the medical science departments of the University as declared by the local authorities who would be considered as a positive impact on the quality of healthcare services to be provided by Bayraklı IHC.

<sup>31</sup> (<http://www.hurriyet.com.tr/eg/27682164.asp>)

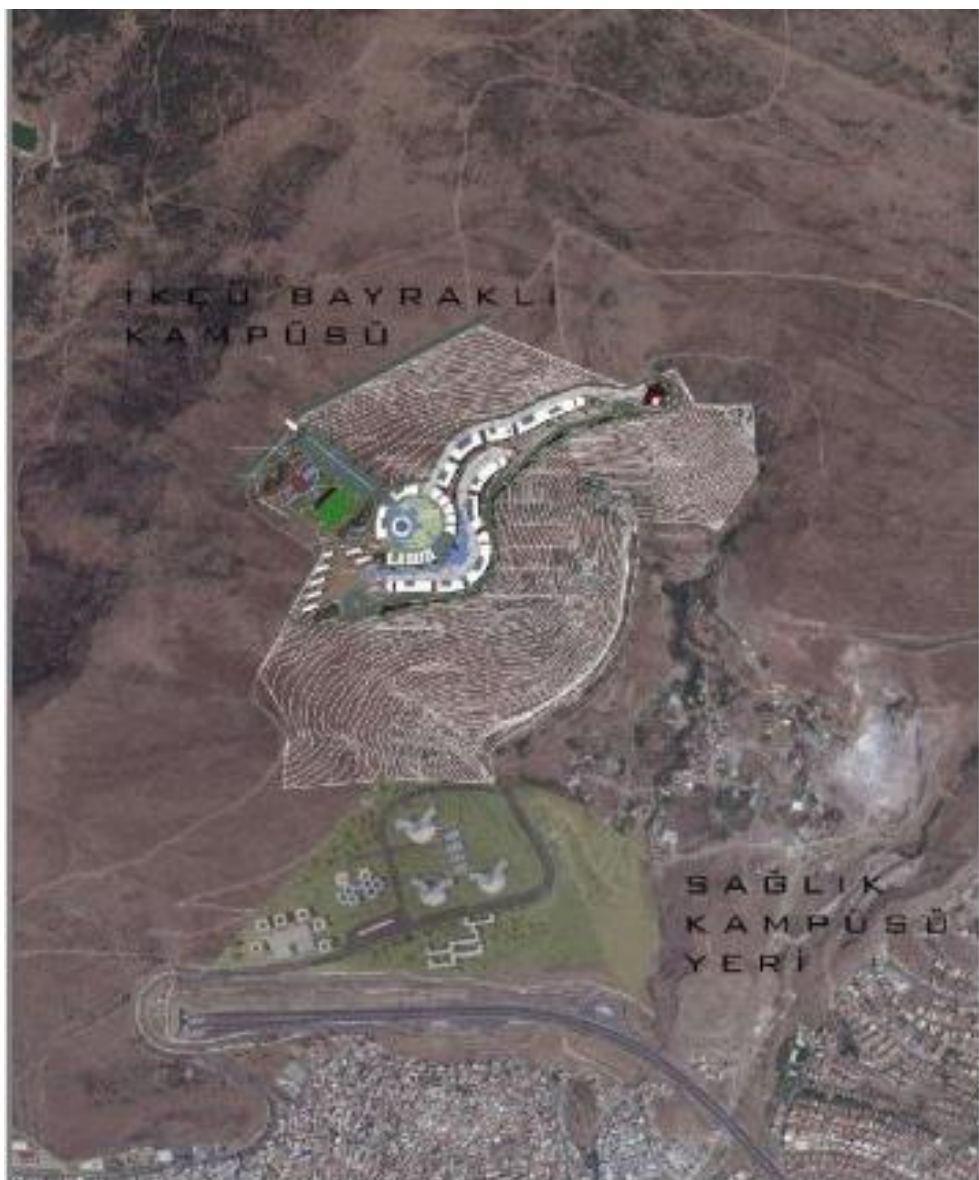


Figure 26: Location of Katip Çelebi University Campus in relation to the location of Bayraklı IHC

### **Influx of informal businesses**

With the İzmir Bayraklı IHC in operation an influx of informal businesses such as food carts, flower shops, pharmacies, medical appliances shops. These would be considered as potential impacts of the project; providing new business and employment opportunities to the local population.

## **12.0 CONCLUSION**

The ESA for the project has been conducted following a series of phases including:

- Scoping
- Stakeholder engagement
- Alternative analysis
- Baseline
- Impact assessment



- Definition of Environmental and Social Management System

The ESA complies with the relevant Turkish regulation and it is aligned with the 2012 IFC Performance Standards and Guidance Notes and EBRD Environmental and Social Policy, 2014 and guidelines. The various activities have been carried out by a working group including Turkish and International experts in environmental and social disciplines.

The general methodology for the impact assessment is based on the definition of Valued Environmental and Social Components (VECs), that are aspects of the physical, biological and social environment that are considered worthy of protection by the relevant legislation or by international standards.

The process of assessing impacts has been based on the following steps:

- The identification of Project Components, as individual elements that are characterized by similar features and construction, operation and decommissioning procedures;
- The identification of Impact Factors, or factors that can change the environmental and social quality of the VECs like air emissions, water discharge etc.,
- The definition of the sensitivity of the VECs to the Impact Factors identified, based on the environmental and social data collected during baseline;
- The definition of the Impacts as a result of the interaction between Impact Factors and Sensitivity of the VECs for each.

Each of the project components has been associated to one or more impact factor for each of the phases of construction, operation and decommissioning. Given the nature of the Project, most of the impact factors are going to be present only during the construction phase, while during the operation phase waste management, operation of forensic hospital are likely to generate some risks.

Impacts have been assessed considering the correct application of a set of standard mitigation measures that are drawn from good industry practice. Additional site or issue specific mitigation measures have been identified to address areas where high residual impacts are likely to occur, in order to ensure the impacts after additional mitigation measure are kept at an acceptable level.

As a result of the Environmental and Social Impact Assessment Study the following conclusion have been driven:

- 1) The project would benefit from the extension of existing transportation routes and public transportation alternatives to ensure access to Bayraklı IHC SPV will be in contact with local authorities to provide input on any future planning of the road and transportation in line with the developments in the area and maximize the benefit from future transportation network developments in the region.
- 2) The community health and safety concerns are valid especially in relation to f the Forensic Hospital. Continuous liaison is necessary with local community members to manage the associated risks.
- 3) Continuous stakeholder engagement is necessary manage the social risks of the project.
- 4)
- 5) The project will develop an Environmental and Social Management System in line with the minimum requirements that are defined as part of the ESA study.

The mitigation measures to be in place for the minimisation of environmental and social impacts of the project is detailed in appropriate sections of the report.

The requirements of an Environmental and Social Management System is also provided as part of the Environmental and Social Impact Study focusing on

- Environmental and Social Management System Structure
- Environmental and Social Management Plan



- Labour Issues and Health & Safety Management Plan
  - Labour Conditions
  - Occupational Health and Safety
  - Community Health And Safety
- Treatment of Patients
  - Dual Management
  - Patient Data Security
  - Forensic Hospital Services



## Report Signature Page

### GOLDER ASSOCIATES (TURKEY) LTD. ŞTİ

Caner Şahin  
Project Manager

Sibel Gülen  
Project Director

CS/SG

Registered in Turkey Registration No. 53/3069

Vat No. 396 056 79 79

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation.

\\ank1-s-

main02\projects\2015\gama&turkerler\1451310053\_gama&turkerler\_izmir&kocaeli\_ppp\_esia\06\_reports\lender\_comments\_on09052016\1451310053\_main\_esa\_izmirbayrakli\_final\_final\_v05sg.docx





# APPENDIX A

## Traffic Study



# APPENDIX B

## Waste Management Plan



# APPENDIX C

## Forms and Questionnaires-Socioeconomic Survey



# APPENDIX D

## Site Photos



# APPENDIX E

## Stakeholder Engagement Plan





# APPENDIX F

## Public Consultation Meeting



# APPENDIX G

## Lab Results and Borehole and Testpits Logs



# APPENDIX H

## Regional Physical and Biological Baseline Characteristics



## REGIONAL GEOLOGY

Three tectonic belts trending in NE—SW directions are separated in the paleotectonic structure of the Western Anatolia. The easternmost belt is the Menderes massif which is composed of metamorphic rock assemblages. The second belt is the Izmir-Ankara zone and the third one, which lies farther to the west, with a platform-type carbonate succession, is called the Karaburun belt. Şengör and Yılmaz (1981) have included this last belt into the continuation of the Sakarya continent in their classification of the cratonic realms of Western Anatolia (Erdoğan, 1990).

Menderes massif includes marble deposition with very thick mica schist layer at the bottom and platform-type carbonate metamorphism above. The “Izmir-Ankara Zone” located west of the Menderes massif is a tectonic belt mainly characterized by flysch-type deposits in and around the İzmir Province. Karaburun belt which is located west of the İzmir-Ankara Zone consists of thick Mesozoic carbonate succession deposited and is of a platform type in below figure<sup>32</sup>.

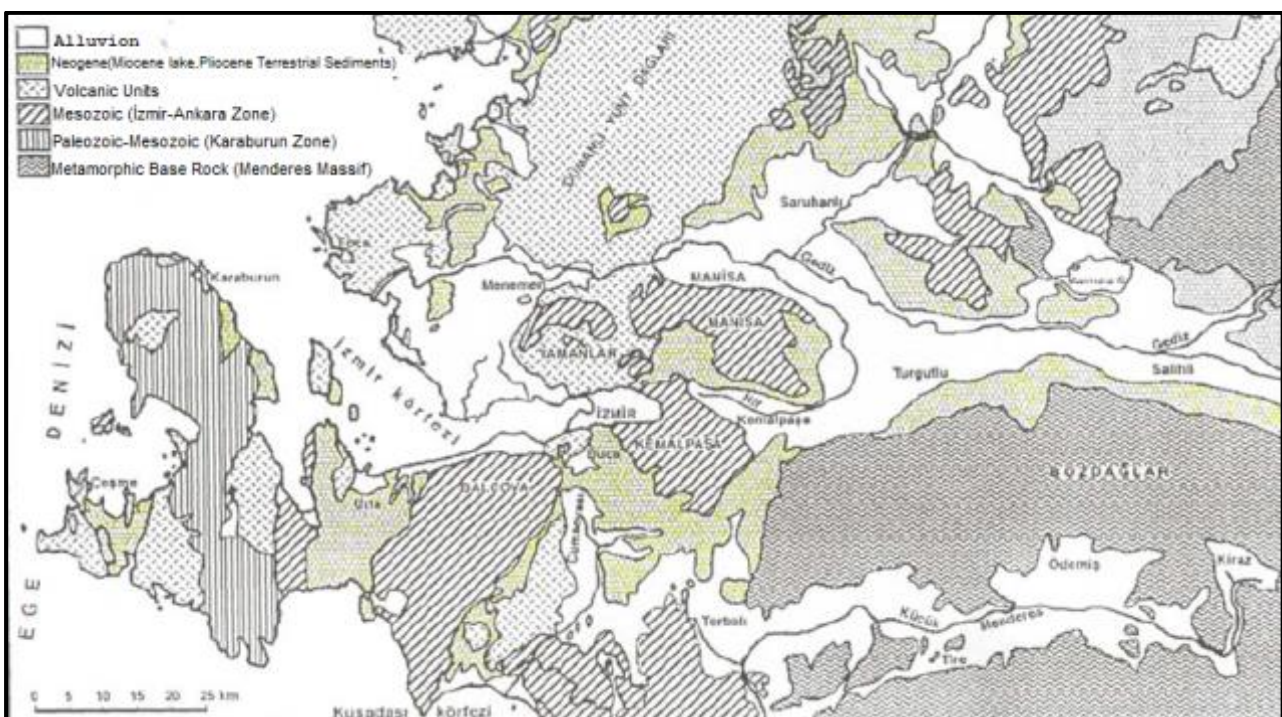


Figure 27: Simplified Geology Map of İzmir Region<sup>33</sup>

Bornova complex (melange) is the main rock unit in the İzmir Region which is of Late Cretaceous age. The Izmir-Ankara zone, which trusted over the Menderes massif, is represented by a Bornova complex which consists of Campanian-Danian age rocks in a large region between Manisa and Seferihisar. Bornova complex is made up of a matrix of sedimentary rocks of flysch facies and mafic volcanic intercalations and blocks of limestones more than 20 km in length, in some areas. The limestone blocks and megablocks were incorporated during the sedimentation of the matrix and, as a result, various soft sediment deformations and chaotic contact relations were formed around them. The generalized stratigraphy of the megablocks, constructed from measured incomplete sections is similar to the stratigraphy of the Karaburun carbonate succession. Besides that, lithological and paleontological correlations show that the blocks are broken parts of the Karaburun succession. The stratigraphic columnar section of the İzmir Region is given in below figure (Erdoğan, 1990).

<sup>32</sup> Modelling of ground seismic behaviour for construction design safety in the İzmir Metropolitan Area, Aliğa and Menemen Districts, September 2007

<sup>33</sup> Modelling of ground seismic behaviour for construction design safety in the İzmir Metropolitan Area, Aliğa and Menemen Districts, September 2007

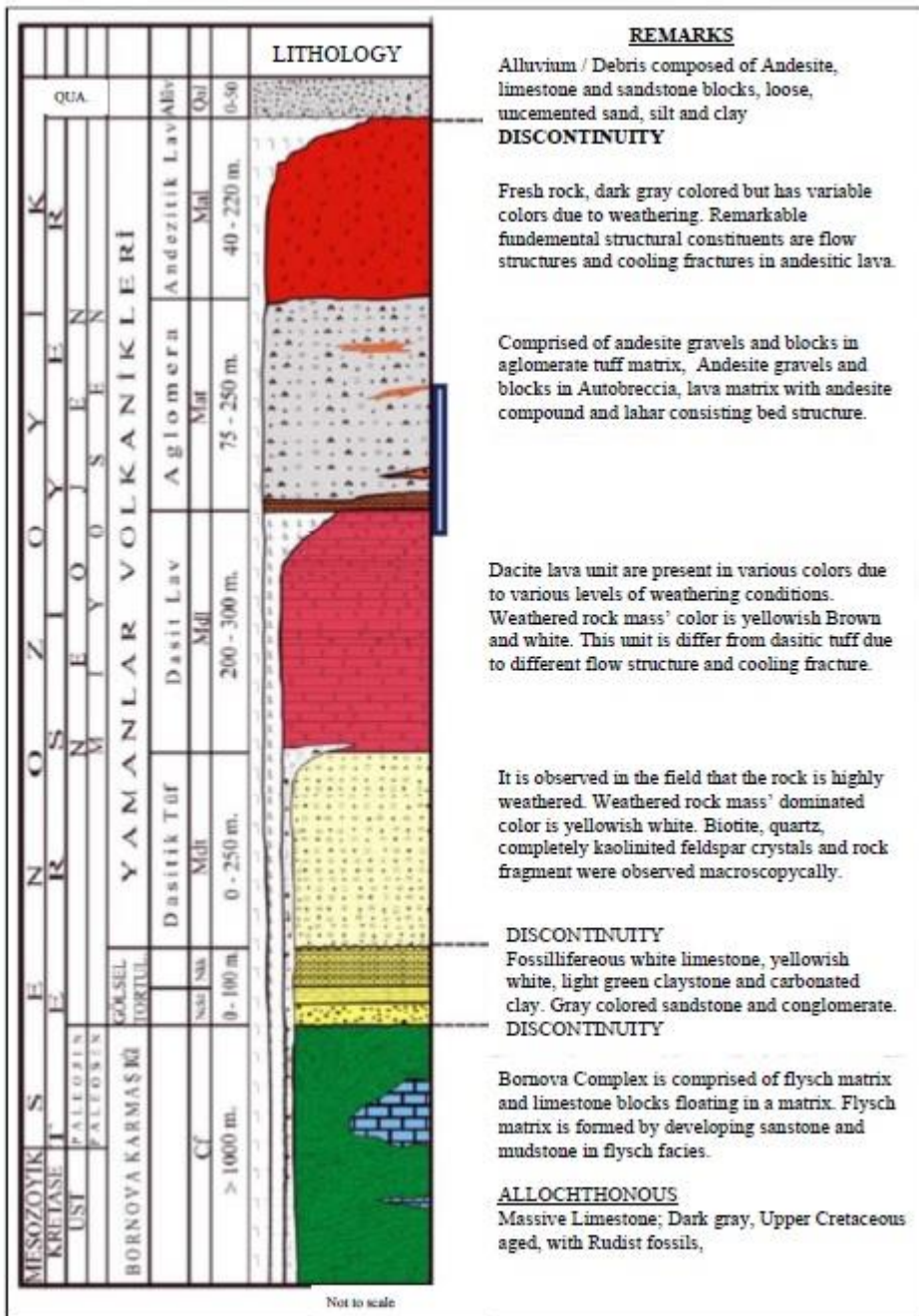


Figure 28: Stratigraphic Columnar Section of İzmir Region<sup>34</sup>

Rock units in the region can be classified in three main groups as: Bornova Complex (melange), Yamanlar Volcanics and Lacustrine Sediments.

**Bornova Complex (melange):** Outcrops of the complex are extensive in the region between Bornova-Işıkkent and in the vicinities of Balçova-Narlıdere.

Variable ages from Palaeozoic to Tertiary were given to Bornova Complex by various writers. The possibility that the Bornova complex is of Palaeocene or younger age gained some importance (Konuk, 1977;

<sup>34</sup> Modelling of ground seismic behaviour for construction design safety in the İzmir Metropolitan Area, Alağa and Menemen Districts, September 2007 and Geological-Geotechnical Investigation Report Phase I, January 2015



Düzbastılar, 1978). The possibility of limestones deposition in the region, affected by nappe tectonism, and of Triassic to Cretaceous age is indicated by Düzbastılar, 1978; Başarır and Konuk, 1981.

**Yamanlar Volcanics:** Yamanlar Volcanics show wide range in the region. They are of Neogene age and composed of Andesite-Dacite featured volcanic products and their derivatives (Innocenti and Mazzuoli, 1972; Savaşçın, 1974; İzdar, 1975; Türk and Koca, 1994; Akay, 2000).

**Lacustrine Sediments:** Lacustrine sediments include lithologies that contain limestone-claystone- sandstone and pebble stone. The formation of the İzmir Gulf is closely related with regional geologic events. The gulf was formed in the Early Quaternary (Middle Pleistocene) in a depression bounded by dip-slip faults. It is indicated that the İzmir Gulf shows glaciations characteristics. Today's gulf characteristics have been reached with Flandrian Transgression (Başoğlu, 1975).

Compiled information about this subject will be given below because of the importance of the Pleistocene and Holocene periods of the İzmir Gulf. The Geological and geomorphological integrity of Pleistocene and Holocene is closely related with regional tectono-eustatic movements and directly related with deltaic the movement of the Gediz Delta in the Pleistocene and Holocene.

Neotectonic movements increasing in the early Palaeocene (Ryan, 1982) has continued during the Pleistocene. Mostly North-Northeast- directional tectonic lines result in vertical slip fractures (Ambraseys and Jackson, 1990; Fairbridge, 1972; Günay, 1998). Tectonic movements have lost their efficiency during the late Pleistocene, early Holocene and also they were developed without a clear orientation (Başoğlu, 1975).

Late neotectonic movements are mostly the result of "Compressional" fractures that are connected with compressive tectonics during the Holocene. This was put in evidence in the Güzelbahçe Gulf south of İzmir Gulf (Eftelioğlu, 1983)<sup>35</sup>.

## REGIONAL SEISMOLOGICAL CHARACTERISTICS

The Western Anatolian neo-tectonics is represented by an extensional tectonic regime. Western Anatolia and Aegean Sea are commonly considered as being under a N-S extension in response to a westward motion of the Anatolian block which is in collision with the Arabian Plate (Oçakoğlu, 2005).

The Western Anatolia extended terrain is bounded by the İzmir-Ankara suture zone to the North to Northwest, the Lycian Nappes to the south, an easterly to north easterly trending fault zone to the south and southeast which is named as the West Anatolia Fault zone. It contains many large active normal faults including the fault zones that control the E-W trending Simav, Alasehir, Büyük Menderes and Küçük Menderes grabens in below figure (Çemen, et al., 2004).

<sup>35</sup> Modelling of ground seismic behaviour for construction design safety in the İzmir Metropolitan Area, Aliağa and Menemen Districts, September 2007 and Geological-Geotechnical Investigation Report Phase I, January 2015



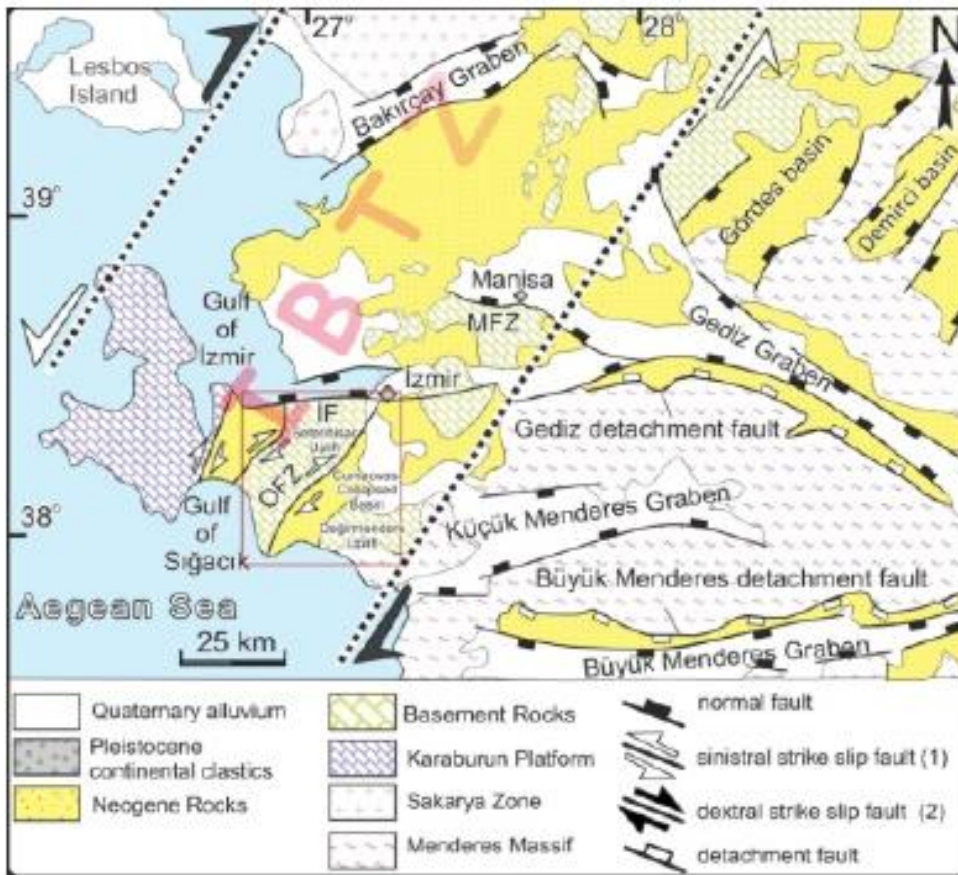


Figure 29: Simplified geological map depicting main basins on İzmir bay and Surroundings<sup>36</sup>

Western Anatolia forms one of the most seismically active and rapidly extending regions in the world. It is currently experiencing an approximately N–S continental extension at a rate of 30–40 mm in a year. It is a part of the ‘Aegean Extensional Province’, a region of distributed extension that covers parts of Greece, Macedonia, Bulgaria and Albania. Approximately E–W trending grabens (e.g. Edremit, Bakırçay, Kütahya, Simav, Gediz, Küçük Menderes, Büyük Menderes, and Gökova grabens) and their basin-bounding active normal faults are the most prominent neotectonic features of Western Turkey. Other, less prominent, structural elements of Western Turkey are the NNE-trending basins and their intervening horsts (e.g. Gördes, Demirci, Selendi, and Uşak-Güre basins; in below figure. In in below figure, heavy lines with hachures show normal faulting: hachures indicate the down-thrown side (Bozkurt, 2001).

<sup>36</sup> A Microgravity Model for the City of İzmir (Western Anatolia) and its Tectonic Implementations

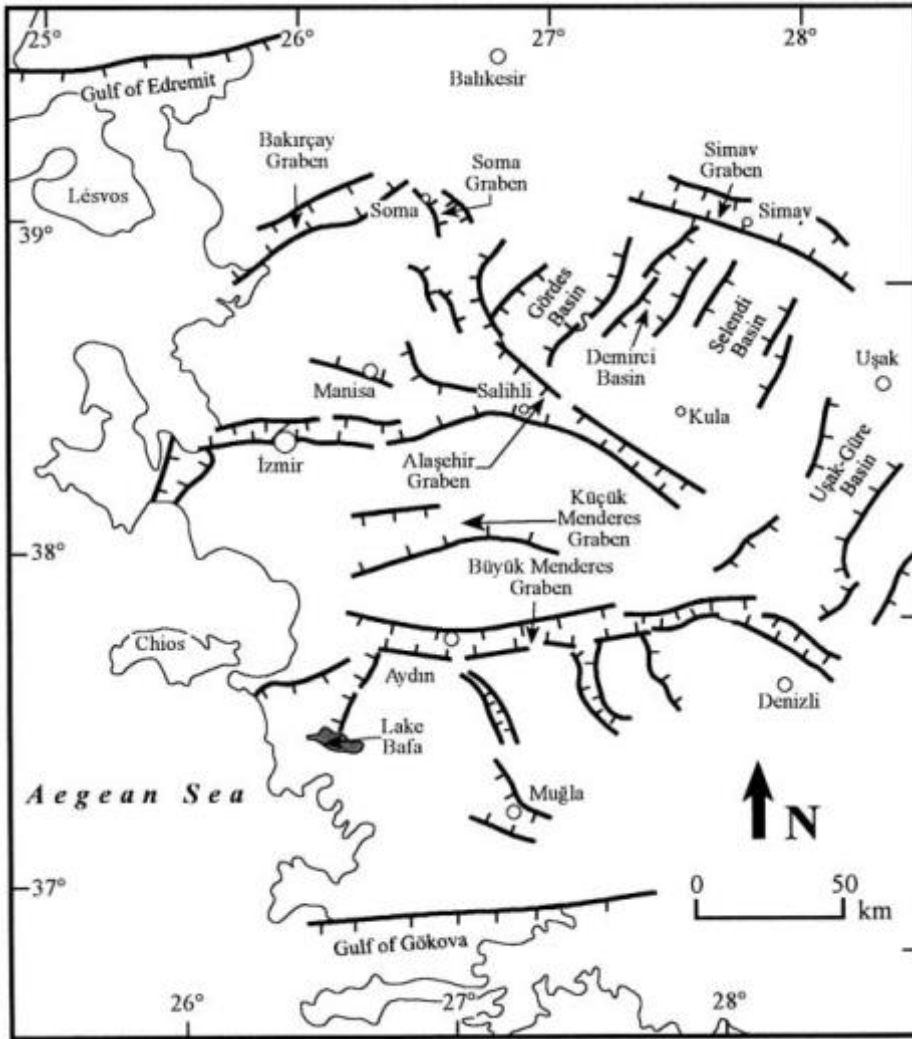


Figure 30: Simplified map showing major structural elements of Western Anatolia<sup>37</sup>

The active faults and their earthquake potential in İzmir Province were evaluated by the Directorate of Mineral Research and Exploration (“MTA”) in 2005<sup>38</sup>. In the scope of this study, active fault mapping studies were performed in an area with a radius of about 50 km having as its centre the İzmir Province. Thirteen active faults have been identified during this research.

The features related to these 13 faults (activity class, type, length etc.) are given in below table.

<sup>37</sup> Bozkurt, E., 2001. Neotectonics of Turkey - a synthesis, Geodinamica Acta, 14, 3-30.

<sup>38</sup> Emre O, Ozalp S, Dogan A, Ozaksoy V, Yildirim C, Goktas F (2005), The active faults and their earthquake potential in İzmir Province. MTA General Directorate of Geology Etudes Official Report no: 10754, Ankara, Turkey

**Table 32: Main features of Active Faults in İzmir Region<sup>39</sup>**

No	Name	Activity Class	Type	Total Length (km)
1	İzmir Fault	Active Fault	Normal Fault	35
2	Tuzla Fault	Active Fault	Dextral Strike-Slip Fault	50
3	Seferihisar Fault	Active Fault	Dextral Strike-Slip Fault	30
4	Gülbahçe Fault	Active Fault	Vertical Fault	70
5	Gediz Graben Main Detachment Fault (West Section)	Active Fault	Normal Fault	27
6	Kemalpaşa Fault	Active Fault	Normal Fault	24
7	Manisa Fault	Active Fault	Normal Fault	40
8	Dağkızılca Fault	Active Fault	Dextral Strike-Slip Fault	27
9	Güzelhisar Fault	Conditionally Active Fault	Dextral Strike-Slip Fault	25
10	Menemen Fault Zone	Conditionally Active Fault	Dextral Strike-Slip Fault	17
11	Yenifoça Fault	Lineament	-	20
12	Gümüldür Fault	Conditionally Active Fault	Normal Fault	15
13	Bornova Fault	Lineament	Dextral Strike-Slip Fault	19

The Earthquake Zoning Map of Turkey was prepared by the Ministry of Public Works and Settlement considering the latest knowledge, approved by the Government of Turkey and published in 1996. The earthquake zones were determined by using the acceleration contour map that was prepared using the probabilistic method. "Regulation on the Buildings to be Constructed on Earthquake Zones (Date: 06.03.2007 O.G. No: 26454)" refers to this map for the calculation of acceleration values that will affect the construction. The earthquake zones of Turkey were classified as follow due to expected acceleration values<sup>40</sup>;

- 1<sup>st</sup> degree earthquake zone : more than 0.4g
- 2<sup>nd</sup> degree earthquake zone : between 0.3g - 0.4g
- 3<sup>rd</sup> degree earthquake zone : between 0.2g - 0.3g
- 4<sup>th</sup> degree earthquake zone : between 0.2g - 0.1g
- 5<sup>th</sup> degree earthquake zone : less than 0.1g

The earthquake zoning map of İzmir Province according to the Map of Turkey Seismic Zones is given in below figure. Based on the seismic zone classification of Turkey, İzmir Province is in the 1<sup>th</sup> degree seismic zone which is the most active zone in Turkey.

<sup>39</sup> Emre O, Ozalp S, Dogan A, Ozaksoy V, Yıldırım C, Goktas F (2005), The active faults and their earthquake potential in İzmir Province. MTA General Directorate of Geology Etudes Official Report no: 10754, Ankara, Turkey

<sup>40</sup> g: gravity(981 cm/s\*s)

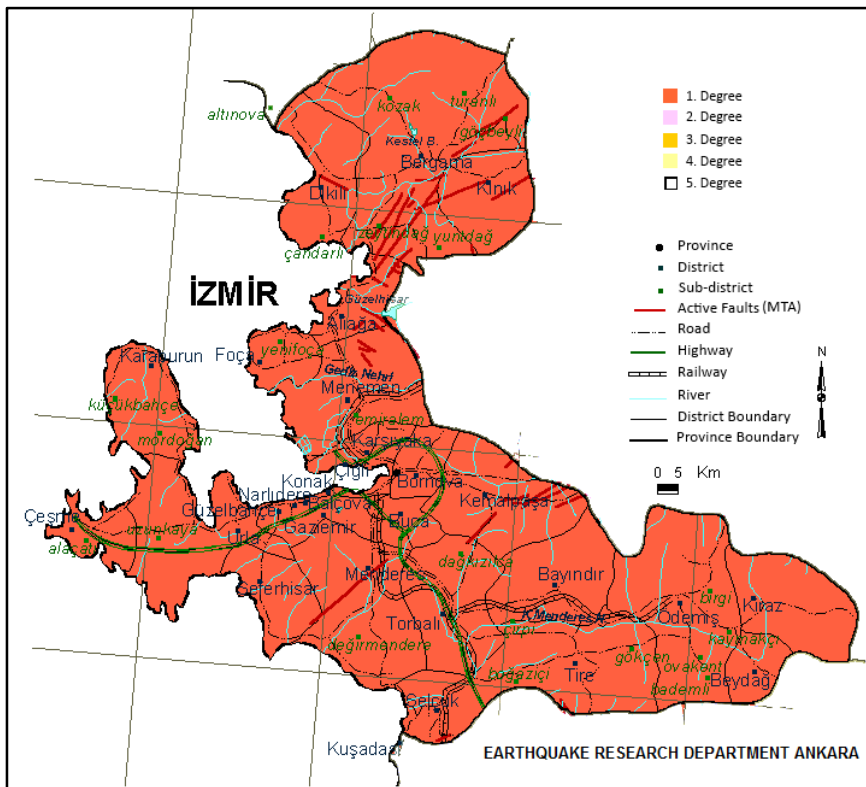


Figure 31: The Earthquake Zoning Map of İzmir Province

The activity of faults in İzmir Region is shown by numerous historical earthquakes. Earthquakes which have magnitudes higher than 5M were listed in “The active faults and their earthquake potential in İzmir Province” report. Magnitudes and Intensities of the earthquakes were also given in this report. Magnitude measures the energy released at the source of the earthquake and is determined from measurements on seismographs. Intensity measures the strength of shaking produced by the earthquake at a certain location and Intensity is determined from effects on people, human structures, and the natural environment. The definition of the Intensity classes is given below<sup>41</sup>.

Intensity Scale	Definition
I	Not felt except by a very few under especially favourable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.

<sup>41</sup> Source: [http://earthquake.usgs.gov/learn/topics/mag\\_vs\\_int.php](http://earthquake.usgs.gov/learn/topics/mag_vs_int.php)



Intensity Scale	Definition
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

The lists of Historical and 20<sup>th</sup> and 21<sup>st</sup> Century (put in evidence instrumentally) Earthquakes in İzmir Region are given in the following tables.

**Table 33: The List of Historical Earthquakes in İzmir Region<sup>42</sup>**

Date	Latitude (°)	Longitude (°)	Magnitude (M)	Intensity (I.)
17	38.40	37.50	7.0	X
105	38.90	27.00	6.4	VIII
176&177	38.60	26.65	5.8	VII
178	38.30	27.10	6.5	VIII
688	38.41	27.20	6.5	IX
1039	38.40	27.30	6.8	VIII
20.04.1389	38.40	26.30	6.7	VIII
20.05.1654	38.50	27.10	6.4	VIII
02.06.1664	38.41	27.20	5.8	VII
1668	38.41	27.20	-	IX
14.02.1680	38.40	27.20	6.2	VII
10.07.1688	38.40	26.90	6.8	X
13.01.1690	38.60	27.40	6.4	VII
September&October 1723	38.40	27.00	6.4	VIII
04.04.1739	38.50	26.90	6.8	IX
24.11.1772	38.80	26.70	6.4	VIII
3&5 July 1778	38.40	26.80	6.4	IX
13.10.19850	38.40	27.20	-	VIII
03.11.1862	38.50	27.90	6.9	X
01.02.1873	37.75	27.00	-	IX
29.07.1880	38.60	27.10	6.7	IX
15.10.1883	38.30	26.20	6.8	IX
01.11.1883	26.30	-	-	VIII

<sup>42</sup> Emre O, Ozalp S, Dogan A, Ozaksoy V, Yildirim C, Goktas F (2005), The active faults and their earthquake potential in İzmir Province. MTA General Directorate of Geology Etudes Official Report no: 10754, Ankara, Turkey



**Table 34: The List of 20<sup>th</sup> and 21<sup>st</sup> Century Earthquakes in İzmir Region<sup>43</sup>**

Date	Latitude (°)	Longitude (°)	Depth (km)	Magnitude (M)	Intensity (I.)
19.01.1909 Foça Earthquake	38.00	26.50	60	6.0	IX
31.03.1928 Torbalı Earthquake	38.18	27.80	10	6.5	VIII
22.09.1939 Dikili Earthquake	39.07	26.94	10	6.6	VIII,IX
23.07.1949 Karaburun Earthquake	38.57	26.29	10	6.6	VII,VIII,IX
02.05.1953 Karaburun Earthquake	38.48	26.57	40	5.0	VII,VIII
16.07.1955 Söke-Balat Earthquake	37.65	27.26	40	6.8	VIII
19.06.1966 Menemen Earthquake	38.55	27.35	9.0	4.8	VI
06.04.1969 Karaburun Earthquake	38.47	26.41	16	5.9	VII,VIII
01.02.1974 İzmir Earthquake	38.55	27.22	24	5.3	VII
16.12.1977 İzmir Earthquake	38.41	27.19	24	5.5	VIII
14.06.1979 Karaburun Earthquake	38.79	26.57	15	5.7	VII
06.11.1992 Doğanbey Earthquake	38.16	26.99	17	5.7	VII
28.01.1994 Manisa Earthquake	38.69	27.49	5.0	5.2	VII
24.05.1994 Karaburun Earthquake	38.66	26.54	17	5.0	VII
10.04.2003 Urla Earthquake	38.26	26.83	16	5.6	VII
17-21 Ekim 2005 Sığacık Körfezi (İzmir) Depremleri	38.131	26.505	20	5.5-5.9	VII

The cause and origin of crustal extension in the Aegean has long been debated, and proposals fall into four different models: (1) 'Tectonic escape' model: the westward extrusion of the Anatolian block along its boundary structures since the late Serravallian (12 Ma); (2) 'Back-arc spreading' model: back-arc extension caused by the south-south-westward migration of the Aegean Trench system. However, there is no consensus on the inception date for the subduction roll-back process and proposals range between 60 Ma and 5 Ma. (3) 'Orogenic collapse' model: the extension is induced by the spreading and thinning of over-thickened crust following the latest Palaeocene collision across the Neotethys during the latest Oligocene-Early Miocene. (4) 'Episodic': a two-stage graben model that involves a Miocene-Early Pliocene first stage (orogenic collapse), and a Plio-Quaternary second phase (westward escape of the Anatolian block) of N-S extension (Bozkurt, 2001).

The age of the grabens is also controversial and proposals fall into three major categories: (1) The grabens began to form during the Tortonian. (2) The basins started to form during the Early Miocene and continued their evolution since then. (3) The grabens are Plio-Quaternary structures (Bozkurt, 2001).

<sup>43</sup> Emre O, Ozalp S, Dogan A, Ozaksoy V, Yildirim C, Goktas F (2005), The active faults and their earthquake potential in İzmir Province. MTA General Directorate of Geology Etudes Official Report no: 10754, Ankara, Turkey and Modelling of ground seismic behaviour for construction design safety in the İzmir Metropolitan Area, Aliağa and Menemen Districts, September 2007.





The 20<sup>th</sup> and 21<sup>st</sup> Century Earthquakes in İzmir Region ( $M \geq 4.0$ ) based on their magnitude are represented in in below figure

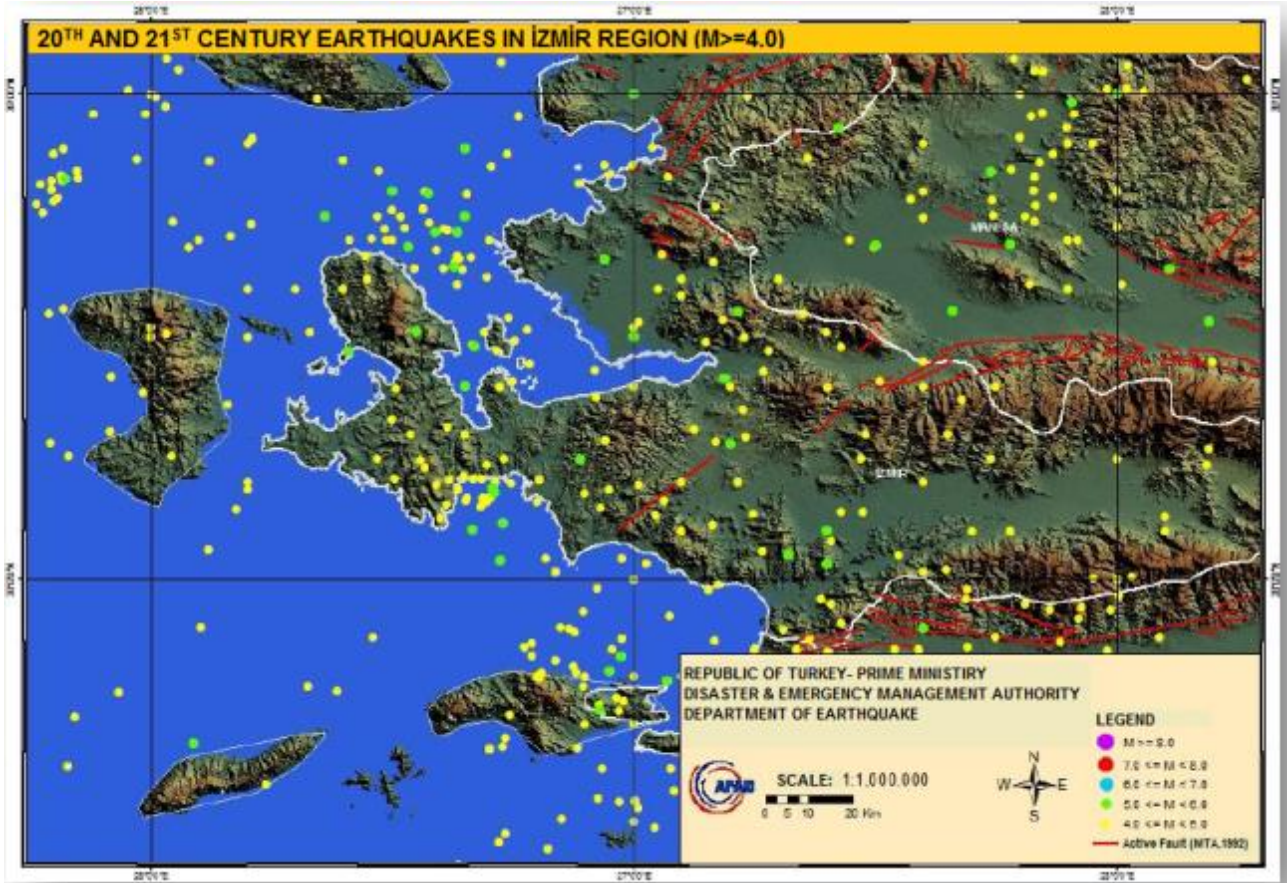


Figure 32: 20<sup>th</sup> and 21<sup>st</sup> Century Earthquakes ( $M \geq 4.0$ ) in İzmir Region<sup>44</sup>

## REGIONAL SOIL AND SUBSOIL CHARACTERISTICS

The total area of the İzmir Province is 855 km<sup>2</sup>. Twenty eight percent of the total surface area of İzmir Province are agricultural land, whereas 34.20% are meadow-pasture, 40% are forest-classified land and 27.5% are wetland in Table 86. As seen in the below table, forest-classified lands are mainly located in the east-north-eastern part of the İzmir province. The areas which are close to the sea coast are mainly meadows and heathlands. The “Land Use Capability Classification” was defined by the Ministry of Food, Agriculture and Livestock. There are eight classifications for the “Land Use Capability Classification”. The land of İzmir Province is mainly classified as Class VII type based on the “Land Use Capability Classification”. The “Land Use Capability Classification” for İzmir Province and explanation for the classes is provided in below table.

Table 35: Land Use Classification for İzmir Province<sup>45</sup>

Type	Total Area (km <sup>2</sup> )	Percentage (%)
Agricultural land	239.40	28.00
Meadow-Pasture	34.20	4.00
Forest	342.00	40.00

<sup>44</sup> “2012 Annual Earthquake Report” published by Prime Ministry; Disaster & Emergency Management Authority; Department of Earthquake.

<sup>45</sup> İzmir Provincial Environmental Status Report, 2013



Type	Total Area (km <sup>2</sup> )	Percentage (%)
Wetland	4.275	0.50
Other	235.125	27.50
<b>Total</b>	<b>855.00</b>	<b>100.00</b>

Large soil groups had been formed in İzmir Province due to climate, topography and main chemical-pedological composition. The “Soil Group Classifications” for İzmir Province are presented in Table 87. As seen in this figure, the northern and eastern part of the İzmir Province mainly consists of non-calcareous brown soil. In the city centre, reddish brown Mediterranean soil covers large areas. Non-calcareous brown soil mainly underlies the forests close to eastern part of the Province. Alluvial soil is also one of the main soil groups in the İzmir Province which is mostly seen in the irrigated agricultural areas.

**Table 36: Land Use Capability Classification for İzmir Province<sup>46</sup>**

Land Use Capability Classification	Area (ha)	Class Characteristic
Class I	117,931	The land is flat or nearly flat, deep, fertile and easily cultivable where traditional agricultural methods are applicable. Some erosion due to the wind or water may exist. The soil has sufficient drainage and has not been subject to damage by floods. The land is suitable for intensive farming.
Class II	95,134	The land is easily cultivable if specific mitigation measures are taken. The Class I and II land can be differentiated based on one or more of the classification factors like the increased inclination, exposure to erosion, semi thick soil, exposure to some flood and the medium wetness that can be easily isolated.
Class III	87,003	The Class III land can be made suitable for crops with high economic yield as long as there is a proper selection of the crops cultivated and the most suitable agricultural methods are applied. The land is inclined, sensitive to erosion or very wet. Crop outs and footstones may be present. The land is excessively sandy or gravelly and has low capacity to retain moisture.
Class IV	72,325	The Class IV land is suitable for the meadows. The field crops can be cultivated occasionally. The factors that would limit agriculture on Class IV land are the increased incline, erosion, poor soil characteristics and the climate. The land with soil with poor drainage can also be classified as Class IV. It is not possible to cultivate crop systems including legumes on the Class IV soil at semi-arid regions.
Class V	-	The Class V land is suitable for perennials like the meadows or the forest. Several factors, such as the gravelly land and the wetness may inhibit the cultivation. The land is flat or nearly flat. It is not subject to erosion by the water or the wind. The grazing and the logging can be allowed as long as continuous soil cover protection is ensured.
Class VI	154,951	The Class VI land requires mid-level mitigation measures even for the perennials like the meadows or the forest. The land is very inclined and is exposed to severe erosion. The wetness or the extreme dryness of the land is among other several reasons that would inhibit
Class VII	656,141	The Class VII land is very inclined, eroded and gravelly. It comprises of soil that is dry or swampy or other various unsuitable soils. Rigours care is required for the meadows or the forest
Class VIII	17,406	The characteristics of the Class VIII land are not suitable for the meadows or the forest or cultivation. However, they do provide an environment for the natural habitat. Recreational areas can be established on Class VIII land. The swamps, deserts, land with deep gullies, the hilly, gravelly or the stony land are considered as Class VIII land.
<b>Total</b>	<b>1,200,891</b>	

<sup>46</sup> İzmir Provincial Environmental Status Report, 2013 and “Technical Instructions for the Classification Standards of the Soil and the Land Use” prepared by the Ministry of Food, Agriculture and Livestock.





# ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

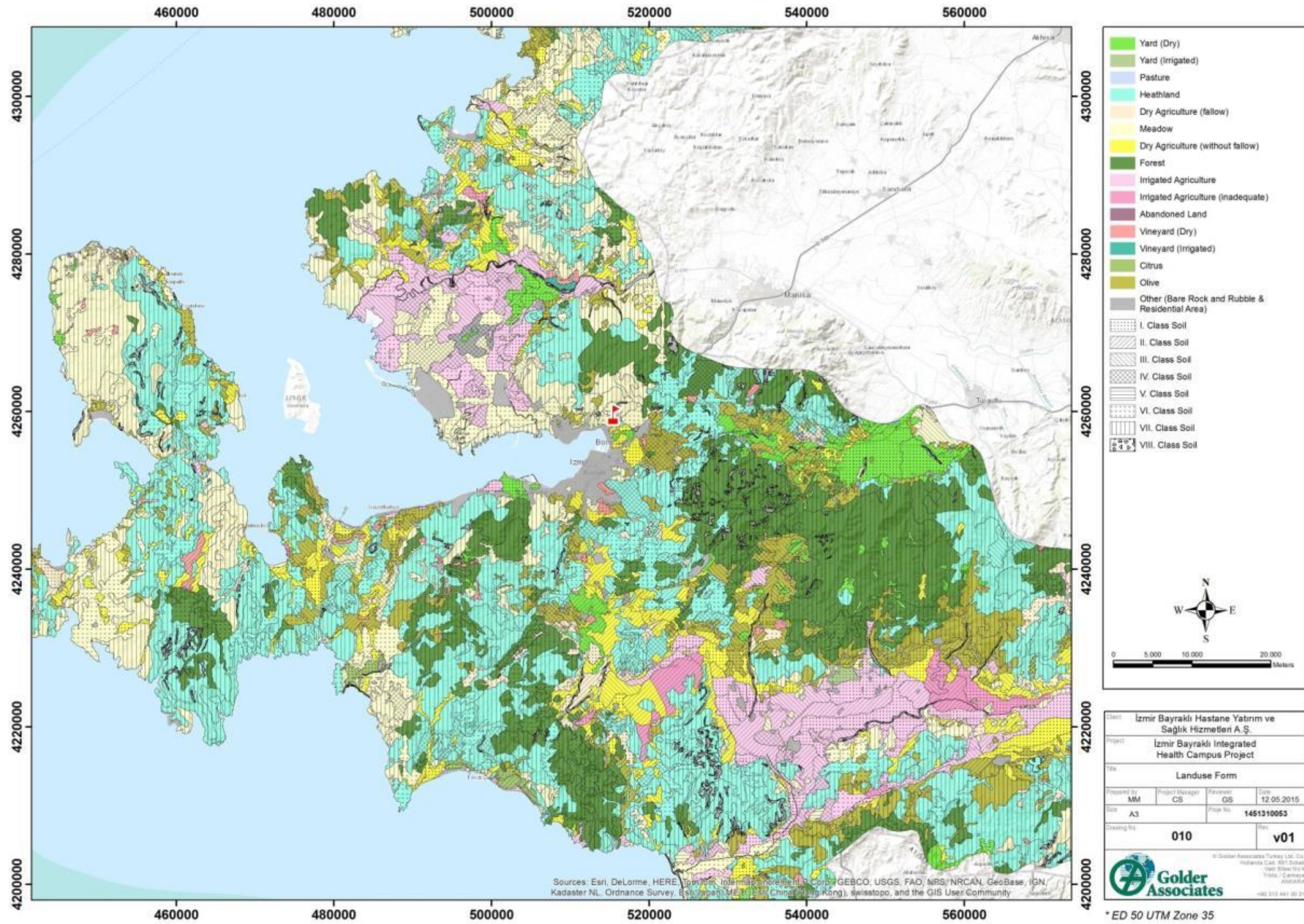


Figure 33: Land Use and Land Use Capability Classification for İzmir Province





# ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

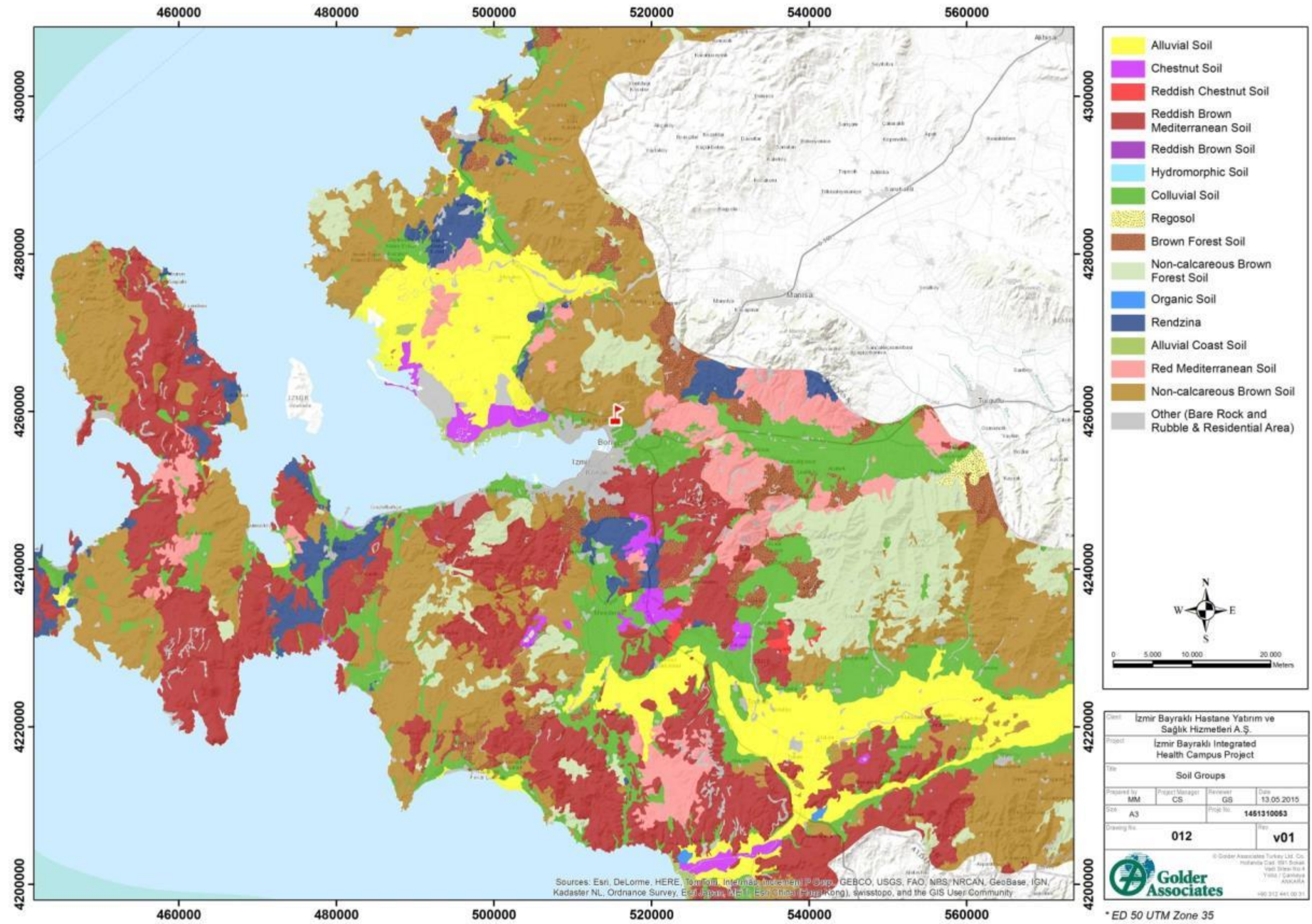


Figure 34: Soil Groups in İzmir Province



## REGIONAL HYDROLOGY AND SURFACE WATER QUALITY

The Province of İzmir comprises mountain ranges that develop in an east-west direction. The ranges lie parallel to each other and vertically onto the Aegean Sea coast. The Gediz, Küçük Menderes and Bakırçay rivers are the major rivers in İzmir Province. These rivers flow between the mountain ranges forming plains and valleys. There are mountains along a north-south direction located west of the city of İzmir in the Karaburun Peninsula. Mountains constitute 60 % of the region, valleys constitute 22% of the region and the plateaus constitute 18% of the region. The height of Bakırçay, Gediz and Küçük Menderes Plains varies between 0-200 m above sea level and the elevation difference between mountains and valleys is about 500-2000m<sup>47</sup>.

The Gediz River is the largest freshwater source for İzmir Bay. The Gediz River basin collects water from more than 400 industrial locations, 4 cities (Kütahya, Uşak, Manisa, and İzmir), 17 towns, and 106 villages. Its watershed covers 17,500 km<sup>2</sup> making it the second-largest river flowing into the Aegean Sea from Anatolia and the third-largest of the whole Aegean Basin. It reaches the sea at the north-eastern section of İzmir Bay, between Foça and İzmir, after flowing a distance of 401 km. Since 1960 the river's regime has been controlled via the Demirköprü Dam which has a reservoir capacity of 1,125,00 m<sup>3</sup>. The water is usually collected during winter and spring and is used for irrigation during summer and early autumn. In general the Gediz River has higher flow rates from December to March. Since 1990 the flow rate has decreased. The data from the last gauging station preceding the river mouth showed that annual mean flow rates were 45.31 m<sup>3</sup>/s in the 1970s, 47.40 m<sup>3</sup>/s in the 1980s, 16.70 m<sup>3</sup>/s in the 1990s, and 20.27 m<sup>3</sup>/s in the 2000s<sup>48</sup>.

The Küçük Menderes River flows on alluvial deposits. It originates in the upper parts of Kiraz and discharges into the sea at the boundaries of the city of Selçuk. The Fetrek and Arapkave streams merge with the Küçük Menderes River in the north<sup>49</sup>. The flow regime of the Küçük Menderes River is irregular. The river is generally fed by rain water. The flow rate rises to its maximum in spring with the snow melt and the river nearly dries up during the summer.

The length of the Bakırçay River is 129 km. It flow through the Manisa (Soma and Kırışağaç) and İzmir Provinces and discharges to the Aegean Sea north of Çandarlı. It is one of the major rivers in the region which is used for agricultural irrigation. The flow regime of the Bakırçay River is also irregular. The river is nearly dry in the summer.

The summarized features of these three rivers are given in below Table.

**Table 37: Major Rivers within İzmir Province<sup>50</sup>**

River	Total Length (km)	Total length within the boundaries of İzmir Province (km)	Flow Rate (m <sup>3</sup> /s)	Tributaries	Usage
Gediz	401	59.4	20	Nif, Kum, Meder, Selendi, Alaşehir, Derbent, Gördes, Demirci, Deliniş, Sarma, Tabak	Agriculture /Energy
Küçük Menderes	175	175	4.6	Rahmanlar, Falaka Brook, Piriççi Brook, Ilıcadere, Kiraz Brook, Uladı Brook, Aktaş Brook	Agriculture
Bakırçay	129	60	10.1	İlyadere, Yortanlıdere, Kırıkgeçit, Galinos Brook, Kocadere, Karadere	Agriculture

<sup>47</sup> The Republic of Turkey, Ministry of Culture and Tourism

<sup>48</sup> Dissolved Nutrient Behaviour along the Estuarine Salinity Gradient at the Gediz River Mouth (Aegean Sea, Turkey), August 2008

<sup>49</sup> The GIS-Integrated Surficial Aquifer Potential Mapping and Its Importance for Aquifer Protection, Küçük Menderes Basin/ West Turkey

<sup>50</sup> İzmir Provincial Environmental Status Report, 2013





A total of 12 dams were constructed for irrigation, drinking water and flood protection purposes in the İzmir Province as the nature of the riverbeds in the region are suitable for such structures. There are more than 3 natural lakes located within the İzmir Province<sup>51</sup>.

The total area of the irrigation fields in İzmir Province is 49,149 ha. Surface water is used for the irrigation of 36,376 ha while groundwater is used for irrigating another 12,873 ha<sup>52</sup>.

The surface water bodies within the close vicinity of the Project Area are presented in Table 37.

Among the dams in the region, the two that are in the close vicinity of the Project area are the Bostanlı Dam, which is located 4 km northeast; and the Değirmendere Dam, which is located 10 km north of the Project Area.

## REGIONAL HYDROGEOLOGY AND GROUNDWATER QUALITY

The first hydrogeological studies were initiated in 1955 by the State Hydraulic Works (“SHW”) in the İzmir Province. These studies mainly covered the Küçük Menderes, Bakırçay and Gediz Basins. Total groundwater reserves from these basins in the İzmir Province are 500 hm<sup>3</sup>/year (Table 89)<sup>53</sup>.

**Table 38: Groundwater Reserves in İzmir Province**

Basin	Plain and/or District Name	Operation Reserve hm <sup>3</sup> /year
K.Menderes	Merkez	180 + 51 (Total aquifer in K. Menderes GW Basin from Alluvions and Marbles)
	Kiraz	
	Beydağ	
	Ödemiş	
	Tire	
	Bayındır	
	Torbali	
	Selçuk	
	Karşıyaka	20
	Bornova	24
	Menderes	26
	Seferihisar	5
	Güzelbahçe	-
	Urla	4.8
	Karaburun	4.5
Çeşme	17	
Gediz	Kemalpaşa	75
	Menemen	31.2
	Foça	-
Bakırçay	Kınık	45
	Bergama	

<sup>51</sup> İzmir Provincial Environmental Status Report, 2013

<sup>52</sup> İzmir Provincial Environmental Status Report, 2013

<sup>53</sup> İzmir Provincial Environmental Status Report, 2013





Basin	Plain and/or District Name	Operation Reserve hm <sup>3</sup> /year
	Dikli	6.5
	Aliağa	14
<b>TOTAL</b>		<b>504</b>

In İzmir province, 37% of the urban water need is supplied from wells while 53% are supplied from the dams. The measured groundwater levels for the above mentioned basins are given in the following figures.

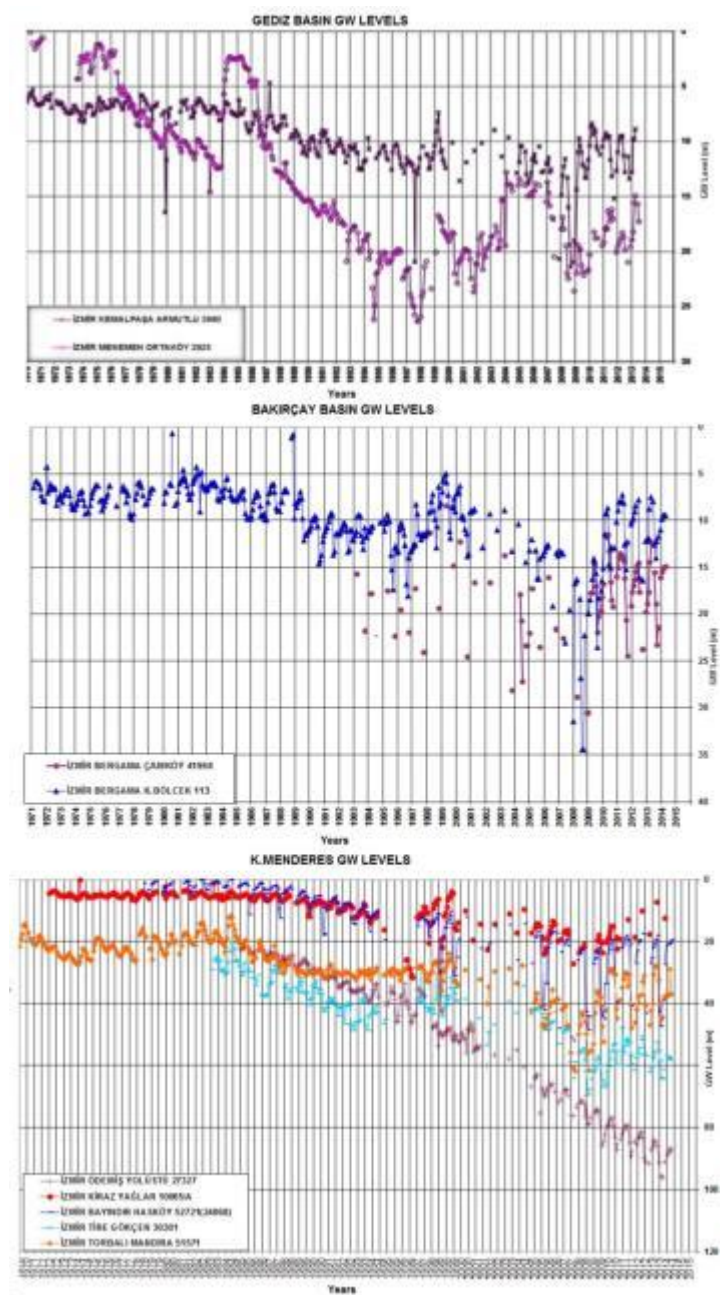


Figure 35: GW Levels in Gediz, Bakırçay and K.Menderes Basins



### GENERAL CLIMATIC CONDITIONS

In İzmir, the lowest temperature was recorded as -6.4°C in January and the highest temperature was recorded as 33.2°C in July. Annual average temperature is 17.9°C.

Monthly minimum, average and maximum temperature values obtained from data recorded in 1960-2014 period in İzmir Meteorological Station are presented in below table.

**Table 39: İzmir Meteorological Station - Normal Temperature Values (1960-2014)**

Months	Maximum(*C)	Average (*C)	Minimum (*C)
January	12.5	8.8	5.9
February	13.4	9.4	6.2
March	16.4	11.8	7.9
April	20.9	15.9	11.5
May	26.1	20.9	15.6
June	30.9	25.7	20.1
July	33.2	28.0	22.7
August	32.8	27.6	22.6
September	29.1	23.6	18.8
October	24.0	18.9	14.8
November	18.5	14.1	10.7
December	14.1	10.5	7.7

As indicated in the table above, average temperature varies between 8.8°C (January) and 28°C (July). Annual average temperature is 17.9°C. The coldest months are December, January and February while the hottest one is July (28°C).

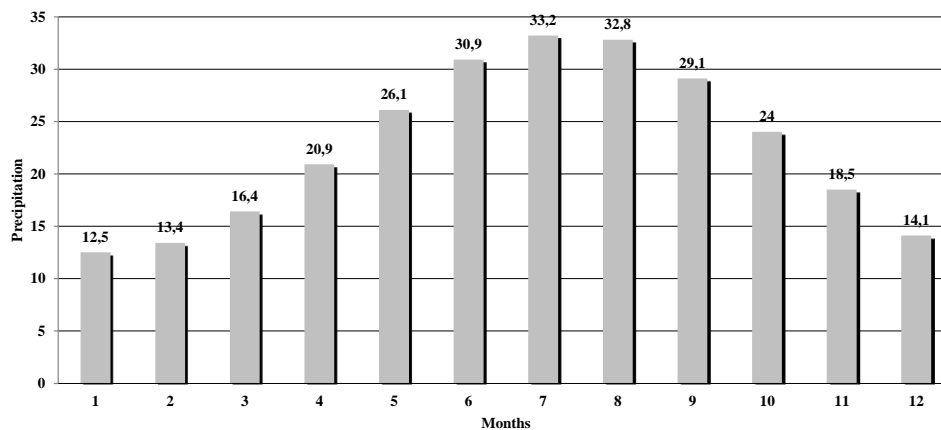


Figure 36:: Maximum Temperature Recorded at İzmir Meteorological Station

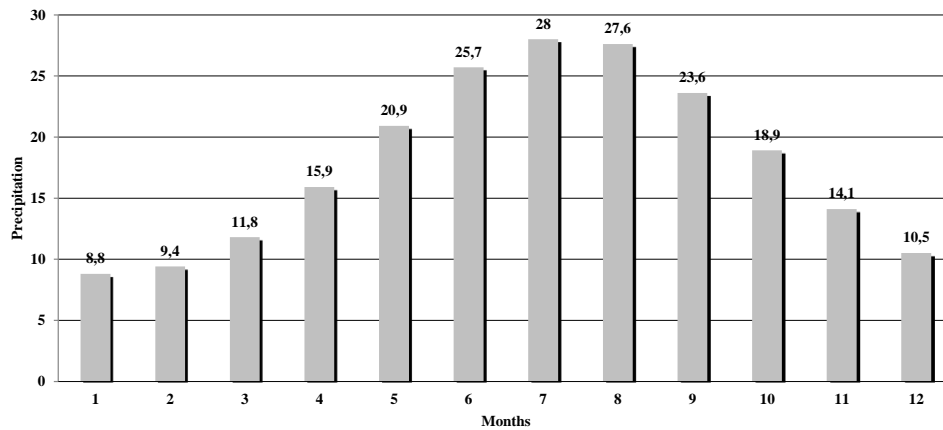


Figure 37: Average Temperature Recorded at İzmir Meteorological Station

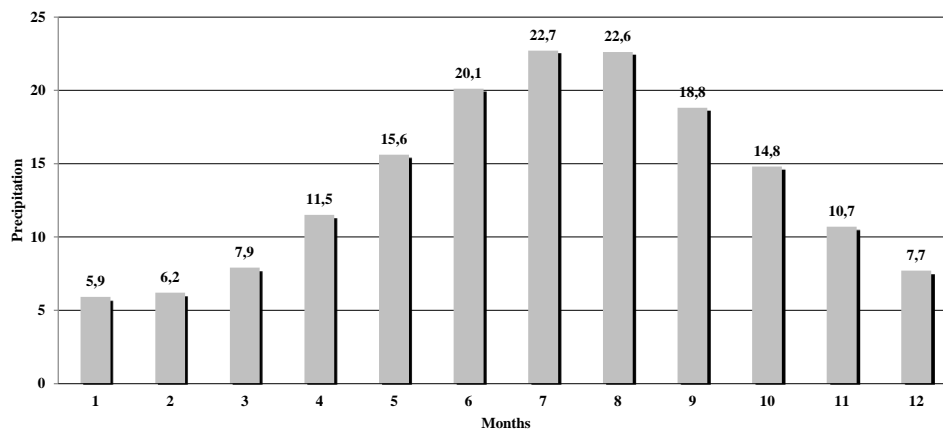


Figure 38: Minimum Temperature Recorded at İzmir Meteorological Station

**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 İzmir Meteorological Station between 1960 and 2014 was used. Precipitation normal, 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 696.1 mm. Maximum amount of precipitation was observed on September (145.3 mm) while minimum amount was observed on July (28 mm).

**Table 40: İzmir Meteorological Station Precipitation Normals (1960-2014)**

Months	Average Total Precipitation (mm)	Daily Maximum Precipitation (mm)
January	121.6	92
February	103.7	137.9
March	75.6	84.1
April	49.5	51.1



May	27	41
June	9.6	37.6
July	1.9	28
August	2.4	34.9
September	16.9	145.3
October	46.2	134.1
November	94.9	108
December	146.8	100.3
<b>Annual</b>	<b>696.1</b>	<b>994.3</b>

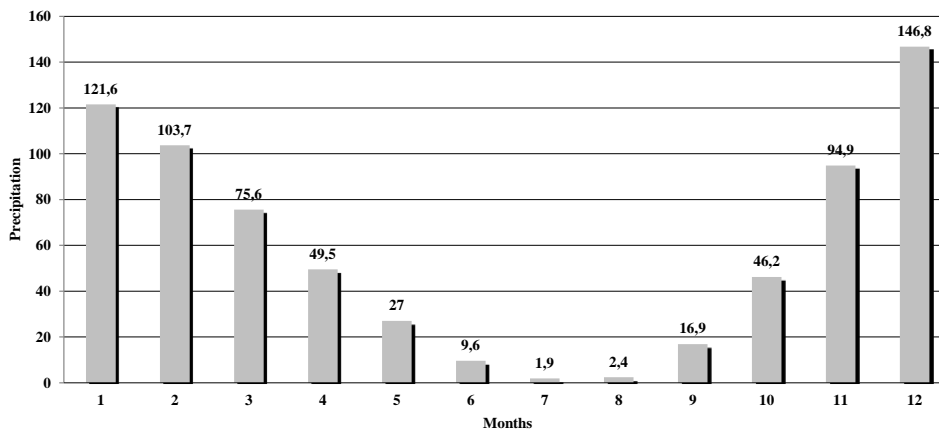


Figure 39: Total Average Precipitation recorded at İzmir Meteorological Station

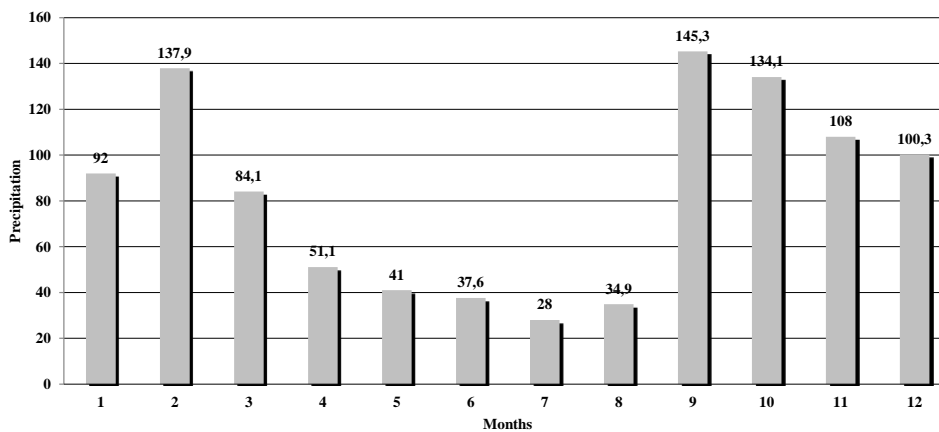


Figure 40: Daily Maximum Precipitation recorded at İzmir Meteorological Station

### Relative Humidity

Average relative humidity values recorded at İzmir Meteorological Station between 1960 and 2014 are presented in the table and figure below. According to the information, annual average relative humidity is 61.6 % for the İzmir Meteorological Station.

Table 41: İzmir Meteorological Station Relative Humidity Values

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
--------	---	----	-----	----	---	----	-----	------	----	---	----	-----



Average Relative Humidity	69,8	68	65,5	62,6	58,8	52,2	50,4	52,3	57	63,4	68,8	71,4
---------------------------	------	----	------	------	------	------	------	------	----	------	------	------

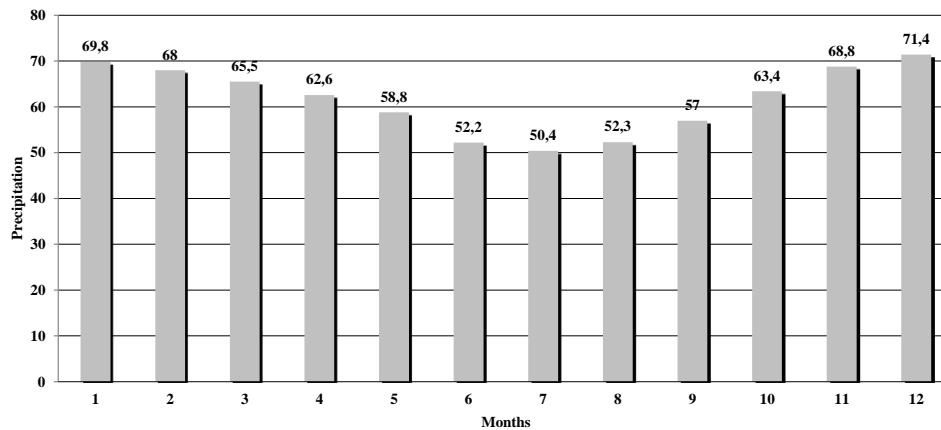


Figure 41: İzmir Meteorological Station Average Relative Humidity Changes by Months

**Local Pressure**

Annual average pressure recorded at İzmir Meteorological Station in between 1960 and 2014 is 1011 hPa. The highest pressure was observed on January with 1033.9 hPa. and the lowest pressure value was observed on February with 980.5 hPa. Average, highest and lowest values are presented in the table and figure below.

**Table 42: Local Pressure Values measured at İzmir Meteorological Station (hPa) (1960-2014)**

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Average Local Pressure	1014,6	1013,2	1012	1009,8	1009,5	1008	1005,9	1006,5	1010,2	1013,5	1014,8	1014,5	<b>1011</b>
Maximum Local Pressure	1033,9	1030,1	1030,3	1026,8	1019,2	1018,8	1014,8	1014,5	1020,9	1024,8	1029,1	1033,6	<b>1024.7</b>
Minimum Local Pressure	981,1	980,5	990	990,9	999,3	996,4	997,5	998,2	998,3	998,1	994,3	991	<b>992.9</b>



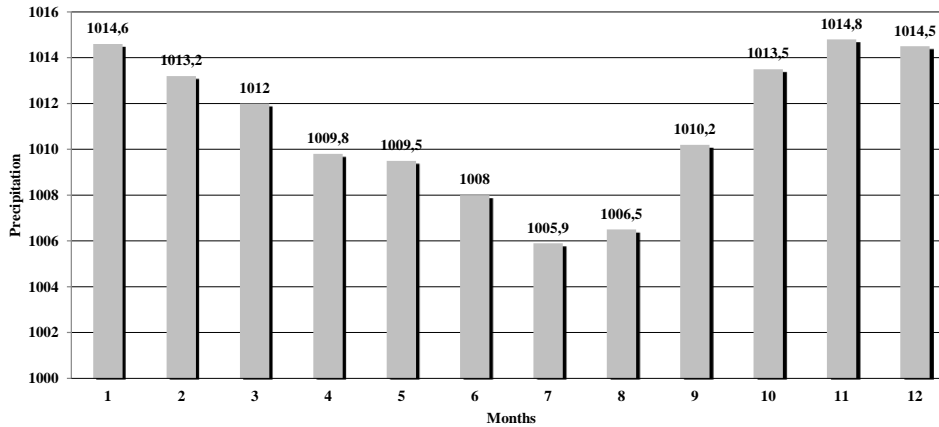


Figure 42: Izmir Meteorological Station Local Average Pressure Changes by Months

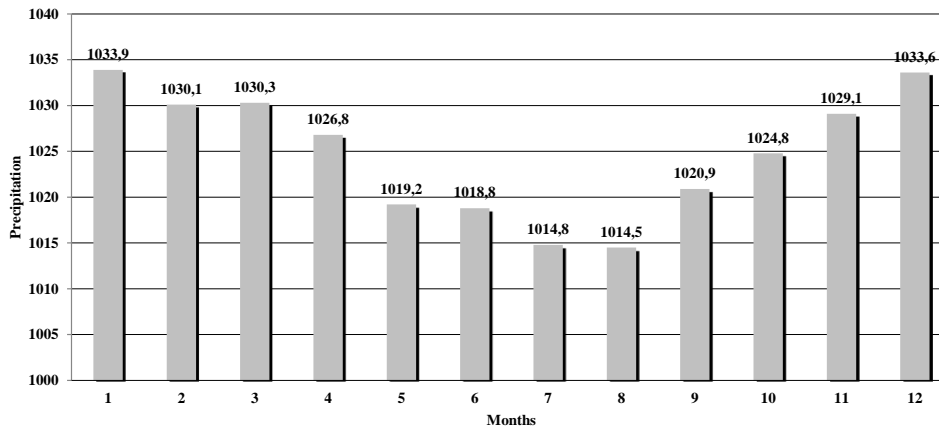


Figure 43: Izmir Meteorological Station Local Maximum Pressure Changes by Months

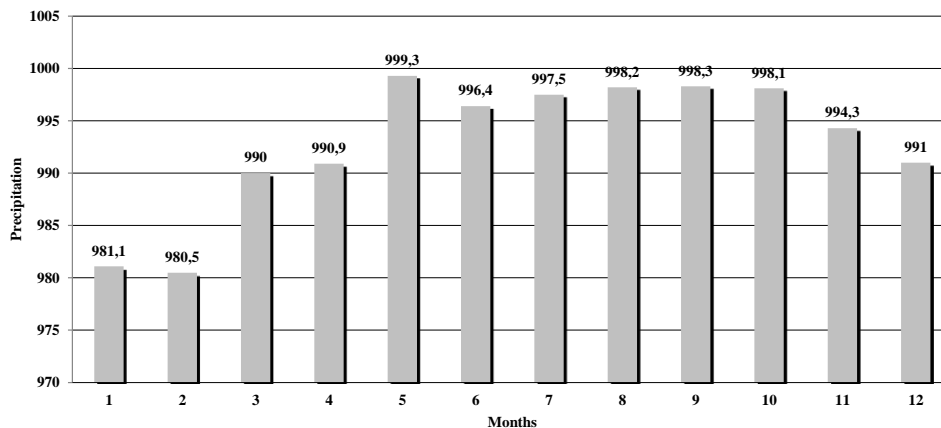


Figure 44: Izmir Meteorological Station Local Minimum Pressure Changes by Months

### 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 2014. Average number of snowy days is 1.2 and maximum snow depth is 8 cm and it was observed on January



Maximum foggy days are observed on November with a 0.4 average days; maximum hails was recorded on January and February with a 0.5 average days, maximum frosty days was observed on January with a 2.4 average days and maximum amount of thunderstorm was observed on December with a 2.9 average days.

**Table 43: Counted Days and Annual Average Values (1960-2014)**

Months	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Number of Snow Days	0,4	0,5	0,2									0,1	1.2
Number of Snow Cover Days	0	0										0	0
Maximum Snow Depth (cm)	8	2										3	13
Number of Foggy Days	0,1	0,1	0,1	0,1	0				0	0,1	0,4	0,3	1.2
Number of Hail Days	0,5	0,5	0,3	0,2	0,1		0	0	0	0,1	0,2	0,4	2.3
Number of Frosty Days	2,4	1,5	0,8								0,2	1,1	6
Number of Thunder Stormy Days	2,7	2,8	2,3	2,3	2,3	1,5	0,6	0,6	1,5	2	2,7	2,9	24.2

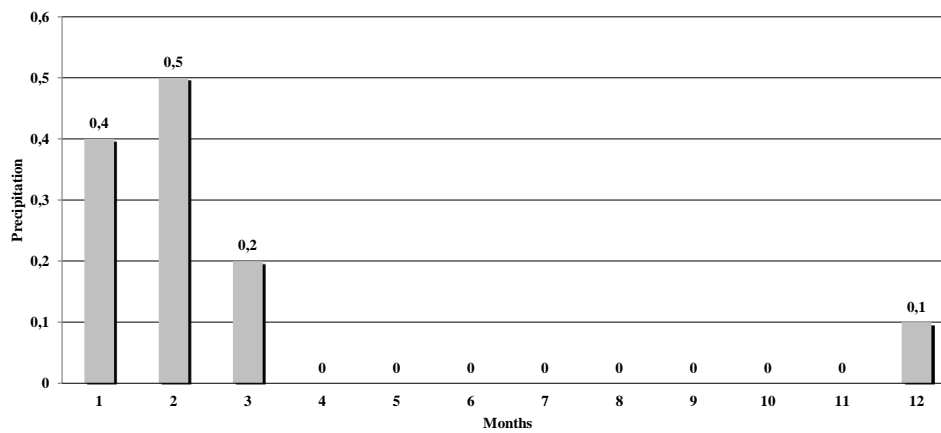


Figure 45: Izmir Meteorological Station. Distribution of Monthly Snow Days

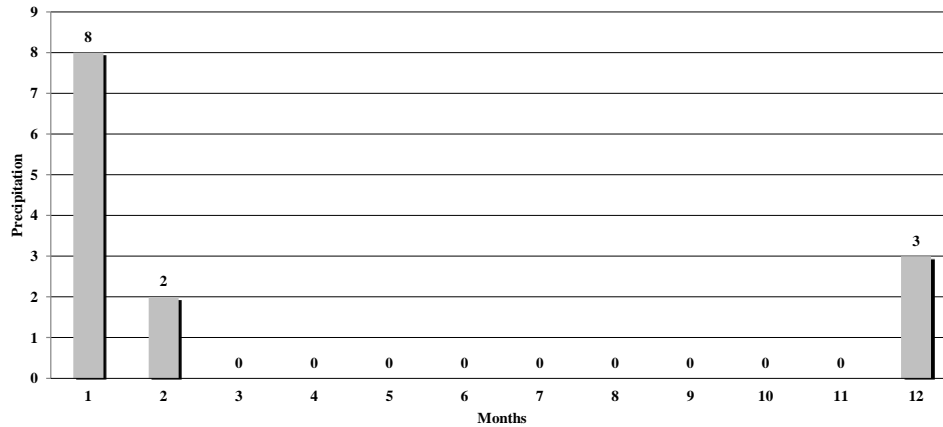


Figure 46: Izmir Meteorological Station. Distribution of Monthly Depth of Snow

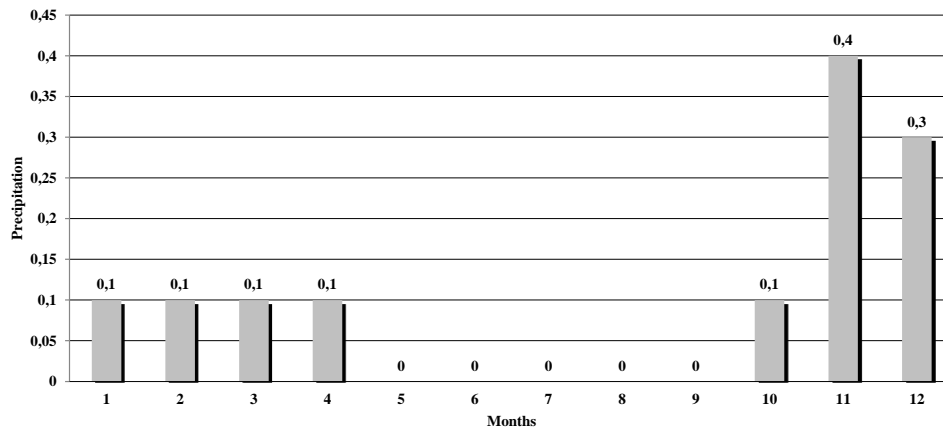


Figure 47: Izmir Meteorological Station. Distribution of Monthly Foggy Days

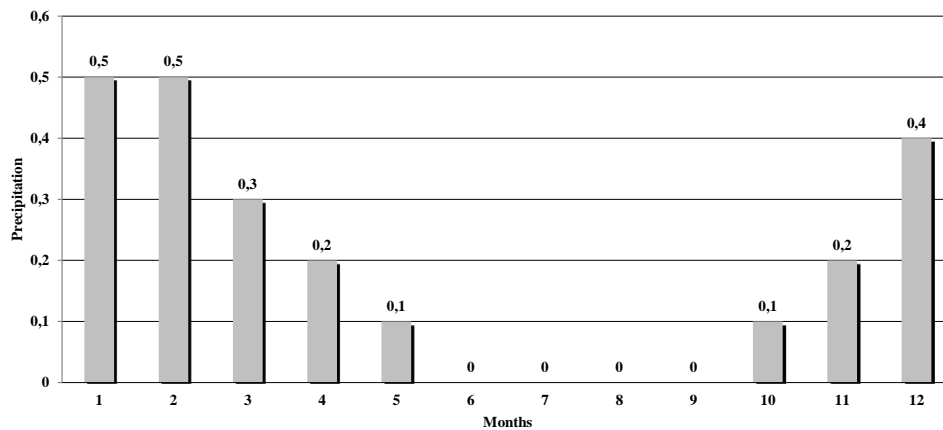


Figure 48: Izmir Meteorological Station. Distribution of Monthly Hail Days

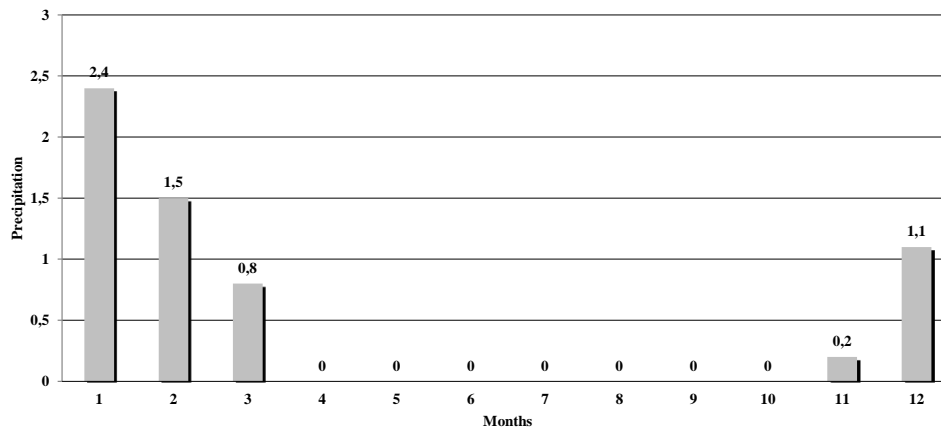


Figure 49: Izmir Meteorological Station. Distribution of Monthly Frosty Days

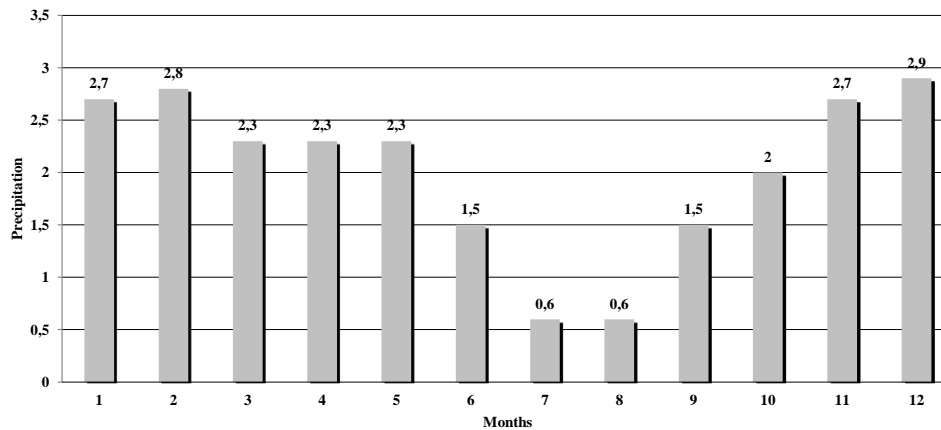


Figure 50: Izmir Meteorological Station. Distribution of Monthly Thunder-stormy Days

### 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 Izmir Meteorological Station 1960-2014 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, WNW (west of northwest) is the dominant wind direction at Izmir Station in the year.



**Table 44: Monthly number of winds at İzmir Meteorological Station**

Number of Winds (Monthly)

Direction	January	February	March	April	May	June	July	August	September	October	November	December
N	1286	1267	1594	1428	1533	1980	2185	1874	1536	1428	1098	1077
NNE	2080	2056	2285	1439	1525	1955	2819	3386	2791	2470	1417	1818
NE	2692	2261	1766	1069	1051	1363	2031	2254	2015	2289	1790	2061
ENE	3012	2617	2211	1066	1236	1094	1735	2070	1852	2590	2283	3004
E	1943	1443	1178	1081	1149	722	535	422	451	1247	1667	1881
ESE	4379	3718	3229	3009	2376	1678	923	874	1443	2758	4502	4938
SE	7007	6059	5634	5586	3792	2347	977	1042	2056	4066	6916	7670
SSE	6200	5826	5713	5463	4157	2379	1226	1441	2924	4940	6907	7198
S	2596	2207	2698	2588	2341	1533	962	1035	1969	2642	2873	2036
SSW	1030	951	1081	1170	1002	758	622	624	879	1040	858	879
SW	851	630	769	883	1019	911	980	769	826	749	613	843
WSW	1568	1433	2313	1942	2974	3343	3732	3802	2580	2126	1555	1753
W	1813	1850	2933	3841	5287	6887	8292	8081	6533	4095	2101	1578
WNW	1789	1952	3306	4110	6318	7072	7831	7518	6854	4392	2164	1517
NW	1110	1232	1975	2492	2597	2765	3001	2783	2438	1731	1279	1010
NNW	1231	1512	1997	2032	2118	2511	2861	2428	2123	1963	1285	1420

**Table 45: Seasonal and Annual numbers of wind in İzmir Meteorological Station**

Number of Winds (Seasonal and Annual)

Direction	Winter	Spring	Summer	Fall	Annual
N	3630	4555	6039	4062	18286
NNE	5954	5249	8160	6678	26041
NE	7014	3886	5648	6094	22642
ENE	8633	4513	4899	6725	24770
E	5267	3408	1679	3365	13719
ESE	13035	8614	3475	8703	33827
SE	20736	15012	4366	13038	53152
SSE	19224	15333	5046	14771	54374
S	6839	7627	3530	7484	25480
SSW	2860	3253	2004	2777	10894
SW	2324	2671	2660	2188	9843
WSW	4754	7229	10877	6261	29121
W	5241	12061	23260	12729	53291
WNW	5258	13734	22421	13410	54823
NW	3352	7064	8549	5448	24413
NNW	4163	6147	7800	5371	23481



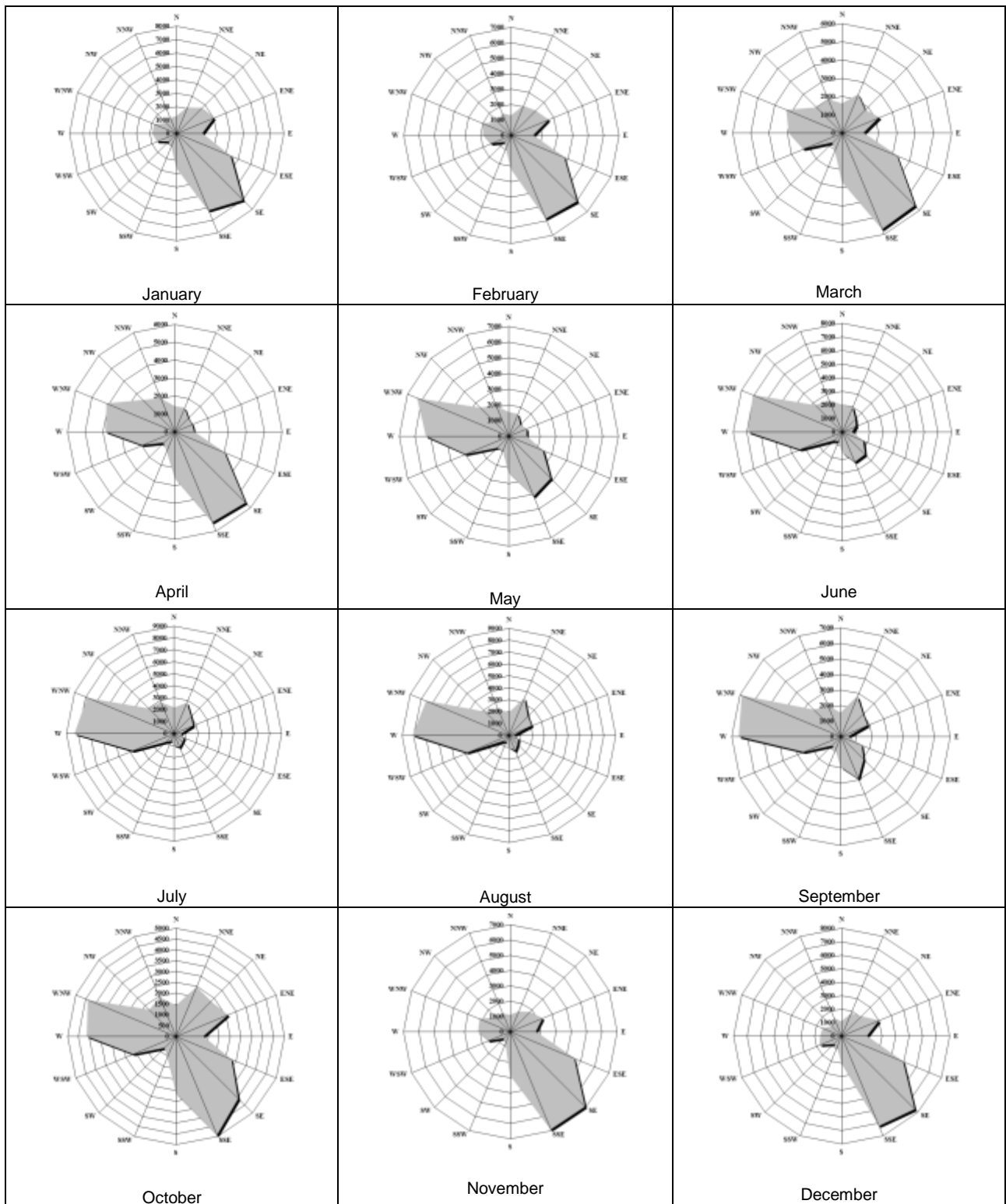


Figure 51: Monthly number of winds in Izmir Meteorological Station

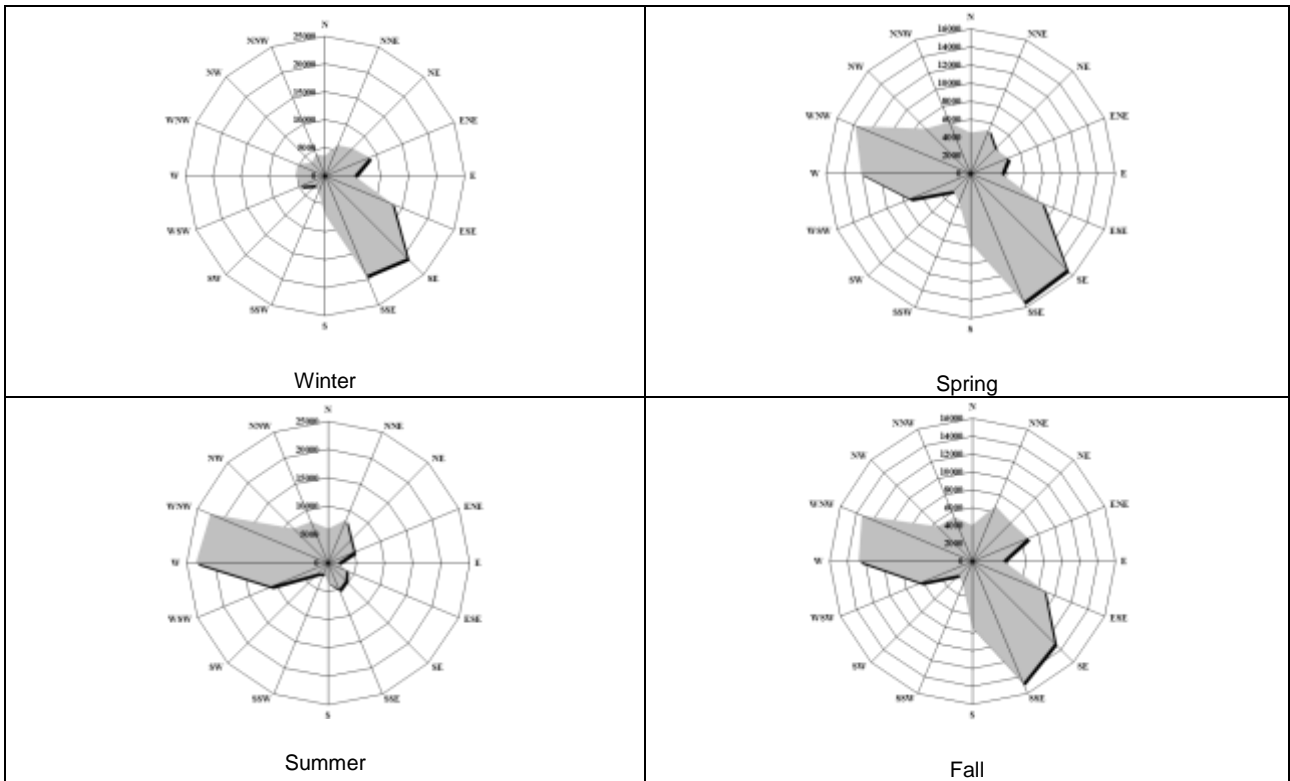


Figure 52: Seasonal number of winds in İzmir Meteorological Station

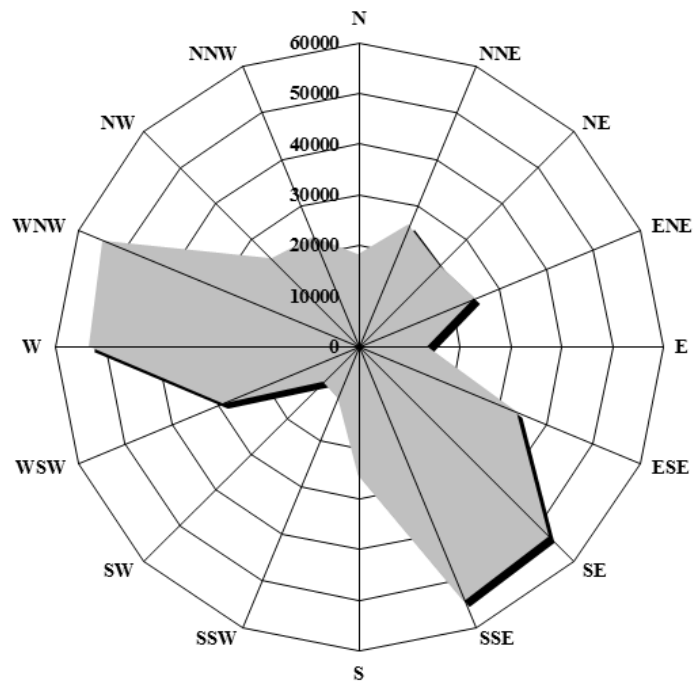


Figure 53: Annual number of winds at İzmir Meteorological Station



**Wind Speed Based on Directions**

According to the İzmir 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 2.96 m/sec towards NE (north of east) at İzmir Station.

**Table 46: Monthly mean wind speed at İzmir Meteorological Station**

Monthly Mean Wind Speed (m/sec)												
Direction	January	February	March	April	May	June	July	August	September	October	November	December
N	2,5	2,6	2,7	2,4	2,4	2,7	3,2	2,9	2,6	2,4	2,1	2,4
NNE	2,9	3,1	2,9	2,5	2,5	3	3,2	3,2	3	3	2,5	2,7
NE	3,1	3,1	2,9	2,6	2,7	2,9	3,3	3,3	3,1	3	2,7	2,9
ENE	2,8	3	2,8	2,5	2,6	2,9	3,1	3	2,8	2,7	2,6	2,7
E	2,4	2,6	2,4	2,4	2,3	2,2	2,2	2,1	2	2,2	2,3	2,4
ESE	2,8	3	2,7	2,9	2,5	2,3	2,2	2,1	2,2	2,4	2,8	2,9
SE	3,2	3,5	3,2	3	2,6	2,3	2	1,9	2,2	2,4	2,9	3,3
SSE	3	3,4	3,1	3	2,5	2,1	1,7	1,7	1,9	2,3	2,9	3,2
S	2,3	2,6	2,5	2,4	2,1	1,6	1,5	1,3	1,6	1,9	2,3	2,6
SSW	2,3	2,5	2,2	2,4	1,9	1,7	1,6	1,3	1,6	1,5	2	2,2
SW	2,5	2,3	2,3	2,2	2,1	2,1	2,1	1,7	1,6	1,6	1,8	2,4
WSW	2,3	2,5	2,4	2,6	2,8	2,9	3,1	3	2,4	2,1	2,2	2,4
W	2,3	2,5	2,8	3	3,2	3,5	3,7	3,6	3,2	2,6	2,3	2,4
WNW	2,4	2,6	2,8	3	3,2	3,4	3,5	3,4	3,1	2,7	2,3	2,3
NW	2,4	2,6	2,8	2,9	2,8	3	3,2	2,9	2,7	2,4	2,3	2,4
NNW	2,3	2,7	2,7	2,6	2,6	2,8	3,1	2,9	2,6	2,4	2,3	2,5

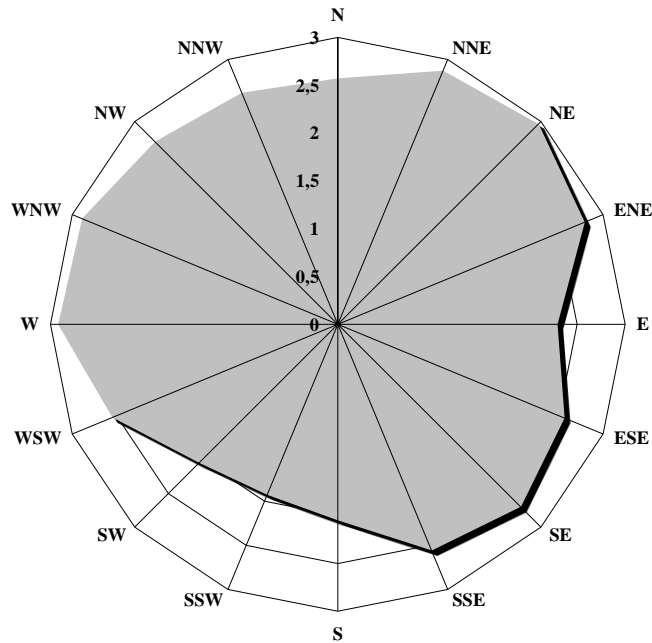


Figure 54: Annual mean wind speed at İzmir Meteorological Station

## REGIONAL BIOLOGICAL COMPONENTS CHACRACTERTICS

From a phytogeographical point of view, the study area is located in the ecoregion identified as “Aegean and Western Turkey Sclerophyllous And Mixed Forests”. The most common natural vegetation formations in this ecoregion are communities of maquis, dominated by evergreen shrubs. *Pinus brutia*, ar *Arbutus andrachne*, *A. unedo*, *Spartium junceum*, and *Laurus nobilis* are the main species of maquis vegetation. In the areas where *Pinus brutia* has been removed, Kermes Oak (*Quercus coccifera*), *Calicotome villosa*, *Palirus spina-cristii*, and *Erica arborea* are the main species.



Figure 55: Aegean And Western Turkey Sclerophyllous and Mixed Forests ecoregion (Source: The Encyclopedia of Earth <http://www.eoearth.org/>)





# APPENDIX I

## HSE Risk Register



# APPENDIX J

## Impact Assessment Methodology and Matrices



## A. Impact Assessment Results

### a. Impact Assessment Methodology

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; however the final methodology will be the result of consultation with the client and the relevant stakeholders.

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.

Impact assessment was performed for main issues for each Environmental and Social 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; however the final methodology will be the result of consultation with the client and the relevant stakeholders.

### i. Physical and Biological Components

---



The **impact assessment** on the single valued environmental 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 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 is directly proportional to the values of the features of the impact factors and is calculated by weighted multiplication of the value of the features of the impact factors 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.

## ii. Social Components

With regards to social components, a qualitative methodology has been used to assess impacts, unlike the semi-quantitative methodology, above-described, used for environmental components (physical and biological). 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), frequency of impact may increase or decrease.

### b. Identification of the project actions

Activities or project actions that could potentially contribute to environmental or social changes during the construction, commissioning and operational phases have been identified from the project description and from the documents provided by the Client. Project actions which can interfere significantly with the environment are listed below for each phase.

#### Construction phase

- Surface levelling and grading
- Rock Fragmentation
- Temporary stockpiling of material
- Transport of construction material
- Construction of facilities
- Disposal of waste deriving from construction (including excavated soil)

#### Operation phase

- Disposal of waste (including medical waste)
- Operation of the facilities

#### Decommissioning/Closure phase





- Demolition/dismantling activities
- Disposal of waste deriving from dismantling/demolition
- Transport of dismantled material
- Reclamation/Reuse

It has to be highlighted that decommissioning phase will be analysed only qualitatively since the project duration will be of at least 25 years and there are not enough details for an in-depth analysis.

### **c. Identification of the components**

After the identification of the Project actions, in order to identify the components potentially impacted by the project actions, matrixes have been created to link environmental, biological and social components to Project actions (Table 47 and Table 48). This assessment was preliminary performed in the Scoping phase before the application of the standard mitigation measures. Based on the new information made available from the Client or coming from the public consultations during the ESA preparation, the matrices have been revised and reported below.



Table 47: Matrix for physical components

Project Phases	Actions	Climate and meteorology	Air quality	Noise and vibration	Hydrogeology and groundwater quality	Geology and geomorphology	Soil and subsoil	Hydrology and surface water quality	Traffic and infrastructures
Construction phase	Surface levelling and grading		■	■			■		■
	Rock Fragmentation		■	■			■		■
	Temporary stockpiling of material		■	■	■	■	■		
	Transport of construction material		■	■					■
	Construction of facilities		■	■	■	■	■		■
	Disposal of waste deriving from construction			■	■	■		■	■
Operational phase	Disposal of waste (including medical and radioactive wastes)		■	■	■		■	■	■
	Operation of the facilities	■	■	■	■		■		■
Decommissioning/Closure	Demolition/dismantling activities		■	■	■	■	■		
	Disposal of waste deriving from dismantling/demolition			■	■		■	■	■
	Transport of dismantled material		■	■					■



Table 48: Matrix for biological components

Project Phases	Actions	Terrestrial Flora	Terrestrial Fauna	Habitats, ecosystems and biodiversity	Protected Areas
Construction phase	Rock fragmentation	■	■	■	■
	Surface levelling and grading	■	■	■	
	Temporary stockpiling of material	■	■	■	
	Transport of construction material		■	■	
	Construction of facilities	■	■	■	
	Disposal of waste deriving from construction (including excavated soil)	■	■	■	
Operational phase	Disposal of waste (including medical waste)	■	■	■	
	Operation of the facilities	■	■	■	
Decommissioning /Closure	Demolition/dismantling activities	■	■	■	
	Disposal of waste deriving from dismantling/demolition	■	■	■	
	Transport of dismantled material		■	■	
	Reclamation/Reuse	■	■	■	■



Table 49: Matrix for social components

Project Phases	Actions	Demographic profile and land use, Employment and socio-economic conditions, Social capital	Health issues and facilities, Education issues and facilities	Cultural Heritage
Construction phase	Surface levelling and grading			
	Rock Fragmentation			
	Temporary stockpiling of material			
	Transport of construction material			
	Construction of facilities			
	Disposal of waste deriving from construction			
Operational phase	Disposal of waste (including medical waste)			
	Operation of the facilities			
Decommissioning/Closure	Demolition/dismantling activities			
	Disposal of waste deriving from dismantling/demolition			
	Transport of dismantled material			



Through the use of the matrices, the following components were identified in the Scoping phase as potentially impacted (negatively or positively) during the life-cycle of the Project.

- **Physical components**
  - Climate and meteorology
  - Air quality
  - Noise and vibration
  - Hydrogeology and groundwater quality
  - Geology and geomorphology
  - Soil and subsoil
  - Hydrology and surface water quality
  - Traffic and infrastructures
- **Biological components**
  - Terrestrial flora
  - Terrestrial fauna
  - Habitats, ecosystems and biodiversity
  - Protected areas
- **Social components**
  - Demographic profile
  - Land use
  - Employment and socio-economic conditions
  - Social capital
  - Health issues and facilities
  - Education issues and facilities
  - Cultural heritage

### d. Identification of the impact factors

Project actions that could potentially contribute to environmental or social changes during the life-cycle of the Project have been identified through an analysis of the project documentation.

Project actions could potentially determinate, during the construction, operational and decommissioning/closure phases, impacts factors able to interfere positively or negatively, in a direct or indirect way, on the environmental and social 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
- Groundwater pollution
- Green house gas emissions

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.



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

**Table 50: Matrix of physical components - Project Actions/Impact Factors**

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
<b>CLIMATE AND METEOROLOGY</b>	-	-	-
	-	operation of the facilities	pollutant and dust emission in the atmosphere; greenhouse gas emissions
<b>AIR QUALITY</b>	Surface levelling and grading	-	pollutant and dust emission in the atmosphere
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	pollutant and dust emission in the atmosphere
	-	Operation of the facilities	
<b>NOISE AND VIBRATIONS</b>	Surface levelling and grading	-	emission of noise and/or vibrations
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	emission of noise and/or vibrations
	-	Operation of the facilities	
<b>HYDROGEOLOGY AND GROUNDWATER QUALITY</b>	Temporary stockpiling of material	-	hydrogeological change; groundwater pollution
	Construction of the facilities	-	



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	
<b>GEOLOGY AND GEOMORPHOLOGY</b>	Surface levelling and grading	-	Changes in the local morphology
	Temporary stockpiling of material	-	
	Construction of the facilities	-	
	-	-	
<b>SOIL AND SUBSOIL</b>	Surface levelling and grading	-	top soil and lower soil removal; occupation of land, pollutant emissions to the top soil
	Rock fragmentation	-	
	Temporary stockpiling of material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)		
	-	Disposal of waste (including medical and radioactive wastewater)	
-	Operation of the facilities		
<b>HYDROLOGY AND SURFACE WATER QUALITY</b>	Disposal of waste deriving from construction (including excavated soil)	-	hydrological change, surface water pollution, surface water run off
	-	Disposal of waste (including medical and radioactive wastewater)	
<b>TRAFFIC AND INFRASTRUCTURE</b>	Surface levelling and grading	-	increased road traffic
	Rock fragmentation	-	
	Transport of construction material	-	
	Construction of the facilities	-	



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	

**Table 51: Matrix of biological components - Project Actions/Impact Factors**

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
<b>TERRESTRIAL FLORA</b>	Surface levelling and grading	-	vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	occupation of land; pollutant and dust emission in the atmosphere
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	
<b>TERRESTRIAL FAUNA</b>	Surface levelling and grading	-	vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere; emission of noise and vibrations
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	occupation of land; pollutant and dust emission in the atmosphere; emission of noise and vibrations
<b>HABITATS, ECOSYSTEMS AND BIODIVERSITY</b>	Surface levelling and grading	-	vegetation clearing and removal of top soil; pollutant and dust emission in the atmosphere; emission of noise and vibrations; introduction of alien species
	Rock fragmentation	-	
	Temporary stockpiling of the material	-	
	Transport of construction material	-	
	Construction of the facilities	-	
	Disposal of waste deriving from construction (including excavated soil)	-	
	-	Disposal of waste (including medical and radioactive wastewater)	occupation of land; pollutant and dust emission in the atmosphere; emission of noise and vibrations
-	Operation of the facilities	emission of noise and vibrations	
<b>PROTECTED AREAS</b>	Rock fragmentation	-	emission of noise and vibrations



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

**Table 52: Matrix of social components – Project Actions/Impact Factors**

Components	Project actions (construction phase)	Project actions (operational phase)	Impact factors
<b>DEMOGRAPHIC PROFILE AND LAND USE, EMPLOYMENT AND SOCIO-ECONOMIC CONDITIONS, SOCIAL CAPITAL</b>	Transport of construction material	-	need of workforce; use of goods and services; unsatisfied occupational expectations, use of local infrastructures
	Construction of facilities	-	need of workforce; use of goods and services; demand of housing
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	
<b>CULTURAL HERITAGE</b>	Rock Fragmentation	-	damage and destruction of cultural resources
	Construction of the facilities	-	
	-	-	
	-	-	
	-	-	
	-	-	
<b>HEALTH ISSUES AND FACILITIES</b>	Surface levelling and grading	-	groundwater pollution; Pollutant and dust emission in the atmosphere; Unsatisfied occupational expectations;
	Rock fragmentation	-	
	Construction of the facilities	-	need of workforce; use of goods and services; demand of housing; creation of medical waste; storage, transportation and disposal
	-	Disposal of waste (including medical and radioactive wastewater)	
	-	Operation of the facilities	





**B. FINAL IMPACT ASSESSMENT MATRICES**

**Table 53: Impact assessment matrix for geology and geomorphology during construction phase after mitigation**

IMPACT ASSESSMENT MATRIX - GEOLOGY AND GEOMORPHOLOGY CONSTRUCTION PHASE		Changes in the local morphology
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	



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - GEOLOGY AND GEOMORPHOLOGY CONSTRUCTION PHASE		Changes in the local morphology
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		<b>Negligible</b>

**Table 54: Impact assessment matrix for soil and subsoil characteristics during construction phase after mitigation**

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS CONSTRUCTION PHASE		Top soil and lower soil removal	Pollutant emissions to the top soil	Occupation of land
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

	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			
		<b>Low</b>	<b>Negligible</b>	<b>Negligible</b>



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

**Table 55: Impact assessment matrix for soil and subsoil characteristics during commissioning and operational phase after mitigation**

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS COMMISSIONING AND OPERATIONAL PHASE		Occupation of land	Pollutant emissions in the top soil	Increase of artificial land use
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			



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - SOIL AND SUBSOIL CHARACTERISTICS COMMISSIONING AND OPERATIONAL PHASE		Occupation of land	Pollutant emissions in the top soil	Increase of artificial land use
Mitigation (M)	high			
	certain			
	high			
	medium			
Sensitivity (S)	low			
	none			
	negligible			
	low			
	medium			
	high			
		<b>Low</b>	<b>Negligible</b>	<b>Low</b>

**Table 56: impact evaluation matrix for on hydrology and surface water quality component during construction phase after mitigation**

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
Duration (D)	short			
	medium-short			
	medium			
	medium-long			



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
	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			





## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY CONSTRUCTION PHASE		Hydrological change	Surface water pollution	Surface water run-off
Sensitivity (S)	negligible			
	low			
	medium			
	high			
		<b>Negligible</b>	<b>Negligible</b>	<b>Negligible</b>

**Table 57: impact evaluation matrix for on hydrology and surface water quality component during commissioning and operational phase after mitigation**

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrological change	Surface water pollution	Surface water run-off
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			
	discontinuous			
	continuous			
Geographic extent (G)	local			
	regional			



**ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL**

IMPACT ASSESSMENT MATRIX - HYDROLOGY AND SURFACE WATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrological change	Surface water pollution	Surface water run-off
	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			
		<b>Negligible</b>	<b>Negligible</b>	<b>Negligible</b>



ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Table 58: impact evaluation matrix for on hydrogeology and groundwater quality component during construction phase after mitigation

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY CONSTRUCTION PHASE		Hydrogeological change	Groundwater pollution
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		



**ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL**

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY CONSTRUCTION PHASE		Hydrogeological change	Groundwater pollution
Mitigation (M)	high		
	certain		
	high		
	medium		
	low		
Sensitivity (S)	none		
	negligible		
	low		
	medium		
	high		
		<b>Negligible</b>	<b>Negligible</b>

**Table 59: impact evaluation matrix for on hydrogeology and groundwater quality component during commissioning and operational phase after mitigation**

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrogeological change	Groundwater pollution
Duration (D)	short		
	medium-short		
	medium		
	medium-long		



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrogeological change	Groundwater pollution
	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		



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - HYDROGEOLOGY AND GROUNDWATER QUALITY COMMISSIONING AND OPERATIONAL PHASE		Hydrogeological change	Groundwater pollution
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		<b>Negligible</b>	<b>Negligible</b>

**Table 60: Impact assessment matrix for air quality during construction phase after mitigation**

IMPACT ASSESSMENT MATRIX - AIR 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	





## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - AIR CONSTRUCTION PHASE		pollutant and dust emission in the atmosphere
	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	
		<b>Negligible</b>



**Table 61: impact evaluation matrix for atmosphere component during operational phase after mitigation**

IMPACT ASSESSMENT MATRIX - AIR OPERATION 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	



**ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL**

IMPACT ASSESSMENT MATRIX - AIR OPERATION PHASE		pollutant and dust emission in the atmosphere
	high	
	certain	
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		<b>Negligible</b>

**Table 62: Impact evaluation matrix for noise and vibration component during construction phase after mitigation**

IMPACT EVALUATION MATRIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE		emission of noise and vibrations
Duration (D)	short	
	medium-short	
	medium	
	medium-long	



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

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



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - NOISE AND VIBRATIONS CONSTRUCTION PHASE		emission of noise and vibrations
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		<b>Negligible</b>

**Table 63: Impact assessment matrix for traffic and infrastructures during construction phase after mitigation**

IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES CONSTRUCTION PHASE		Increased road traffic
Duration (D)	short	
	medium-short	
	medium	
	medium-long	
	long	
Frequency (F)	concentrate	
	discontinuous	
	continuous	
Geographic extent (G)	local	
	regional	
	beyond regional	



**ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL**

<b>IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES CONSTRUCTION PHASE</b>		<b>Increased road traffic</b>
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	
		<b>Negligible</b>

**Table 64: Impact assessment matrix for traffic and infrastructures during commissioning and operational phase after mitigation**





**ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL**

<b>IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES COMMISSIONING AND OPERATIONAL PHASE</b>		<b>Increased road traffic</b>
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	



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT ASSESSMENT MATRIX - TRAFFIC AND INFRASTRUCTURES COMMISSIONING AND OPERATIONAL PHASE		Increased road traffic
Mitigation (M)	high	
	medium	
	low	
	none	
Sensitivity (S)	negligible	
	low	
	medium	
	high	
		<b>Negligible</b>

**Table 65: Impact evaluation matrix for terrestrial flora component during construction phase after 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		



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA CONSTRUCTION PHASE		vegetation clearing and removal of terrestrial top soil	pollutant and dust emission in the atmosphere
	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		



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA CONSTRUCTION PHASE	vegetation clearing and removal of terrestrial top soil	pollutant and dust emission in the atmosphere
	Negligible	Negligible

**Table 66: Impact evaluation matrix for terrestrial flora component during operational phase after mitigation**

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA OPERATIONAL PHASE		occupation of land	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		



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - TERRESTRIAL FLORA OPERATIONAL PHASE		occupation of land	pollutant and dust emission in the atmosphere
	long-term		
	irreversible		
Probability of occurrence (P)	low		
	medium		
	high		
	certain		
Mitigation (M)	high		
	medium		
	low		
	none		
Sensitivity (S)	negligible		
	low		
	medium		
	high		
		<b>Low</b>	<b>Negligible</b>

**Table 67: Impact evaluation matrix for terrestrial fauna component during construction phase after mitigation**

IMPACT EVALUATION MATRIX - 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			



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - TERRESTRIAL FAUNA CONSTRUCTION PHASE		vegetation clearing and disturbance of terrestrial top soil	pollutant and dust emission in the atmosphere	emission of noise and vibrations
	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			





## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - TERRESTRIAL FAUNA CONSTRUCTION PHASE		vegetation clearing and disturbance of terrestrial top soil	pollutant and dust emission in the atmosphere	emission of noise and vibrations
	none			
	negligible			
Sensitivity (S)	low			
	medium			
	high			
		<b>Low</b>	<b>Negligible</b>	<b>Negligible</b>

**Table 68: Impact evaluation matrix for terrestrial fauna component during operational phase after mitigation**

IMPACT EVALUATION MATRIX - TERRESTRIAL FAUNA OPERATIONAL PHASE		occupation of land	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			



**ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL**

<b>IMPACT EVALUATION MATRIX - TERRESTRIAL FAUNA OPERATIONAL PHASE</b>		<b>occupation of land</b>	<b>pollutant and dust emission in the atmosphere</b>	<b>emission of noise and vibrations</b>
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			
		<b>Low</b>	<b>Negligible</b>	<b>Negligible</b>

**Table 69: Impact evaluation matrix for habitat and biodiversity component during construction phase after mitigation**



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - HABITAT AND BIODIVERSITY CONSTRUCTION PHASE		vegetation clearing and disturbance of terrestrial top soil	pollutant and dust emission in the atmosphere	emission of noise and vibrations	introduction of alien species
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				



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - HABITAT AND BIODIVERSITY CONSTRUCTION PHASE		vegetation clearing and disturbance of terrestrial top soil	pollutant and dust emission in the atmosphere	emission of noise and vibrations	introduction of alien species
Mitigation (M)	high				
	medium				
	low				
	none				
Sensitivity (S)	negligible				
	low				
	medium				
	high				
		<b>Low</b>	<b>Negligible</b>	<b>Negligible</b>	<b>Negligible</b>

**Table 70: Impact evaluation matrix for habitat and biodiversity component during operational phase after mitigation**

IMPACT EVALUATION MATRIX - HABITAT AND BIODIVERSITY OPERATIONAL PHASE		occupation of land	pollutant and dust emission in the atmosphere	emission of noise and vibrations
Duration (D)	short			
	medium-short			
	medium			
	medium-long			
	long			
Frequency (F)	concentrate			



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - HABITAT AND BIODIVERSITY OPERATIONAL PHASE		occupation of land	pollutant and dust emission in the atmosphere	emission of noise and vibrations
	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			



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - HABITAT AND BIODIVERSITY OPERATIONAL PHASE		occupation of land	pollutant and dust emission in the atmosphere	emission of noise and vibrations
	medium			
	high			
		<b>Low</b>	<b>Negligible</b>	<b>Negligible</b>

**Table 71: Impact evaluation matrix for protected areas component during construction phase after mitigation**

IMPACT EVALUATION MATRIX - PROTECTED AREAS 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	





## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

IMPACT EVALUATION MATRIX - PROTECTED AREAS CONSTRUCTION PHASE		emission of noise and vibrations
	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	
		<b>Negligible</b>



# APPENDIX K

## Regulatory Framework



## A. REGULATORY AND POLICY FRAMEWORK

### a. Current National Environmental and Social Legislation

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

**Table 72: Relevant Turkish Regulations for the Hospital Project**

Issue	Relevant Guidelines and Regulations
<b>Construction Phase</b>	
<i>Environmental Issues</i>	
<b>General</b>	<ul style="list-style-type: none"> <li>- Environmental Law (Law Number: 2872)</li> </ul>
<b>Permitting</b>	<ul style="list-style-type: none"> <li>- Regulation on Environmental Impact Assessment</li> <li>- Regulation on Environmental Auditing</li> <li>- Regulation on Environmental Permits and Licenses</li> </ul>
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>- Regulation on Control of Industrial Air Pollution</li> <li>- Regulation on Assessment and Management of Air Quality</li> <li>- Regulation on Control of Exhaust Gas Emission</li> <li>- Regulation on Air Pollution Caused by Heating</li> <li>- Regulation on Odour Causing Emissions</li> </ul>
<b>Energy Conservation</b>	<ul style="list-style-type: none"> <li>- Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage</li> </ul>
<b>Water And Wastewater Quality</b>	<ul style="list-style-type: none"> <li>- Regulation on Control of Water Pollution</li> <li>- Urban Wastewater Treatment Regulation</li> <li>- Regulation on Protection of Wetlands</li> <li>- Regulation on Control of Pollution Caused by Hazardous Substances in Water and its Environment</li> <li>- Regulation on Management of Surface Water Quality</li> </ul>
<b>Hazardous Materials Management</b>	<ul style="list-style-type: none"> <li>- Regulation on Restrictions on the Production, Placing on the Market, and Use of Some Hazardous Materials</li> <li>- Regulation on Preparation and Distribution of Material Safety Data Sheets on Hazardous Materials and Aids</li> <li>- Regulation on Classification, Package, and Labelling of the Hazardous Materials and Aids</li> <li>- Regulation on Inventory and Control of the Chemicals</li> </ul>
<b>Waste Management</b>	<ul style="list-style-type: none"> <li>- Regulation on Waste Management</li> <li>- Regulation on Control of Waste Oil</li> <li>- Regulation on Control of Medical Waste</li> <li>- Regulation on Control of Waste Batteries and Accumulators</li> <li>- Regulation on Control of Vegetative Oil</li> <li>- Regulation on Control of PCB and PCTs</li> <li>- Regulation on Control of Packaging Waste</li> <li>- Regulation on Control of End of Life Tires</li> <li>- Regulation on Control of End of Life Vehicles</li> <li>- Regulation on Landfills (Regular Storage of Wastes)</li> </ul>
<b>Noise</b>	<ul style="list-style-type: none"> <li>- Regulation on Assessment and Management of Environmental Noise</li> </ul>



<b>Soil Quality</b>	<ul style="list-style-type: none"> <li>- Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources</li> </ul>
<b>Occupational and Community Health and Safety Issues</b>	
<b>Occupational and Community Health and Safety</b>	<ul style="list-style-type: none"> <li>- Labour Law</li> <li>- Occupational Health and Safety Law</li> <li>- Related regulations</li> </ul>
<b>Operation Phase</b>	
<b>Environmental Issues</b>	
<b>General</b>	<ul style="list-style-type: none"> <li>- Environmental Law (Law Number: 2872)</li> <li>- Land Acquisition Act of Turkey (Law Number: 2942)</li> <li>- Protection of Cultural and Natural Assets Law of Turkey (Law Number: 2863)</li> </ul>
<b>Permitting</b>	<ul style="list-style-type: none"> <li>- Regulation on Environmental Impact Assessment</li> <li>- Regulation on Environmental Auditing</li> <li>- Regulation on Environmental Permits and Licenses</li> </ul>
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>- Regulation on Control of Industrial Air Pollution</li> <li>- Regulation on Assessment and Management of Air Quality</li> <li>- Regulation on Air Pollution Caused by Heating</li> <li>- Regulation on Odour Causing Emissions</li> </ul>
<b>Energy Conservation</b>	<ul style="list-style-type: none"> <li>- Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage</li> </ul>
<b>Water and Wastewater Quality</b>	<ul style="list-style-type: none"> <li>- Regulation on Control of Water Pollution</li> <li>- Urban Wastewater Treatment Regulation</li> </ul>
<b>Hazardous Materials Management</b>	<ul style="list-style-type: none"> <li>- Regulation on Restrictions on the Production, Placing on the Market, and Use of Some Hazardous Materials</li> <li>- Regulation on Preparation and Distribution of Material Safety Data Sheets on Hazardous Materials and Aids</li> <li>- Regulation on Classification, Package, and Labelling of the Hazardous Materials and Aids</li> <li>- Regulation on Inventory and Control of the Chemicals</li> </ul>
<b>Waste Management</b>	<ul style="list-style-type: none"> <li>- Regulation on Waste Management</li> <li>- Regulation on Control of Medical Waste</li> <li>- Regulation on Control of Waste Batteries and Accumulators</li> <li>- Regulation on Control of Vegetative Oil</li> <li>- Regulation on Control of Packaging Waste</li> <li>- Regulation on Control of End of Life Vehicles</li> <li>- Regulation on Landfills (Regular Storage of Wastes)</li> </ul>
<b>Noise</b>	<ul style="list-style-type: none"> <li>- Regulation on Assessment and Management of Environmental Noise</li> </ul>
<b>Soil Quality</b>	<ul style="list-style-type: none"> <li>- Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources</li> </ul>

**Occupational and Community Health and Safety Issues**



<b>Occupational and Community Health and Safety</b>	<ul style="list-style-type: none"><li>- Labour Law (Law Number: 4857)</li><li>- Occupational Health and Safety Law (Law Number: 6331)</li><li>- Related legislation of the Ministry of Labour and Social Security</li></ul>
<b>Issues about Health Services</b>	
<b>Health Services</b>	<ul style="list-style-type: none"><li>- Health Services Basic Law (Law Number: 1593)</li><li>- General Healthcare Law (Law Number: 3359)</li><li>- Regulation on Operation of Inpatient Treatment Institutions</li><li>- Regulation on Patient Rights</li><li>- Regulation on Providence of Patient and Personnel Security</li><li>- Related legislation of the Ministry of Health</li></ul>
<b>Issues about Forensic Hospital</b>	
<b>Forensic Hospital</b>	<ul style="list-style-type: none"><li>- Criminal Law (Law Number: 5237)</li><li>- Law on Execution of Penalties and Security Precautions (Law Number: 5275)</li><li>- Related legislation of the Ministry of Justice</li></ul>

### i. Permitting Responsibilities

The Project is legally exempt from the requirement of an official Environmental Impact Assessment (“EIA”) process. However, concrete plant(s) with the capacity of 100 m<sup>3</sup>/hr and above and trigeneration plants with the installed capacity of 20 MWt and higher, are subject to preparation of a PDF and obtaining “EIA is not Required” decision in accordance with the Regulation on Environmental Impact Assessment (dated: November 25, 2014, Official Gazette No: 29186, Annex – II Article 18 and Article 44 of the Regulation, respectively).

A Trigeneration plant will be installed as a part of the Project to produce part of the power required for the operation of the facilities. The capacity of the unit will be 4 MWt (thermal power). During the operation phase there will be boiler operation combusting natural gas to produce heat for the consumption of the project facilities. The total capacity of the boilers will be 11.2 MWt (thermal power). According to this, the total capacity will be 18.3 MWt (15.8 + 2.5) which is below 20 MWt. The capacity is lower than the aforementioned criteria stated in the Regulation on Environmental Impact Assessment. Hence the project is not subject to the preparation of PDF for the Trigeneration Plant.

There will not be concrete plant constructed under the scope of the Project. Needed concrete will be supplied from external concrete batching plants which are located close to the site, however there is a also possibility to construct a concrete batching plant with 90 m<sup>3</sup>/h capacity which in that case; there will not be requirement for preparing a single PDF.

If in the future during the construction works a requirement arises to increase the capacity of the concrete batching plant which will exceed 100 m<sup>3</sup>/hr , referring to the aforementioned Turkish EIA criteria, preparation of a single PDF will be necessary

Hospitals and healthcare facilities having capacity higher than 20 beds are included in Annex- 1 and the trigeneration plants having capacity more than 1 MWt thermal power are included in Annex-2 of the Regulation on Environmental Permits and Licenses (dated: September 10, 2014, Official Gazette No: 29115). Hence, Environmental Permit for operation phase will be received from the Ministry of Environment and Urbanization (“MoEU”).



## b. International Requirements

### i. International Conventions and Agreements

Turkey ratified the following main international conventions and agreements for environmental protection. Hence, the project will be performing in line with the project relevant requirements of this documentation:

- The United Nations Framework Convention on Climate Change, 2004
- Kyoto Protocol to the United Nations Framework Convention on Climate Change, 2008
- Beijing Convention on the Protection of the Ozone Layer, the Montreal Protocol on Substances depleting the Ozone Layer and the relevant amendments to the Protocol, 1989
- Convention on Long-Range Transboundary Air Pollution, 1979
- United Nations, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989
- United Nations Convention to Combat Desertification, 1994
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention);
- UNESCO, Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention) and the relevant amendments to the Protocol, 2000
- UNESCO Convention on the Protection of the World Cultural and Natural Heritage, 1972
- United Nations Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention), 1999
- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), 1999

### ii. Current European Union Environmental and Social legislation

Project has voluntarily decided to be in compliance with EU legislation in order to be in compliance with relevant and applicable EBRD and European Investment Bank (“EIB”) requirements.

Relevant European Directives applicable to the Project are provided in the table below.

**Table 73: Relevant European Regulations**

Environmental Issues	
<b>Impact assessment</b>	Council Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment
<b>Air quality</b>	<ul style="list-style-type: none"> <li>■ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). Directive 2010/75/EU replaces definitively, with effect from 7 January 2014:               <ul style="list-style-type: none"> <li>• Directive 1999/13/EC on reducing emissions of volatile organic compounds (VOCs);</li> <li>• Directive 2008/1/EC concerning integrated pollution prevention and control;</li> </ul> </li> </ul> <p>with effect from 1st January 2016:</p>





<b>Environmental Issues</b>	
	<ul style="list-style-type: none"><li>• Directive 2001/80/EC on the limitation of emissions of certain pollutants from large combustion plants.</li><li>■ Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe</li><li>■ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC</li><li>■ Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer</li><li>■ Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels and amending Directive 93/12/EEC</li><li>■ Directive 2001/81/EC of the European Parliament and of the Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants</li></ul>
<b>Energy Conservation</b>	<ul style="list-style-type: none"><li>■ 32012L0027: Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance</li><li>■ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control</li><li>■ EC/JRC 2008: IPPC Reference Document on Best Available Techniques for Energy Efficiency. June 2008</li></ul>
<b>Water and Wastewater Quality</b>	<ul style="list-style-type: none"><li>■ Council Directive 91/271/EEC of 21 May 1991 Concerning Urban Wastewater Treatment</li><li>■ Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption</li><li>■ Council Directive of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States</li><li>■ Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration</li><li>■ Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances</li><li>■ Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community</li><li>■ Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and</li></ul>



<b>Environmental Issues</b>	
	amending Directive 2000/60/EC of the European Parliament and of the Council
<b>Water Conservation</b>	<ul style="list-style-type: none"><li>■ Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community</li><li>■ Council Directive of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC</li></ul>
<b>Hazardous Materials Management</b>	<ul style="list-style-type: none"><li>■ Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC</li><li>■ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006</li><li>■ Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances</li><li>■ Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods</li></ul>
<b>Waste Management</b>	<ul style="list-style-type: none"><li>■ Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste</li><li>■ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste</li><li>■ Directive 94/62/EC of the European Parliament and of the Council of 20 December 1994 on packaging and packaging waste</li><li>■ Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)</li><li>■ Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment</li><li>■ Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC</li><li>■ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives</li><li>■ Directive 2000/53/EC of the European Parliament and of 18 September 2000 on end-of life vehicles</li></ul>



<b>Environmental Issues</b>	
	<ul style="list-style-type: none"><li>■ 32012L0019: Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) Text with EEA relevance</li></ul>
<b>Noise</b>	<ul style="list-style-type: none"><li>■ Council Directive of 6 February 1970 on the approximation of the laws of the Member States relating to the permissible sound level and the exhaust system of motor vehicles</li><li>■ Directive 2000/14/EC of the European Parliament and of the Council of 8 May 2000 on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors</li><li>■ Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise</li></ul>
<b>Soil Quality</b>	<ul style="list-style-type: none"><li>■ Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture</li><li>■ Directive 2004/35/CE of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage</li></ul>
<b>Nature Conservation and Biodiversity</b>	<ul style="list-style-type: none"><li>■ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora</li><li>■ Council Decision 98/145/EC of 12 February 1998 on the approval, on behalf of the European Community, of the amendments to Appendices I and II to the Bonn Convention on the conservation of migratory species of wild animals as decided by the fifth meeting of the Conference of the parties to the Convention</li><li>■ Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds</li></ul>
<b>Occupational and Community Health and Safety Issues</b>	
<b>Occupational and Community Health and Safety</b>	<ul style="list-style-type: none"><li>■ Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work</li><li>■ Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace</li><li>■ Council Directive 89/655/EEC of 30 November 1989 concerning the minimum safety and health requirements for the use of work equipment by workers at work (amending directives 95/63/EC and 2001/45/EC)</li><li>■ Council Directive 89/656/EEC of 30 November 1989 on the minimum health and safety requirements for the use by workers of personal protective equipment at the workplace</li><li>■ Council Directive 83/477/EEC of 19 September 1983 on the protection of workers from the risks related to exposure to asbestos at work</li></ul>



### Occupational and Community Health and Safety Issues

- Council Directive 90/269/EEC of 29 May 1990 on the minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers
- Council Directive 90/270/EEC of 29 May 1990 on the minimum safety and health requirements for work with display screen equipment
- Directive 2004/37/EC of the European Parliament and of the Council of 29 April 2004 on the protection of workers from the risks related to exposure to carcinogens or mutagens at work
- Directive 2000/54/EC of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work
- Council Directive 92/57/EEC of 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites
- Council Directive 92/58/EEC of 24 June 1992 on the minimum requirements for the provision of safety and/or health signs at work
- Council Directive 92/85/EEC of 19 October 1992 on the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding
- Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres
- Directive 2002/44/EC of the European Parliament and of the Council of 25 June 2002 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration)
- Directive 2003/10/EC of the European Parliament and of the Council of 6 February 2003 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (noise)
- Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields)
- Commission Directive 2000/39/EC of 8 June 2000 establishing a first list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work
- Council Directive 80/1107/EEC of 27 November 1980 on the protection of workers from the risks related to exposure to chemical, physical and biological agents at work
- Council Directive 88/364/EEC of 9 June 1988 on the protection of workers by the banning of certain specified agents and/or certain work activities



### Occupational and Community Health and Safety Issues

	<ul style="list-style-type: none"><li>■ Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances</li></ul>
Other	<ul style="list-style-type: none"><li>■ Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment</li><li>■ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control</li><li>■ Directive 2010/75/EC of the European Parliament and of the Council of 24 November 2010 concerning industrial emissions (integrated pollution prevention and control)</li></ul>

### iii. Requirements of International Financial Institutions

International Standards (i.e. Equator Principles, IFC Performance Standards and guidelines, EBRD Performance Requirements) have been analysed by Golder and considered in the preparation of the present document.

#### 1. Requirements of Equator Principles

The Equator Principles are a set of voluntary environmental and social guidelines that have been adopted by a significant number of financial institutions influential in the project finance market (collectively the Equator Principles Financial Institutions, EPFIs). The EPs comprise a set of ten broad principles that are underpinned by the environmental and social policies, standards and guidelines.

Among other contents, the EPs endorse the environmental and social policies and guidelines of the World Bank.

The 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.

The EPFIs have ten (10) 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

In addition, the Equator Principles endorse the applicable IFC Performance Standards, IFC General EHS Guidelines and IFC Industry Specific EHS Guidelines and EBRD Performance Requirements.



### 2. EBRD Performance Requirements

The 2014 Environmental and Social Policy of the EBRD is a document which details the commitments of the agreement establishing the Bank particularly for the "promotion of environmentally sound and sustainable development".

In order to translate this objective into successful practical outcomes, the Bank has adopted a comprehensive set of specific Performance Requirements ("PRs") that clients are expected to meet, covering key areas of environmental and social impacts and issues. The Bank is committed to promoting EU environmental standards as well as the European Principles for the Environment, to which it is a signatory, which is reflected in the PR 3. The Bank expects clients to assess and manage the environmental and social issues associated with their projects so that projects meet the PRs.

The breadth, depth, and type of analysis required for Environmental Assessment ("EA") depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates potential environmental risks and impacts in the project impact zone; examines alternatives; identifies ways of selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation.

According to the EBRD's environmental and social policy, the following requirements have to be taken into consideration:

- preparation of an ESIA;
- compliance with its PRs (where applicable) including:
  - PR1 - Assessment and management of environmental and social impacts and issues
  - PR2 - Labour and working condition
  - PR3 - Resource efficiency, pollution prevention and control
  - PR4 – Health and safety
  - PR5 - Land acquisition, involuntary resettlement and economic displacement
  - PR6 - Biodiversity conservation and sustainable management of living resources
  - PR7 - Indigenous peoples
  - PR8 - Cultural heritage
  - PR9 - Financial intermediaries
  - PR10 - Information disclosure and stakeholder engagement
- adherence to the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice (Aarhus Convention) that the Project meets good international environmental practice, such that:
  - EU standards (where applicable,); and
  - World Bank Group EHS Guidelines (where EU standards do not suffice).
- Compliance to Sub-sectoral Environmental and Social Guidelines: Health Services and Clinical Waste Disposal
- Adherence to Workers' accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009

The Project should also meet ILO core Labour standards on:

- Forced Labour (C105)
- Child Labour (C182)
- Discrimination (C111)
- Freedom of Association and the Right to Organize (C 87)
- Equal Remuneration (C100)
- Minimum Age (C138).

### 3. IFC Standards and Guidelines





The World Bank - IFC has developed performance standards, policies, general environmental, health and safety guidelines, and industry-specific environmental, health and safety guidelines on social and environmental sustainability, to minimize negative environmental and social impacts of the development projects it supports, and to optimize benefits.

### a. IFC Requirements

IFC 2012 Performance Standards (IFC 2012 PS) have been considered the main reference as they are the most recent environmental and social standards issued by an International Financial Institution. IFC 2012 PS comprises 8 documents:

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

Performance Standard 1 establishes the importance of:

- Integrated assessment to identify the environmental and social impacts, risks and opportunities of projects;
- Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
- The proponent's management of environmental and social performance throughout the life of the project.

Performance Standards 2 through 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, to compensate/offset for risks and impacts to workers, Affected Communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describes potential environmental and social risks and impacts that require particular attention.

The key principles stated in the performance standards that are relevant for this methodology can be summarized as follows:

- principles of non-discrimination and equal opportunity;
- principles of non-discrimination apply to migrant workers;
- principles of pollution prevention;
- the principle of "like-for-like or better";
- principle of proportionality and good international practice;
- the holistic and ecosystem approaches;
- the participatory approach (social);



- the management and conservation principle;
- the preventive, precautionary and anticipatory principle.

### **b. IFC EHS Guidelines**

The Environmental, Health, and Safety (“EHS”) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (“GIIP”). The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

The General EHS Guidelines are organized as follows:

#### **1. Environmental**

- 1.1 Air Emissions and Ambient Air Quality
- 1.2 Energy Conservation
- 1.3 Wastewater and Ambient Water Quality
- 1.4 Water Conservation
- 1.5 Hazardous Materials Management
- 1.6 Waste Management
- 1.7 Noise
- 1.8 Contaminated Land

#### **2. Occupational Health and Safety**

- 2.1 General Facility Design and Operation
- 2.2 Communication and Training
- 2.3 Physical Hazards
- 2.4 Chemical Hazards
- 2.5 Biological Hazards
- 2.6 Radiological Hazards
- 2.7 Personal Protective Equipment (“PPE”)
- 2.8 Special Hazard Environments
- 2.9 Monitoring

#### **3. Community Health and Safety**

- 3.1 Water Quality and Availability
- 3.2 Structural Safety of Project Infrastructure
- 3.3 Life and Fire Safety (L&FS)
- 3.4 Traffic Safety
- 3.5 Transport of Hazardous Materials
- 3.6 Disease Prevention



### 3.7 Emergency Preparedness and Response

## 4. Construction and Decommissioning

### 4.1 Environment

### 4.2 Occupational Health & Safety

### 4.3 Community Health & Safety

## References and Additional Sources

Apart from general guidelines, also applicable industry sector EHS guidelines were considered. These documents are technical reference with general and industry specific examples of GIIP and include:

- IFC EHS Guidelines for Healthcare Facilities
- Workers' accommodation: processes and standards Public guidance note by IFC and the EBRD, 2009

## 4. EIB Requirements

The 2013 Environmental and Social Practices handbook of the EIB is a document which provides advice on planning and managing the environmental and social appraisal and monitoring. It describes the steps for determining the scope of the environmental and social review process throughout the project cycle that the EIB shall carry out for all projects in all regions. It also explains the role of highly specialised units or individuals who collectively ensure that the Bank's activities respond to the highest possible standards.

The EIB applies a number of core environmental and social safeguard measures that reflect international good practice to all its lending activities. It requires that all its projects:

- apply the European Principles for the Environment<sup>54</sup>, i.e. comply with EU environmental principles, standards and practices, if practical and feasible in some regions;
- comply with the EU environmental *Acquis*<sup>55</sup> on environmental assessment as defined in the EIB Sourcebook on EU Environmental Law<sup>56</sup>;
- comply with international conventions and agreements ratified by the EU;
- comply with the EU social *Acquis*<sup>57</sup> as defined in the EIB Reference Book on EU Social Legislation and through the EIB Social Guidance Notes;
- apply "Best Available Techniques", as appropriate;
- apply good environmental management practices during project implementation and operation;
- adhere to other specific international good environmental and social practices.

If the EIA is required, the EIB Environmental and Social Statement require that all projects, irrespective of location, comply with the process and content consistent with the requirements of the EU EIA Directive. Within

---

<sup>54</sup> The regional coverage of the European Principles for the Environment concerns at least the respective regions of operations of each signatory institution. For projects located in the Member States of the EU, the European Economic Area countries, the EU Candidate and potential Candidate countries, the EU approach, which is defined in the EC Treaty and the relevant secondary legislation, is the logical, uncontested and mandatory reference. The projects in this region should also comply with any obligation and standards upheld in relevant multilateral environmental agreements, such as Convention on Biological Diversity, the Espoo Convention, United Nations Framework Convention on Climate Change, etc. In all other countries, projects financed by the signatories should comply with the appropriate EU environmental principles, practices and standards, if practical and feasible, such as affordability, local environmental conditions, international good practice etc.

<sup>55</sup> The "environmental *Acquis*" is comprised of the main EU legal instruments, approximately 300 directives.

<sup>56</sup> <http://www.eib.org/attachments/strategies/sourcebook-on-eu-environmental-law.pdf>

<sup>57</sup> The "social *Acquis*" is the part of the *acquis communautaire* that includes the body of laws, principles, policy objectives, declarations, resolutions and international agreements defining the social policy of the EU.



the EU, the EIA is legally governed by the EU Directive on EIA. Outside the EU, the Bank refers to EU law as the benchmark of its EIA requirements. The EU approach is determined by the scale, nature and location of the project and the policy, institutional and socio-economic framework that is in place.

The promoter is responsible for carrying out an EIA according to national and other applicable environmental law, with reference to the EIA Directive and also the Habitats 92/43/EEC and Bird Directives 79/409/EEC, and the requirements of the Bank.

The EIB recognises the significant value of biodiversity in terms of ecological services and economic and social values and that protecting biodiversity is a key element in sustainable development: acknowledging that its projects may have a potential impact on biodiversity, the Bank has taken a balanced approach to managing its operations in order to minimise any negative impacts on biodiversity by applying the precautionary principle<sup>58</sup> and to enhance positive impacts on biodiversity and ecosystems whenever practicable, to secure favourable economic, environmental and social outcomes of its financing activities.

The Bank's approach and commitment to nature and biodiversity are grounded in the principles and practices contained in the EU Nature Conservation Policy, namely the Birds (79/409/EEC) and Habitats Directives (92/43/EEC), and in international treaties and conventions signed by the EU, such as the Convention on Biological Diversity ("CBD"), the Convention on International Trade in Endangered Species of Wild Fauna and Flora ("CITES"), the Bonn Convention on Migratory Species ("CMS") and the Ramsar Convention on Wetlands amongst others.

The environmental and social assessment should flag any potential impacts the project may have on biodiversity and these should include:

- potential impacts on protected areas and areas supporting protected species;
- impacts on other areas that are not protected but are important for biodiversity;
- activities posing a particular threat to biodiversity (in terms of their type, magnitude, location, duration, timing, reversibility);
- impact on areas that provide important biodiversity services including extractive reserves, indigenous people's territories, wetlands, fish breeding grounds, soils prone to erosion, relatively undisturbed or characteristic habitats, flood storage areas, groundwater recharge areas, etc.

The EIB will ensure that the appropriate mitigation measures have been developed to address the potential impacts on nature and biodiversity. These may include:

- restoring impacted areas with species consistent with local ecological conditions;
- offsetting biodiversity losses through the creation of ecologically comparable areas elsewhere that are managed for biodiversity;
- financial or in-kind compensation to direct users of biodiversity.

## B. Project Environmental Standards

A summary of applicable national and international environmental standards are provided below. The most stringent legislative requirement will be valid for the project.

### Water Quality

- **Domestic Wastewater Effluent Quality**

---

<sup>58</sup> The Precautionary Principle states that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (The Rio Declaration (992) and the Preamble of the Convention on Biological Diversity (1992)).



Domestic waste water will be created during construction and operation phases of the project. Domestic wastewater will be connected to sewerage system of the Municipality.

Regulation on Control of Water Pollution - Table 21.4 indicates domestic wastewater discharge standards for equivalent population higher than 100,000. However, the provisions set in Turkish Urban Wastewater Treatment Regulation, of which the discharge quality standards were valid by 31.12.2014, are exactly the same with the provisions set in EU Directive 91/271/EEC on Urban Wastewater Treatment.

**Table 74: National Domestic Wastewater Discharge Standards**

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)	Urban waste water directive 91/271/EEC
		Composite Sample 2 Hour	Composite Sample 24 Hour	Concentration (mg/L)	Concentration (mg/L)
Biochemical Oxygen Demand (BOD5)	mg/l	40	35	25	25
Chemical Oxygen Demand (COD)	mg/l	120	90	125	125
Suspended Solids (SS)	mg/l	40	25	35 35 (more than 10,000 p.e.) 60 (2,000-10,000 p.e.)	35 35 (more than 10,000 p.e.) 60 (2,000-10,000 p.e.)
pH	-	6-9	6-9	-	

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

## Air Quality

### • Ambient Air Quality

The Regulation on Assessment and Management of Air Quality 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.



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

**Table 75: Ambient Air Quality Standards**

Parameter	Average Period	Ambient Air Quality Limits of Turkish Regulation on Air Quality Assessment and Management			Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air For Europe
		Annex – IA: Transition Period Limits (*)		Annex I: Future Target Values (year for target)	
		2008	2014		
SO <sub>2</sub> (µg/m <sup>3</sup> )	Hourly	900	750	350 (2019) <i>(not to exceed over 24 in a year)</i>	350
	24 hr	400 (STL) (95% in a year)	250 (STL)	125 (2019) <i>(not to exceed over 3 in a year)</i>	125
	Yearly and winter season (Oct1 – March31) <i>(for wildlife and ecosystem)</i>	60 (LTL)	20	20 (2014)	
	Winter average (Oct1 – March31)	250	125		
	Target Limit for yearly average	60			
	Target Limit for winter average	120			
	LTL yearly	150 (LTL)			
NO <sub>2</sub> (µg/m <sup>3</sup> )	Hourly			200 (2024) <i>(not to exceed over 18 in a year)</i>	200
	Yearly	100 (LTL)	60	40 (2024)	40
	24 hr	300 (STL) (95% in a year)			





<b>NOx</b> (µg/m <sup>3</sup> )	<b>Yearly</b> (for vegetation)			30 (2014)	
<b>PM<sub>10</sub></b> (µg/m <sup>3</sup> )	<b>24 hr</b>	300 (STL) (95% in a year)	100	50 (2019) (not to exceed over 35 in a year)	50
	<b>Yearly</b>	150 (LTL)	60	40 (2019)	40
	<b>Winter average</b> (Oct1 – March31)	200	90		
<b>Settled Dust</b> (mg/m <sup>2</sup> day)	Short term				390
<b>PM<sub>2.5</sub></b> (µg/m <sup>3</sup> )	24hr				
	1 year				
<b>Lead</b> (µg/m <sup>3</sup> )	LTL – yearly (human health)	2 (LTL)	1	0.5 (2019) 1.0 (for areas in the vicinity of and contaminated by industries)	
<b>Benzene</b> (µg/m <sup>3</sup> )	Yearly			5 (2021)	
<b>CO</b> (mg/m <sup>3</sup> )	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<sub>2</sub> and PM10 winter standards are valid.

• **Emissions**

The Regulation on Control of Industrial Air Pollution 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 Vapours and Gases, Carcinogenic Substances, applicable after January 1, 2012



- Annex 12: Calculation of Non-Stack (Fugitive) Emissions Mass Flowrate

The Regulation on Control of Industrial Air Pollution - 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.

Regulation on Industrial Air Pollution Control Annex-5 A) Group 1 provides emission rules and limits for Combustion Facilities. The trigeneration plant with thermal capacity of 2.5 MWt will utilize natural gas for electricity requirements. Annex-5 A) Group I - Table 5.2 provides emission limits for gas fuel combustion facilities for heating thermal power of below 50 MWt. The emission limits are given below table.

**Table 76: Regulation on Control of Industrial Air Pollution Table 5.2. - Emission Limits for Facilities with Thermal Capacity Lower than 50 MW**

Fuel	SO <sub>2</sub> mg/Nm <sup>3</sup>	CO mg/Nm <sup>3</sup>	NO <sub>2</sub> mg/Nm <sup>3</sup>	Dust mg/Nm <sup>3</sup>
Natural gas, LPG, refinery gas	100	100	800	10

### 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 77: 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 78: Turkish Ambient Noise Limits Generated by Construction Sites**

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

### Soil Quality



The assessment of soil quality in Turkey is based on the “Regulation on Soil Pollution Control and Point Source Contaminated Sites” (“Soil Regulation” or “Regulation”) 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 are effective as of 08 June 2015.

The Regulation states that, all the facilities/activities that are listed in the Annex 2 - Table 2 of the regulation, should submit the online Activity Preliminary Information Sheet to the MoEU. The facility/activity owners have to also submit a signed, hardcopy version of the form to the Provincial Directorate of the MoEU. The Provincial Directorate is responsible for submitting the approved form to the MoEU.

The Activity Preliminary Information Sheet is presented in Annex 3 of the Regulation.

The hospital project is included in the list of Annex-2 (NACE Code: 8610, hospital services).

The process described in the Regulation is as follows:

### *“CHAPTER III*

#### *Information System and Information Sheets*

##### *Obligation to Arrange Activity Preliminary Information Sheet*

*ARTICLE 8: (1) Existing activity owners who execute activities given in Annex 2 Table 2 and new activity owners shall fill the Activity Preliminary Information Sheet given in Annex 3 according to Polluted Fields Information System and submit to provincial directorate.*

*(2) Provincial Directorate shall control Activity Preliminary Information Sheets and approves on the Polluted Fields Information System.*

*(3) Activity owner is obliged to submit this form to provincial directorate in written and signed format, as well.*

*(4) Provincial Directorate is obliged to submit approved Activity Preliminary Information Sheets to the Ministry in written and signed format.*

*(5) Ministry shall add these statements into Potentially Polluted Fields List.”*

The Provincial Directorate of the MoEU would assess the Activity Preliminary Information Sheet and decide whether the facility should be included in the Potentially Polluted Sites List or not. The criteria for the assessment of the Activity Preliminary Information Sheet are presented in Annex 4 of the Regulation. In case one of the assessment criteria is valid for the facility, then the facility would be included in the Potentially Polluted Sites List. The criteria in Annex 4 are presented as follows:

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

- 1) Presence of hazardous chemicals at the facility of the storage type of any of the hazardous chemicals,
  - a) For storage:
    - Lack of ground isolation, or
    - Use of open areas without drainage system.
  - b) For above ground tanks:
    - Lack of leakage control , or
    - Lack of leakage control from the pipes, or
    - Lack of ground isolation.
  - c) For underground tanks:
    - Tanks are single-walled, or
    - Tanks were installed 10 or more years ago, or
    - Lack of leakage control, or



- Lack of leakage control from the pipes, or
  - Lack of corrosion protection or cathodic protection.
- 2) Occurrence of industrial accidents at the facility site.
  - 3) Temporary storage of hazardous waste at the facility site; and
    - a) If any of the stored wastes is marked by (A) per the Regulation on General Principals of Waste Management Annex-IV Waste List, or
    - b) Lack of impermeable ground at the temporary waste storage area, or
    - c) Lack of drainage system around the temporary waste storage area.
  - 4) When a treatment plant is available for the industrial wastewater,
    - a) Temporary storage of the sludge at the facility site, or
    - b) Discharge of treated waste water to a property.

When a facility is added to the Potentially Polluted Sites List, based on the abovementioned assessment criteria, an audit would be conducted by the Provincial Directorate of the MoEU as outlined in the Regulation.

If an industrial accident or an industrial accident due to a natural hazard occurs, the accident would be reported in accordance with the Declaration Form presented in Annex 5 of the Regulation and the facility would be included in the Potentially Polluted Sites List.

According to the Regulation, once the site is added into the list of “Potentially Polluted Sites List”, 1st Stage Investigation is requested by the MoEU as outlined in the Regulation and its Guidance documents. This may be followed by 2nd Stage Investigation, Risk Assessment and potentially by Clean-Up/Remediation all outlined and regulated by the provisions of the Soil regulation.

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 Annex-IV Waste List. Thus, the Project Site may potentially be identified as a “Potentially Polluted Site” by the MoEU.

If the source of the pollution is unknown, however an indication of pollution is identified; samples would be collected and analysed for generic pollution indicator parameters, identified for each industrial activity based on the NACE code of the facility. The generic pollution indicator parameters for each industrial activity based on the NACE code of the facility is presented in Annex 2, Table 2 of the Regulation and the limits for the generic pollution indicator parameters are presented in Annex 1 of the Regulation.

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 79: 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)	
					DF=10 (dilution factor*)	DF=1 (dilution factor*)
Lead	7439-92-1	400			135	14
Barium	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
Cadmium	7440-43-9	70		1124	27	3
Tin	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

\* If the distance to the aquifer is less than 3m, the aquifer is fractured or karstic or the area of the pollutant source is equal to or larger than 10 hectares, DF:1, otherwise DF:10.





# APPENDIX L

## Data Collected From Site



1. Geology and Geomorphology

Table 80: The lithology obtained from borehole logs

Borehole No	Borehole Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
BH-1	55.00	194	0.00-0.50	TOP SOIL
			0.00-55.00	ANDESITE, Grey- locally brown-reddish coloured, mostly medium strength, moderately- highly weathered, locally in the form of Agglomerate and presence of tuff levels
BH-5	47.00	190	0.00-1.00	FILL MATERIAL
			1.00-8.40	ANDESITE Bordeaux-grey-red coloured, locally presence of Agglomerate and Tuff transition
			8.40-12.00	AGGLOMERATE Brown-reddish coloured, presence of tuff in small quantities
			12.00-16.00	TUFF Brown, locally presence of Andesite interlayer
			16.00-32.50	ANDESITE Grey-bordeaux coloured, mostly has medium strength, moderately-highly weathered
			32.50-44.50	AGGLOMERATE Grey-brown-reddish coloured, presence of Tuff and Andesite transition,
			44.50-47.00	ANDESITE Grey coloured, transition of tuff
BH-13	38.00	179	0.00-38.00	ANDESITE / AGGLOMERATE Grey-brown-bordeaux-reddish coloured, locally in the form of Agglomerate, tuff cemented in between 11,00-12,00 and 20,00-21,00 meters
BH-16	32.70	172	0.00-.025	FILL MATERIAL
			0.25-9.00	ANDESITE Grey-light brown coloured, slightly-moderately weathered,
			9.00-20.00	AGGLOMERATE Dark green-brown coloured, locally presence of andesite transition and tuff interlayer



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Borehole No	Borehole Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
			20.00-32.70	ANDESITE Grey-bordeaux-brown coloured, locally presence of agglomerate transition, agglomerates are tuff cemented
BH-20	32.80	171	0.00-0.40	FILL MATERIAL-DEBRIS
			0.40-32.80	ANDESITE / AGGLOMERATE Grey- locally brown-reddish brown, mostly close-locally crushed- moderate fractures, medium- weak- locally strong- very weak strength, moderately - highly - locally completely weathered, locally has an appearance of Agglomerate and Breccia, discontinuities; 5°, 15°, 30°, 45°, 60°, 80°, 90°, open, matte, rough, with clay fillings
BH-39	52.00	223	0.00-1.50	TUFF Brownish-greyish, with small quantities of fine-medium sized gravels
			1.50-5.00	ANDESITE / AGGLOMERATE Grey coloured
			5.00-7.50	TUFF Brown-reddish coloured
			7.50-9.00	ANDESITE Grey coloured, locally in the form of Agglomerate
			9.00-12.00	TUFF Brown-reddish coloured, with small quantities of fine-medium sized gravels
			12.00-25.50	AGGLOMERATE Grey-brown-reddish coloured, with Andesite boulders, locally Tuff cemented
			25.50-32.50	TUFF Brown-grey-yellowish coloured, mostly weak-medium strength
			32.50-52.00	AGGLOMERATE Brown-grey- dark green coloured, presence of tuff interlayer, locally presence of andesite levels



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Borehole No	Borehole Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
BH-41	35.00	206	0.00-35.00	AGGLOMERATE Brown, tuff cemented, moderate-wide- locally crushed fractures, weak- very weak strength; highly- completely weathered, locally moderately weathered, discontinuities cannot be observed. *Tuff level was observed after 34.30 m
			0.00-1.50	DEBRIS
BH-47	48.00	210	1.50-48.00	ANDESITE Grey-locally brown-reddish brown, mostly close- locally crushed- moderate fractures, medium-weak- locally strong- very weak strength, moderately- highly- locally completely weathered, locally Agglomerate-Breccia with Tuff and Clay matrix were observed, Discontinuities; 5°, 15°, 30°, 45°, 60°, 80°, 90°, Open, matte, rough, with clay filling, 90° closed, 1-2 mm Clay filling
			0.00-22.20	ANDESITE Grey- locally brown- reddish brown, wide- close- locally moderate- crushed fractures, medium- weak- locally strong- very weak strength, slightly-moderately weathered, locally in the appearance of Agglomerate-Breccia, Discontinuities; 5°, 15°, 30°, 45°, 60°, 80°, 90°, Open, matte, rough, with clay filling
BH-50	34.00	201	22.20-34.00	TUFF Light brown, mostly wide-locally close fractures, medium strength, slightly weathered, Discontinuities; 5°, 30°, 45°, 80°, Open, matte, rough, (highly-completely weathered after 29.15 m)
			0.00-0.40	TOPSOIL
BH-51	51.40	180	0.40-1.50	DEBRIS Andesite originated
			1.50-51.40	ANDESITE Some levels are in the form of Agglomerate, Grey coloured-pinkish grey, slightly- locally moderately weathered, very poor-poor- fair RQD, mostly close-intense- locally crushed fractures, (Possible Agglomerate levels; brownish in between 3.90-4.30 m, 5.20-5.50 m,9.50-10.00 m, 14.80-15.30 m,16.00-19.50 m)
			0.00-0.40	TOPSOIL



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Borehole No	Borehole Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
BH-53	46.50	183	0.00-46.50	ANDESITE Grey-locally reddish brown, mostly close-locally intense-moderate and crushed fractures, medium-weak strength, slightly-moderately- locally highly weathered, locally with tuff matrix, in the appearance of Agglomerate and Breccia, Discontinuities; 5°, 15°, 30°, 45°, 60°, 80°, 90°, Open, matte, rough, with clay filling, 45°, 90° closed, clay fillings; 1-2 mm thick
			0.00-1.00	DEBRIS
BH-55	55.00	189	1.00-55.00	ANDESITE Grey- locally brown- reddish brown, mostly close- locally intense- crushed fractures, moderate-wide fractures, medium- weak strength- locally strong, moderately- highly weathered, locally tuff cemented Agglomerate and Breccia are observed, Discontinuities; 5°, 15°, 30°, 45°, 60°, 80°, 90°, Open, matte, rough, with clay filling
			0.00-10.50	ANDESITE Grey-bordeaux-brown, slightly-moderately weathered, mostly strong
BH-66	46.50	179	10.50-12.00	TUFF Brown-greyish coloured
			12.00-18.00	ANDESITE Grey, medium strength, locally intense and crushed fractures
			18.00-34.00	TUFF Brown-greyish coloured, mostly medium-weak strength
			34.00-46.50	ANDESITE Grey-bordeaux-brown, locally tuff cemented
			0.00-0.40	TOPSOIL
BH-68	37.00	167	0.40-1.50	DEBRIS Waste material
			1.50-10.00	AGGLOMERATE / ANDESITE With alternation, intercalated, Agglomerate; cementing material tuff; brownish coloured, Andesite are; greyish, Agglomerates; locally highly weathered, mostly medium-weak strength, intense- crushed fractures, very weak RQD



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Borehole No	Borehole Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
			10.00-37.00	ANDESITE Greyish-pinkish grey coloured, locally with transition of agglomerate, agglomerate levels are locally highly weathered, close- intense- crushed fractures, mostly; very poor- poor RQD, medium strength, mostly slightly-moderately weathered, locally highly weathered, (highly weathered parts are mostly agglomerate levels)
BH-73	53.00	180	0.00-1.00	DEBRIS-FILL MATERIAL
			1.00-53.00	ANDESITE Grey- locally brown-reddish brown, mostly intense- locally close- moderate fractures, medium-weak strength-strong, moderately-highly weathered, locally Tuff cemented Agglomerate-Breccia are observed, Tuff interlayered between 12.20-13.00 m, Discontinuities; 5°, 15°, 30°, 45°, 60°, 80°, 90°, open, matte, rough, with clay filling
BH-75	39.50	166	0.00-0.50	FILL MATERIAL
			0.50-1.50	WEATHERED AGGLOMERATE
			1.50-3.00	AGGLOMERATE Brown-reddish coloured, andesite particles compacted with tuff
			3.00-8.00	ANDESITE Grey-bordeaux coloured, locally in the form of agglomerate
			8.00-16.00	AGGLOMERATE Brown-reddish coloured, with andesite particles compacted with tuff (Andesite level in between 12.70-13.70 m)
			16.00-25.00	ANDESITE Grey-bordeaux coloured, locally with agglomerate transition, locally with tuff interlayer
			25.00-39.50	AGGLOMERATE Brown-reddish coloured, locally with Andesite and Tuff transition
BH-78	38.00	168	0.00-38.00	ANDESITE Grey- locally reddish brown, mostly close- locally wide- moderate and crushed fractures, medium-weak strength, slightly-moderately- locally highly weathered, locally Agglomerate-Breccia with tuff matrix are





## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Borehole No	Borehole Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
				observed, presence of Tuff interlayer in between 28.60 m-29.00 m, Discontinuities; 5°, 15°, 30°, 45°, 60°, 80°, 90°, open, matte, rough, with clay filling
BH-80	46.00	173	0.00-0.50	TOP SOIL
			0.50-5.50	FILL MATERIAL With sand, gravel, debris and rock blocks
			5.50-10.50	ANDESITE Grey-bordeaux-light brown
			10.50-36.50	AGGLOMERATE Brown-reddish coloured, andesite particles compacted with tuff, locally with andesite transition
			36.50-46.00	ANDESITE Grey-bordeaux-light brown, locally in the form of agglomerate
BH-82	45.00	178	0.00-0.50	FILL MATERIAL
			0.50-2.50	TUFF Brown-greyish coloured, with little amount of fine-medium gravels
			2.50-27.50	AGGLOMERATE Brown-dark green-reddish coloured, fine-medium sized grains, grey coloured Andesite levels are observed
			27.50-31.50	TUFF Brown-reddish coloured
			31.50-45.00	ANDESITE Grey coloured, locally in the form of agglomerate and with tuff interlayers

**Table 81: The lithology obtained from bore test pit logs**

Test Pit No	Test Pit Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
TP-1	1.40	190.5	0.00-0.30	TOP SOIL



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Test Pit No	Test Pit Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
			0.30-1.40	ANDESITE Grey - pinkish coloured
TP-2	1.60	187.60	0.00-0.40	TOP SOIL
			0.40-1.60	ANDESITE Grey - pinkish coloured
TP-3	1.50	181.50	0.00-0.30	TOP SOIL
			0.30-1.50	ANDESITE Locally presence of Tuff layers Grey-brown
TP-4	1.40	175.50	0.00-0.30	TOP SOIL
			0.30-1.40	ANDESITE Grey coloured
TP-5	1.60	175.00	0.00-0.30	TOP SOIL
			0.30-1.60	ANDESITE Grey - pinkish coloured
TP-6	1.50	209.50	0.00-0.30	TOP SOIL
			0.30-1.50	ANDESITE Locally presence of Tuff interlayers Grey-brown
TP-7	1.80	201.50	0.00-0.40	TOP SOIL
			0.40-1.80	ANDESITE Grey-beige coloured, locally presence of Tuff interlayers
TP-8	1.50	177.00	0.00-0.30	TOP SOIL
			0.30-1.50	WEATHERED ANDESITE presence of Tuff interlayers, Grey-yellowish coloured
TP-9	1.50	168.90	0.00-0.25	TOP SOIL
			0.25-1.50	TUFF-WEATHERED TUFF Yellowish-brown coloured



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Test Pit No	Test Pit Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
TP-10	1.50	201.00	0.00-0.20	TOP SOIL
			0.20-0.60	WEATHERED ANDESITE Grey coloured
			0.60-1.50	ANDESITE Grey-blackish coloured
TP-11	1.40	223.00	0.00-0.20	TOP SOIL
			0.20-1.40	ANDESITE Grey coloured
TP-12	1.50	199.00	0.00-0.40	TOP SOIL
			0.40-1.50	TUFF Yellowish-brown coloured, weak strength
TP-13	1.40	213.90	0.00-0.20	TOP SOIL
			0.20-1.40	ANDESITE Grey coloured
TP-14	1.40	214.00	0.00-0.15	TOP SOIL
			0.15-1.40	ANDESITE Grey coloured
TP-15	1.50	200.50	0.00-0.30	TOP SOIL
			0.30-1.50	ANDESITE Grey-dark Grey coloured
TP-16	1.50	177.50	0.00-0.35	TOP SOIL
			0.35-1.50	TUFF Yellowish-brown
TP-17	1.50	186.50	0.00-0.20	TOP SOIL
			0.20-1.50	ANDESITE / WEATHERED ANDESITE Grey coloured



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Test Pit No	Test Pit Depth (m)	Elevation (m)	Depths (m)	Formations-Lithology
TP-18	1.40	175.50	0.00-0.20	TOP SOIL
			0.20-1.40	ANDESITE Grey coloured
TP-19	1.50	165.50	0.00-0.40	TOP SOIL
			0.40-1.50	TUFF-AGGLOMERATE Yellowish-brown
TP-20	3.30	176.10	0.00-1.40	FILL Block-gravel
			1.40-3.30	ANDESITE-WEATHERED ANDESITE (Completely Weathered), Grey-bluish coloured
TP-21	1.50	152.50	0.00-0.30	TOP SOIL
			0.30-1.50	ANDESITE Presence of Tuff interlayers Grey-yellowish coloured
TP-22	1.50	145.50	0.00-0.40	TOP SOIL
			0.40-1.50	ANDESITE Grey-pinkish coloured, locally presence of Tuff interlayers
TP-23	1.60	140.10	0.00-0.40	TOP SOIL
			0.40-1.60	ANDESITE Grey coloured



2. Soil

No visual indications of contamination or potential contamination sources were observed at the Project Area during the site visit conducted on 2 - 3 February 2015. In the light of this observation, in order to describe the baseline soil quality, 4 soil samples (and 1 duplicate sample for QA/QC) were collected from the topsoil layer (upper 30 cm) during the site visit. The soil sampling locations and the relevant sample information (coordinates, names, sampling date and time) are given in the table below.

Table 82: Soil Sampling Locations

Sampling ID	Coordinates (UTM ED50)			Date	Time
	Zone	Easting	Northing		
TZ-1	35	515860	4259848	02.02.2015	12:05
TZ-2	35	516033	4259800	02.02.2015	13:05
TZ-3	35	515483	4259823	02.02.2015	13:45
TZ-4	35	515048	4259553	02.02.2015	14:15
TZ-5 (duplicate of TZ-4)	35	515048	4259553	02.02.2015	14:45

The assessment of soil in Turkey is based on the “Regulation on Soil Pollution Control and Point Source Contaminated Sites“ (“Soil Regulation”) 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 became effective as of 08 June 2015.

The activities within the Site would be covered by Annex 2, Table 2 of the Soil Regulation as below table.:

Table 83: The activity specific contamination indicator parameters

NACE Code	Industrial Activity	Activity specific contamination indicator parameters
8610	Hospital Services	TOX, TPH, Ag, As, Ba, Bi, Cd, Cr, Cu, Hg, Mo, Pb, Pt, Sb, Se, Sn, Zn

The list of analytical parameters that need to be analysed in the samples, per the regulation, is referred to as “the activity-specific contamination indicator parameters”. Activity-specific contamination indicator parameters for the Project Area listed in the above table are: Total Organic Halogens (TOX), Total Petroleum Hydrocarbons (TPH), Silver (Ag), Arsenic (As), Barium (Ba), Bismuth (Bi), Cadmium (Cd), Chromium (Cr), Copper (Cu), Mercury (Hg), Molybdenum (Mo), Lead (Pb), Platinum (Pt), Antimony (Sb), Selenium (Se), Tin (Sn), Zinc (Zn).

The map showing the study area and the soil sampling locations are given in Figure 58.



# ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

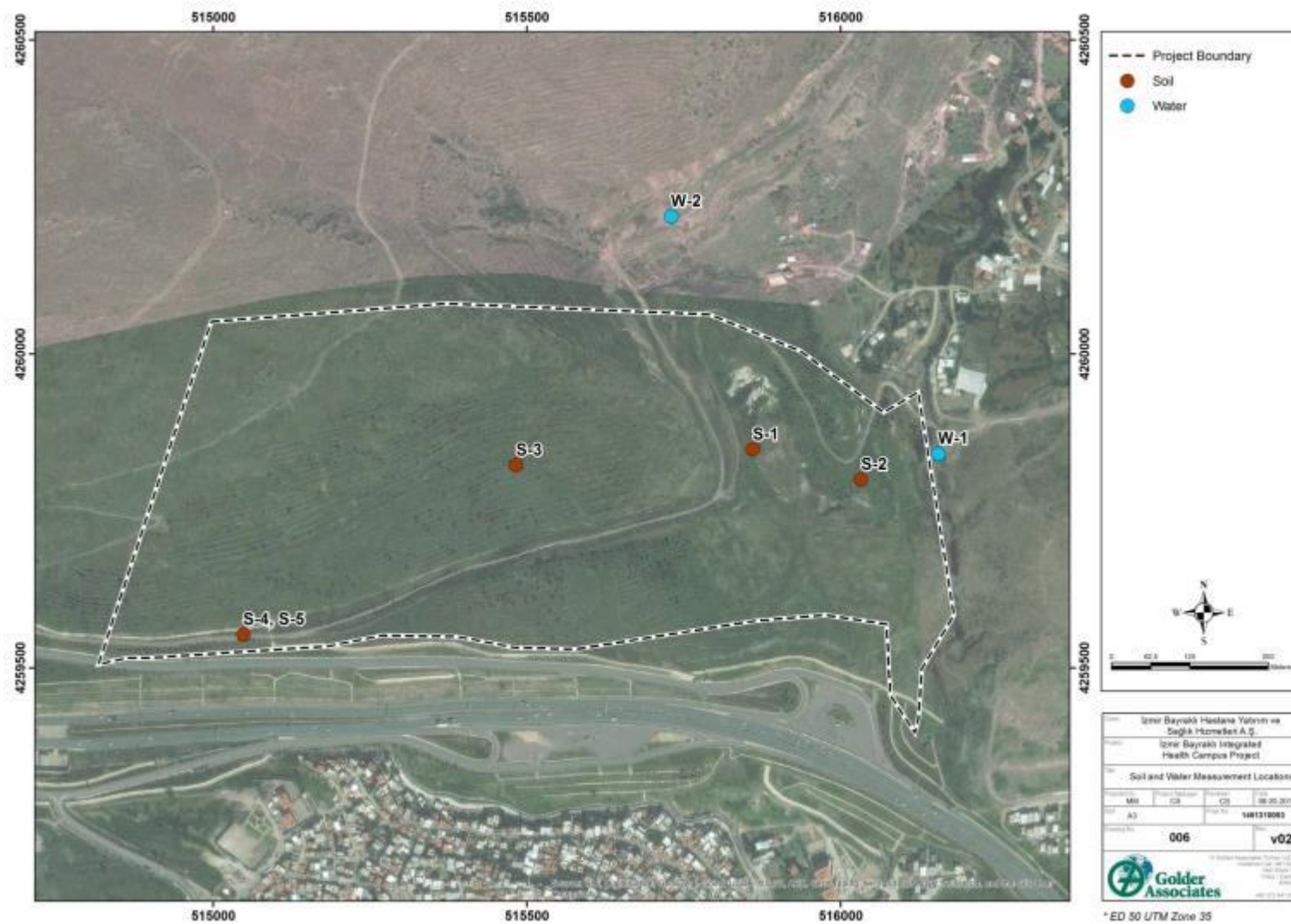


Figure 56: Soil and Surface Water Sampling Locations





The four soil samples and one duplicate sample collected were sent to “Segal Çevre Ölçüm ve Analiz Laboratuvar” which is accredited by TURKAK for analyses and were analysed in accordance with the Turkish legislation.

As the samples were collected from the top soil, in accordance with the Soil Regulation and its Guidance Documents, the results were compared with the generic pollutant limit values listed in ANNEX 1: List of Generic Pollutant Limit Values, column “Ingestion of soil or dermal contact” and “Outdoor inhalation of fugitive dust”.

The Generic Pollutant Limit Values have the following description in the Soil Regulation: “Generic Pollutant Limit Value (GPLV): Refers to the Limit Value for a Pollutant, given in Annex 1 Generic Pollutant Limit Values List, calculated or determined by considering that intended use of the polluted area is or will be residential area and that it will pose risks on human health, and by assuming that humans are exposed to the pollutant at maximum level for a reasonable period.”

The comparison of the soil chemical analysis results to the Turkish Regulatory Limits is presented in Table 76, below. The results exceeding the limit values in the column “Ingestion of soil or dermal contact” are indicated in red while the results exceeding the limit values are shown in the column “Outdoor inhalation of fugitive dust” are indicated in blue:

**Table 84: Comparison of the soil chemical analysis results with the Generic Pollutant Limit Values**

Parameter	Unit	Ingestion of soil or dermal contact (mg/kg oven dry soil)	Outdoor inhalation of fugitive dust (mg/kg oven dry soil)	TZ-1	TZ-2	TZ-3	TZ-4	TZ-5 (Duplicate of TZ-4)
Antimony	mg/kg	31	-	<1.25	<1.25	<1.25	<1.25	<1.25
Arsenic	mg/kg	0.4	471	13	9	<1.25	3.75	2.48
Copper	mg/kg	3129	-	19.75	28.75	5.75	8.75	8.5
Barium	mg/kg	15643	433702	120.5	78.5	65.25	182.5	244.75
Mercury	mg/kg	23	-	<0.25	<0.25	<0.25	<0.25	<0.25
Zinc	mg/kg	23464	-	97	164	15.75	25.5	29.25
Silver	mg/kg	391	-	<5	<5	<5	<5	<5
Cadmium	mg/kg	70	1124	<0.25	<0.25	<0.25	<0.25	<0.25
Tin	mg/kg	46929	-	<1.25	<1.25	<1.25	<1.25	<1.25
Chromium	mg/kg	235	24	38.5	32.25	5.25	18.25	23.5
Lead	mg/kg	400	-	34.75	22	2.5	14.25	12.25
Molybdenum	mg/kg	391	-	<2.5	<2.5	<2.5	<2.5	<2.5
Selenium	mg/kg	391	-	<1.25	<1.25	<1.25	<1.25	<1.25
TPH	mg/kg	-	-	209.73	10.97	28.07	15.49	25.32
TOX	mg/kg	-	-	229.4	214.37	129.47	159.09	128.11

### 3. Surface Water Quality

In order to describe the baseline surface quality, 2 surface water samples were collected from the Laka Creek and the artificial pond during the site visit conducted on 2 - 3 February 2015. The surface water sampling locations and the relevant sample information (coordinates, names, sampling date and time) are given in Table 77



**Table 85: Surface Water Sampling Locations**

Sampling ID	Surface Water Name	Coordinates (UTM ED50)			Sampling Date	Time
		Zone	Easting	Northing		
SZ-1	Laka Creek	35	516156	4259841	03.02.2015	11:45
SZ-2	Artificial Pond	35	515730	4260219	03.02.2015	12:15

The assessment of surface water in Turkey is based on the “Regulation on Surface Water Quality” originally published in the Official Gazette number 28483, dated 30 November 2012 and amended in the Official Gazette number 29327, dated 15 April 2015. Table 5 in the Appendix 5 of the Regulation on Surface Water Quality gives the limit concentration values for the water quality classes. The summary of the definitions of the classes are given below. The results of the analyses were compared with the values stated in the Regulation on Surface Water Quality and are given in the Table 78.

**Table 86: Surface Water Quality**

Water Quality Parameters	Water Quality Classes				Samples	
	I	II	III	IV	SZ-1	SZ-2
<b>General Condition</b>						
Temperature (°C)	≤ 25	≤ 25	≤ 30	> 30	25	25
Colour (m <sup>-1</sup> )	RES 436 nm: ≤ 1.5	RES 436 nm: 3	RES 436 nm: 4.3	RES 436 nm: >4.3	1.3	1.7
	RES 525 nm: ≤ 1.2	RES 525 nm: 2.4	RES 525 nm: 3.7	RES 525 nm: >3.7	0.5	0.7
	RES 620 nm: ≤ 0.8	RES 620 nm: 1.7	RES 620 nm: 2.5	RES 620 nm: >2.5	0.2	0.3
pH	6.5-8.5	6.5-8.5	6.0-9.0	< 6.0 or > 9.0	7.94	7.90
Electrical Conductivity (µS/cm)	< 400	1000	3000	> 3000	226	166
<b>(A) Oxidation Parameters</b>						
Oxygen Saturation (%)	>90	70	40	< 40	111	112
Dissolved Oxygen (mg O <sub>2</sub> /L)	> 8	6	3	< 3	10.1	10.1
Chemical Oxygen Demand (COD) (mg/L)	< 25	50	70	> 70	20.0	21.0
Biochemical Oxygen Demand (BOD) (mg/L)	< 4	8	20	> 20	<1.0	1.6
<b>B) Nutrient Parameters</b>						
Ammonia as N (mg NH <sub>4</sub> <sup>+</sup> -N/L)	< 0.2	1	2	> 2	0.093	<0.040
Nitrate as N (mg NO <sub>3</sub> <sup>-</sup> -N/L)	< 5	10	20	> 20	1.5	<0.060
Nitrite as N (mg NO <sub>2</sub> <sup>-</sup> -N/L)	< 0.01	0.06	0.12	> 0.3	0.0294	<0.0020
Total Kjeldahl Nitrogen as N (mg N/L)	< 0.5	1.5	5	> 5	1.00	1.00



Water Quality Parameters	Water Quality Classes				Samples	
	I	II	III	IV	SZ-1	SZ-2
Phosphorus (mg P/L)	< 0.03	0.16	0.65	> 0.65	0.464	0.023
<b>C) Trace Elements (Metals) and Inorganic Contamination Parameters</b>						
Aluminium (mg Al/L)	≤ 0.3	≤ 0.3	1	> 1	0.143	0.394
Arsenic (µg As/L)	≤ 20	50	100	> 100	<5.0	<5.0
Copper (µg Cu/L)	≤ 20	50	200	> 200	1.2	1.1
Barium (µg Ba/L)	≤ 1000	2000	2000	> 2000	43.9	37.0
Boron (µg B/L)	≤ 1000	≤ 1000	≤ 1000	> 1000	210	<10
Mercury (µg Hg/L)	≤ 0.1	0.5	2	> 2	<0.010	<0.010
Zinc (µg Zn/L)	≤ 200	500	2000	> 2000	<2.0	<2.0
Iron (µg Fe/L)	≤ 300	1000	5000	> 5000	102	253
Cadmium (µg Cd/L)	≤ 2	5	7	> 7	<0.40	<0.40
Cobalt (µg Co/L)	≤ 10	20	200	> 200	<2.0	<2.0
Chromium (µg Cr/L)	≤ 20	50	200	> 200	<1.0	<1.0
Lead (µg Pb/L)	≤ 10	20	50	> 50	<5.0	<5.0
Manganese (µg Mn/L)	≤ 100	500	3000	> 3000	20.4	18.2
Nickel (µg Ni/L)	≤ 20	50	200	> 200	2.3	<2.0
Selenium (µg Se/L)	≤ 10	≤ 10	20	> 20	<10.0	<10.0
<b>D) Bacteriological Parameters</b>						
Fecal Coliform	10	200	2000	> 2000	5800	119
Total Coliform	≤100	20000	100000	> 100000	5800	679

4. Air Quality and Noise

Table 87: PM<sub>10</sub>, Settled Dust and SO<sub>2</sub>&NO<sub>2</sub> Measurement Summary

Measurement No:	Measurement Location (UTM ED-50, X, Y)	Measurement Date	Measurement Results	Turkish Limit Value*	IFC, WHO Limit Value**
PM10-1 (µg/m <sup>3</sup> )	515776 – 4259578	18.02.2015-19.02.2015	18,1	90	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
PM10-2 (µg/m <sup>3</sup> )	515944 – 4259834	18.02.2015-19.02.2015	18,8		
PM10-3 (µg/m <sup>3</sup> )	516256 – 4259149	18.02.2015-19.02.2015	19,2		
PM10-4 (µg/m <sup>3</sup> )	514970 – 4259113	18.02.2015-19.02.2015	19,1		
SD-1 (mg/m <sup>2</sup> -day)	515776 – 4259578	18.02.2015-18.03.2015	61,17	390	-
		18.03.2015-18.04.2015	62,3		
SD-2 (mg/m <sup>2</sup> -day)	515944 – 4259834	18.02.2015-18.03.2015	62		
		18.03.2015-18.04.2015	65,56		
SD-3 (mg/m <sup>2</sup> -day)	516256 – 4259149	18.02.2015-18.03.2015	51,3		
		18.03.2015-18.04.2015	51,52		
SD-4 (mg/m <sup>2</sup> -day)	514970 – 4259113	18.02.2015-18.03.2015	NR***		
		18.03.2015-18.04.2015	NR		



## ENVIRONMENTAL AND SOCIAL ASSESSMENT-FINAL

Measurement No:	Measurement Location (UTM ED-50, X, Y)	Measurement Date	Measurement Results	Turkish Limit Value*	IFC, WHO Limit Value**
P-1 (µg/m <sup>3</sup> )	515776 – 4259578	18.02.2015-18.03.2015	(SO <sub>2</sub> : 2.74), (NO <sub>2</sub> : 23.45)	(SO <sub>2</sub> : 20), (NO <sub>2</sub> : 40)	(SO <sub>2</sub> : 20), (NO <sub>2</sub> : 40)
		18.03.2015-18.04.2015	(SO <sub>2</sub> : 1.54), (NO <sub>2</sub> : 21.44)		
P-2 (µg/m <sup>3</sup> )	515944 – 4259834	18.02.2015-18.03.2015	(SO <sub>2</sub> : 2.68), (NO <sub>2</sub> : 49.44)		
		18.03.2015-18.04.2015	(SO <sub>2</sub> : <1.46), (NO <sub>2</sub> : 36.69)		
P-3 (µg/m <sup>3</sup> )	516256 – 4259149	18.02.2015-18.03.2015	(SO <sub>2</sub> : 2.19), (NO <sub>2</sub> : 46.07)		
		18.03.2015-18.04.2015	(SO <sub>2</sub> : <1.46), (NO <sub>2</sub> : 34.19)		
P-4 (µg/m <sup>3</sup> )	514970 – 4259113	18.02.2015-18.03.2015	(SO <sub>2</sub> : NR), (NO <sub>2</sub> : NR)		
		18.03.2015-18.04.2015	(SO <sub>2</sub> : 1.83), (NO <sub>2</sub> : 17.62)		
P-5 (µg/m <sup>3</sup> )	514675 – 4259070	15.03.2015-15.04.2015	(SO <sub>2</sub> : 2.5), (NO <sub>2</sub> : 26.68)		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 1.62), (NO <sub>2</sub> : 39.7)		
P-6 (µg/m <sup>3</sup> )	514746 – 4259474	15.03.2015-15.04.2015	(SO <sub>2</sub> : 160.67****), (NO <sub>2</sub> : 37.67)		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 2.62), (NO <sub>2</sub> : 40.8)		
P-7 (µg/m <sup>3</sup> )	515272 – 4259911	15.03.2015-15.04.2015	NR		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 2.23), (NO <sub>2</sub> : 21.89)		
P-8 (µg/m <sup>3</sup> )	516150 – 4259716	15.03.2015-15.04.2015	(SO <sub>2</sub> : 1.8), (NO <sub>2</sub> : 16.5)		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 1.69), (NO <sub>2</sub> : 18.84)		
P-9 (µg/m <sup>3</sup> )	515909 – 4259042	15.03.2015-15.04.2015	NR		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 2.1), (NO <sub>2</sub> : 29.73)		
P-10 (µg/m <sup>3</sup> )	516210 – 4259146	15.03.2015-15.04.2015	(SO <sub>2</sub> : <1.46), (NO <sub>2</sub> : 14.27)		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 2.54), (NO <sub>2</sub> : 20.69)		
P-11 (µg/m <sup>3</sup> )	515235 – 4259159	15.03.2015-15.04.2015	(SO <sub>2</sub> : 1.59), (NO <sub>2</sub> : 15.7)		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 2.35), (NO <sub>2</sub> : 17.6)		
P-12 (µg/m <sup>3</sup> )	516450 – 4259336	15.03.2015-15.04.2015	(SO <sub>2</sub> : <1.46), (NO <sub>2</sub> : 10.88)		
		15.04.2015-15.05.2015	(SO <sub>2</sub> : 2.27), (NO <sub>2</sub> : 31.14)		

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

\*\*World Health Organization, (WHO), IFC Environmental Health and Safety Guidelines

\*\*\*No Result

\*\*\*\*Human Interference



**Table 88: Background Noise Levels Observed at 15 Minutes Measurement Points**

Point No.	Date	Leq (Total A) dB	Duration
N(15)-1	February 01 <sup>st</sup> , 2015	67.0	15 minutes (18:45 – 19:00)
N(15)-2	February 02 <sup>nd</sup> , 2015	50.1	15 minutes (12:00 – 12:15)
N(15)-3	February 02 <sup>nd</sup> , 2015	52.8	15 minutes (12:30 – 12:35)
N(15)-4	February 02 <sup>nd</sup> , 2015	45.2	15 minutes (13:05 – 13:20)
N(15)-5	February 02 <sup>nd</sup> , 2015	51.0	15 minutes (13:35 – 13:50)
N(15)-6	February 02 <sup>nd</sup> , 2015	52.6	15 minutes (14:05 – 14:20)
N(15)-7	February 02 <sup>nd</sup> , 2015	56.0	15 minutes (14:50 – 15:05)
N(15)-8	February 03 <sup>rd</sup> , 2015	45.5	15 minutes (11:40 – 11:55)

**Table 89: Background Noise Levels Observed at 24 Hours Measurement Points**

Point No.	Date	Leq (Total A) dB					Duration
		L <sub>day</sub> * (09:00 - 17:00)	L <sub>evening</sub> * (17:00 - 23:00)	L <sub>night</sub> * (23:00 - 09:00)	L <sub>day</sub> ** (07:00 - 22:00)	L <sub>night</sub> ** (22:00 - 07:00)	
N(24)-1	February 18 <sup>th</sup> -19 <sup>th</sup> , 2015	64.3	67.3	62.9	65.0	63.5	24 hours (16:46 – 16:45)
N(24)-2	February 18 <sup>th</sup> -19 <sup>th</sup> , 2015	65.1	64.7	62.7	65.0	62.2	24 hours (15:24 – 15:23)
N(24)-3	February 18 <sup>th</sup> -19 <sup>th</sup> , 2015	71.7	70.0	68.6	71.1	68.1	24 hours (17:14 – 17:13)
N(24)-4	February 18 <sup>th</sup> -19 <sup>th</sup> , 2015	67.5	68.9	66.7	67.4	67.7	24 hours (18:12 – 18:11)

\*Time durations for L<sub>day</sub>, L<sub>evening</sub> and L<sub>night</sub> are described in Turkish Regulation on Assessment and Management of Environmental Noise.

\*\*Time durations for L<sub>day</sub> and L<sub>night</sub> are described in IFC General EHS Guidelines - Environmental Noise Management.



## 5. Biodiversity

A total of 14 vegetation surveys were conducted in the LSA in order to identify the presence of vascular plant species with particular regard for characteristic, exotic, threatened or protected species. The species observed and their global and national conservation status according the IUCN Red List of Threatened Species and “The Red Data Book of Turkish Plants” (Ekim et. al., 2006) are listed below.

In general, the vegetation in the LSA is characterized by low Mediterranean sclerophyllous shrubland (maquis) interrupted by many rock outcrops that creates particular habitat niches where shrubs, and forbs like ferns and *Ubicularis rupestris* find humid microhabitats.

The entire area is heavily grazed by cattle as demonstrated by the vegetation, mainly composed of species that protect themselves with thorns (e.g. *Q. coccinifera*, *Sarcopoterium spinosum*) or by producing toxic components (e.g. *Asphodelus ramosus*).

The south west part of the LSA was reforested in 2012 with Mediterranean cypress (*Cupressus sempervirens*) and black pine (*Pinus nigra*) and the exotic eucalyptus tree (*Eucalyptus* sp.). Less grazed areas with more diverse and natural vegetation are present on the hill top, in the buffer area north of the project footprint, while at lower elevation the impact of existing anthropogenic disturbances is more evident grazing and discharge of construction waste.

The presence of a small artificial pond in the buffer area north of the Project site and of a permanent stream on the east border of the footprint, although polluted by cattle farms and partially modified, enable the presence of more hygic vegetation (e.g. *Salix* sp., *Nerium oleander*, *Phragmites australis*).

**Table 90: list of vascular plant observed during the survey on the LSA**

Family	Species (Scientific name)	Plant Growth Form	Endemic or Exotic	IUCN Category
APIACEAE	<i>Visnaga daucoides</i>	Forb	–	LC*
	<i>Artemisia squamata</i>	Forb	–	-
APOCYNACEAE	<i>Nerium oleander</i>	Shrub	–	LC
ASPARAGACEAE	<i>Asparagus acutifolius</i>	Forb	–	NE
ASPHODELACEAE	<i>Asphodelus ramosus</i>	Forb	–	NE
ASPLENIACEAE	<i>Asplenium</i> sp.	Forb	–	-
ASTERACEAE	<i>Centaurea diffusa</i>	Forb	–	LC*
	<i>Centaurea solstitialis</i>	Forb	–	LC
	<i>Helichrysum</i> sp.	Forb	–	LC*
	<i>Senecio leucanthemifolius</i>	Forb	–	LC*
	<i>Taraxacum</i> sp.	Forb	–	-
	<i>Tragopogon longirostis</i>	Forb	–	LC*
BRASSICACEAE	<i>Capsella bursa-pastoris</i>	Forb	–	LC*
CARYOPHYLLACEAE	<i>Silene</i> sp.	Forb	–	-
CISTACEAE	<i>Cistus salviifolius</i>	Forb	–	NE





Family	Species (Scientific name)	Plant Growth Form	Endemic or Exotic	IUCN Category
COMPOSITAE	<i>Tripleurospermum</i> sp.	Forb	-	-
CRASSULACEAE	<i>Umbilicus rupestris</i>	Forb	-	NE
CUCURBITACEAE	<i>Ecballium elaterium</i>	Forb	-	-
CUPRESSACEAE	<i>Cupressus sempervirens</i>	Shrub	-	LC
EUPHORBIACEAE	<i>Euphorbia falcata</i>	Forb	-	LC*
FABACEAE	<i>Acacia</i> sp	Shrub	Ex	-
	<i>Astragalus trojanus</i>	Shrub	-	LC*
	<i>Calicotome villosa</i>	Shrub	-	-
	<i>Spartium junceum</i>	Shrub	-	-
FAGACEAE	<i>Quercus coccifera</i>	Shrub	-	LC*
	<i>Quercus ilex</i>	Shrub	-	LC*
IRIDACEAE	<i>Moraea sisyrinchium</i>	Forb	-	NE
LABIATAE	<i>Rosmarinus officinalis</i>	Shrub	-	NE
LILIACEAE	<i>Ornithogalum narbonense</i>	Forb	-	-
MYRTACEAE	<i>Eucalyptus</i> sp	Tree	Ex	-
OLEACEAE	<i>Olea europaea</i>	Shrub	-	LC*
PAPAVERACEAE	<i>Papaver gracile</i>	Forb	-	-
PINACEAE	<i>Pinus brutia</i>	Shrub	-	LC
	<i>Pinus nigra</i>	Shrub	-	LC
POACEAE	<i>Phragmites australis</i>	Graminoid	-	LC
	<i>Poa</i> sp.	Graminoid	-	-
	<i>Festuca</i> sp.	Graminoid	-	-
POLYGONACEAE	<i>Polygonum cognatum</i>	Forb	-	LC*
	<i>Rumex acetosella</i>	Forb	-	LC*
RHAMACEAE	<i>Paliurus spina-christi</i>	Shrub	-	NE
RANUNCULACEAE	<i>Anemone coronaria</i>	Forb	-	NE
ROSACEAE	<i>Rosa</i> sp.	Shrub	-	-
ROSACEAE	<i>Sarcopoterium spinosum</i>	Shrub	-	NE
SALICACEAE	<i>Salix</i> sp.	Shrub	-	-
SIMAROUBACEAE	<i>Ailanthus altissima</i>	Shrub	Ex	-



\* IUCN status at national level from Red Data Book when not evaluated at global level



Figure 57: *Quercus coccifera* (top left), *Calicoma villosa* (top right), *Asphodelus ramosus* (bottom left), *Anemone coronaria* (bottom right)

Studies on fauna are supported by literature research and incidental field observations during the field survey that took place in March 25th (2015).

A list of species potentially present in the area is given for: Amphibians, Reptiles, Birds and Mammals in following tables. Species observed in the area during the field survey in March 25<sup>th</sup> (2015), are indicated with an O (Observed), while species potentially present according in the area according to literature research, are indicated with an L (Literature). The species in the lists were selected considering both the species distribution and the capacity of habitat present in the LSA to host this species.

The conservation status of each species is assessed according to local and international convention. The species lists include data on family, scientific name, common name, preferred habitat and if the species is exotic (Ex) or endemic (En). IUCN Status, BERN Convention, and 2015-2016 Central Hunting Commission decisions (M.A.K.) (dated June 5, 2015 and Official Gazette No: 29377) categories are also indicated where applicable.

**Table 91: Amphibia (Amphibians)**



Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
<b>BUFONIADE</b>							
<i>Bufo bufo</i>	Common Toad	Under humid stone, earth channels and cracks	-	LC	III	-	L
<i>Pseudepidalea variabilis</i>	Green toad	In stony open spaces on the trees and boscage	-	DD	II	-	L
<b>HYLIDAE</b>							
<i>Hyla arborea</i>	Tree frog	Loose and gumbo earth inner and dead water	-	LC	II	-	L
<b>PELOBATIDAE</b>							
<i>Pelobates syriacus</i>	Eastern Spadefoot	Under humid stone, earth channels and cracks	-	LC	II	-	L

Table 92: Reptilia (Reptiles)

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	BERN	MAK	Literature / Observed
<b>TESTUDINIDAE</b>							
<i>Testudo graeca</i>	Spur-thighed Tortoise	Stony, sandy and dry places	-	VU	II	I	L
<b>LACERTIDAE</b>							
<i>Lacerta trilineata</i>	Balkan Green Lizard	Roadside well-planted areas, and regions not too far from water	-	LC	II	I	L
<i>Ophisops elegans</i>	Snake-eyed Lizard	Sparsely planted open spaces, stony and earthy grounds	-	-	II	I	L
<b>GEKKONIDAE</b>							
<i>Hemidactylus turcicus</i>	Turkish Gecko	Under stone, rock crevices, house and ruins.	-	LC	III	I	L
<b>TYPHLOPIDAE</b>							
<i>Typhlops vermicularis</i>	Eurasian Blind Snake	In the humid soil and under stone	-	-	III	I	L
<b>COLUBRIDAE</b>							
<i>Elaphe situla</i>	European Ratsnake	woodland edges, forested ravines, scrubland and thickets, rocky outcrops.	-	LC	II	I	L
<b>SCINCIDAE</b>							
<i>Ablepharus kitaibelii</i>	European Copper Skink	Dry areas including south facing slopes, meadows,	-	LC	II	I	O



Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	BERN	MAK	Literature / Observed
		scrubland and clearings in woodland.					

Table 93: Aves (Birds)

Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
<b>ALAUDIDAE</b>							
<i>Alauda arvensis</i>	Eurasian Skylark	Farm, open field, shrubland and mountainside.	-	LC	III	II	L
<i>Melanocorypha calandra</i>	Calandra Lark	Settlement and farms	-	LC	II	I	L
<b>HIRUNDINIDAE</b>							
<i>Riparia riparia</i>	Sand Martin	Forests and cities	-	LC	II	I	L
<i>Hirundo rustica</i>	Barn Swallow	Settlement	-	LC	II	I	L
<i>Delichon urbica</i>	Northern House-martin	Settlement and rocky places	-	LC	II	I	O
<i>Hirundo daurica</i>	Red-rumped Swallow	Steppes and coasts	-	LC	II	I	L
<b>TURDIDAE</b>							
<i>Luscinia megarhynchos</i>	Common Nightingale	Woodlands, parks and cemeteries	-	LC	III	I	L
<b>SYLVIDAE</b>							
<i>Sylvia hortensis</i>	Orphean Warbler	Shrubland, brushwood, gardens and lowlands	-	LC	II	I	L
<i>Sylvia cantillans</i>	Subalpine Warbler	Shrubland, open areas, settlements	-	LC	II		L
<i>Sylvia rueppelli</i>	Rueppell's Warbler	Thick thorny shrubs	-	LC	II		L
<b>COLUMBIDAE</b>							
<i>Streptopelia decaocto</i>	Eurasian Collared-dove	Cities, forestry and boscage	-	LC	III	II	O
<i>Columba palumbus</i>	Common Woodpigeon	Settlements and woodlands	-	LC	III	III	L
<i>Streptopelia turtur</i>	European Turtle-dove	Settlements and agricultural lands	-	LC	III	III	L
<b>GRUIFORMES</b>							



Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
<i>Rallus aquaticus</i>	Western Water Rail	Pool, lakes and wetlands rich in vegetation	-	LC	III		L
<i>Gallinula chloropus</i>	Common Moorhen	Pool, lakes and wetlands rich in vegetation	-	LC	III		O
<i>Fulica atra</i>	Common Coot	Pool, lakes and wetlands rich in vegetation	-	LC	III		O
<b>PHASIANIDAE</b>							
<i>Alectoris chukar</i>	Chukar Partridge	Stony and rocky places	-	LC	III	III	L
<i>Coturnix coturnix</i>	Common Quail	Sowed farms, grasslands and steps	-	LC	III	III	L
<b>PASSERIDAE</b>							
<i>Passer domesticus</i>	House Sparrow	Settlements, farms and schrubland	-	LC	-	III	O
<b>EMBERIZIDAE</b>							
<i>Emberiza cirrus</i>	Cirl Bunting	Settlements, schrubland and forestlands	-	LC	II		L
<i>Emberiza cia</i>	Rock Bunting	Schrublands and rocky areas,	-	LC	II		L
<i>Emberiza melanocephala</i>	Black-headed Bunting	Agricultural areas, schrublands	-	LC	II		L
<b>PARIDAE</b>							
<i>Parus major</i>	Great Tit	Woodlands, parks and gardens	-	LC	II	I	L
<b>FALCONIDAE</b>							
<i>Falco tinnunculus</i>	Common Kestrel	Settlements and forestlands	-	LC	II	I	O
<i>Falco peregrinus</i>	Peregrine Falcon	Forestlands and open fields	-	LC	II	I	L
<i>Falco columbarius</i>	Falco columbarius	Valleys with rude vegetation and wetland areas	-	LC	II	I	L
<b>LARIDAE</b>							
<i>Larus fuscus</i>	Lesser Black-backed Gull	Rocky islands, flood plains, riversides and channels	-	LC	-	II	L
<i>Larus minutus</i>	Little Gull	Riversides, lakesides, grainy and muddy beaches	-	LC	II	I	L





Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
<b>CORVIDAE</b>							
<i>Corvus monedula</i>	Eurasian Jackdaw	Woodlands, rocky places and ruins	-	LC	-	III	L
<i>Corvus frugilegus</i>	Rook	Lowlands, woodlands, parks and gardens	-	LC	-	III	L
<i>Corvus corone</i>	Carrion Crow	Open fields and farms	-	LC	-	III	O
<i>Pica pica</i>	Black-billed Magpie	Rarely woodlands, parks and gardens	-	LC	-	III	L
<b>PHALACROCORACIDAE</b>							
<i>Phalacrocorax carbo</i>	Great Cormorant	Lake, ponds, rivers	-	LC	II		O
<i>Microcarbo pygmaeus</i>	Pygmy Cormorant	Lake, ponds, rivers	-	LC	II		L
<b>CICONIIDAE</b>							
<i>Ciconia ciconia</i>	White Stork	Lowlands with tree, humid meadowlands, flood plains, lagoon with shallow water	-	LC	II	I	L
<i>Ciconia nigra</i>	Black Stork	Wetlands surrounded by forests	-	LC	II		O
<b>ANATIDAE</b>							
<i>Anas platyrhynchos</i>	Mallard	Lake, ponds, rivers	-	LC	III		L
<b>APODIDAE</b>							
<i>Apus apus</i>	Common Swift	Woodlands	-	LC	III	I	L
<b>PICIDAE</b>							
<i>Picus viridis</i>	Eurasian Green Woodpecker	Forestlands, boscsages and gardens	-	LC	II	II	L
<b>FRINGILLIDAE</b>							
<i>Fringilla coelebs</i>	Eurasian Chaffinch	Forestlands, woodlands, parks and gardens	-	LC	III	II	L
<i>Carduelis carduelis</i>	European Goldfinch	Woodlands and gardens	-	LC	II	I	L
<b>STURNIDAE</b>							
<i>Sturnus vulgaris</i>	Common Starling	Settlements and farms	-	LC	-	II	L

Table 94: Mammalia (Mammals)





Family and Species Name	Common Name	Habitat	Endemic /Exotic	IUCN Red list	Bern	MAK	Literature / Observed
<b>SORICIDAE</b>							
<i>Crocidura leucodon</i>	Bicolored Shrew	Bostcages, open fields	-	LC	III	-	L
<b>RHINOLOPHIDAE</b>							
<i>Rhinolophus ferrumequinum</i>	Greater Horseshoe Bat	Forestlands, woodlands and boscages	-	LC	II	I	L
<i>Rhinolophus hipposideros</i>	Lesser Horseshoe Bat	Forestlands, woodlands and boscages	-	LC	II	I	L
<i>Myotis mystacinus</i>	Whiskered Myotis	Small caves, castle wall, garret, tree hollow and bark -	-	LC	-	I	L
<b>MURIDAE</b>							
<i>Apodemus flavicollis</i>	Yellow-necked Field Mouse	Humid forests and forest limit	-	LC	-	-	L
<b>M USTEL DAE</b>							
<i>Mustela nivalis</i>	Least Weasel	All kinds of habitat	-	LC	III	II	L
<i>Martes foina</i>	Martes foina	deciduous forest, forest edge, and open rocky hillsides	-	LC	III	-	L
<b>ERINACEIDAE</b>							
<i>Erinaceus concolor</i>	Southern White-breasted Hedgehog	Urban, suburban and agricultural areas to natural vegetation	-	LC	III	-	L
<b>LEPORIDAE</b>							
<i>Lepus europaeus</i>	European Hare	All kinds of habitat	-	LC	III	III	L
<b>STURNIDAE</b>							
<i>Vulpes vulpes</i>	Red Fox	Forestland, farms and open fields	-	LC	-	III	L

Characteristic species of maquis communities include red fox (*Vulpes vulpes*), hare (*Lepus europeus*), hedgehog (*Erinaceus concolor*) and bird assemblages of Sylvia warblers (*Sylvia hortensis*, *S. cantillans* and *S. rueppelli*) and buntings (*Emberiza cirulus*, *E. cia*, *E. melanocephala*).

The presence of species connected to freshwater environment (e.g. *Anas platyrhynchos*, *Phalacrocorax carbo*) is supported by a small artificial pond in the buffer area north of the Project site and of a permanent stream on the east border of the footprint, although polluted by cattle farms and partially modified.

A number of important bird species nest in or migrate through this ecoregion, primarily in the coastal habitats and wetlands. Examples include the pygmy cormorant (*Microcarbo pygmaeus*), dalmatian pelican (*Pelecanus crispus*), and the lesser kestrel (*Falco naumanni*).

The following bird species had been incidentally observed in the study area: *Riparia riparia*, *Luscinia megarhynchos*, *Streptopelia decaocto*, *Passer domesticus*, *Falco tinnunculus*, *Pica pica* and *Fringilla coelebs*.



These species are common in anthropic habitats. In addition the European copper skink (*Ablepharus kitaibeli*) was also observed on a rocky outcrop.



# APPENDIX M

## Air Quality and Noise Modelling



## AIR QUALITY MODELLING CONSTRUCTION

Construction activities will affect air quality mainly through emissions of dust from the excavation and storage of soil, vehicles traffic on unpaved roads, the emission of particulate from vehicle exhausts and the emission of particulate from stationary sources like power generators. Emissions of gaseous pollutants, particularly NO<sub>x</sub> and SO<sub>2</sub>, will be mostly related to the vehicle and machinery exhausts and emissions from stationary sources like power generators.

### Exhaust Gases

In general, diesel oil will be used as fuel for the construction machinery. However, the pollution created by the emission of vehicles in the project area is considered not to affect the existing air quality negatively when it is taken into account that such vehicles will be operated for 10 hours a day and they will not be in use continuously.

In below table, type and number of engineering vehicles, horse power and the emission factors were shown. Emission values from engineering vehicles have been calculated by using the Exhaust Emission Factors for Non-road Engine Modeling (Report No. NR-009A) of United States Environmental Protection Agency (EPA).

**Table 95: Exhaust Emission Factors for Construction Equipment**

Machinery / Equipment	Number	Engine Power (HP)	Emission Factors (g/hp-hr)			
			HC	CO	NO <sub>x</sub>	PM
Concrete Mobile Pump	5	400	0.3	1.0	4.5	0.4
Concrete Stationary Pump	6	440	0.3	1.0	4.5	0.4
Bulldozer	2	220	0.4	1.0	4.5	0.4
Excavator	16	260	0.4	1.0	4.5	0.4
Wheeled Loader	1	200	0.4	1.0	4.5	0.4
Tracked Loader	1	200	0.4	1.0	4.5	0.4
Backhoe Loader	4	200	0.4	1.0	4.5	0.4
Truck (26 m <sup>3</sup> )	36	250	0.4	1.0	4.5	0.4
Truck (20 m <sup>3</sup> )	9	250	0.4	1.0	4.5	0.4
Lorries (18-wheeler)	2	250	0.4	1.0	4.5	0.4
Hi-Ups (30 tons)	2	250	0.4	1.0	5.2	0.7
Tractor	4	60	0.4	1.0	4.5	0.4
Grader	1	200	0.4	1.0	4.5	0.4
Air Compressor	7	10	0.6	2.5	5.0	0.6
Forklift	4	75	0.4	1.0	5.2	0.7



Telescopic Forklift	3	125	0.4	1.0	4.5	0.4
Generator (250 kV)	15	250	0.4	1.0	4.5	0.4
Generator (400 kV)	5	400	0.3	1.0	4.5	0.4
Roller	1	50	0.6	2.5	5.0	0.6
Paver	1	225	0.4	1.0	4.5	0.4
Bobcat	2	60	0.4	1.0	5.2	0.7
Mobile Crane	10	200	0.4	1.0	4.5	0.4
Concrete Placing Boom	10	270	0.4	1.0	4.5	0.4
Water Tanker	4	200	0.4	1.0	4.5	0.4

Exhaust emission values from the construction equipment have been calculated by using these coefficients and illustrated in below table.

**Table 96: Exhaust Emission Values**

Machinery / Equipment	Number	Engine Power (HP)	Emission (kg/hr)			
			HC	CO	NOx	PM
Concrete Mobile Pump	5	400	0.60	2.00	9,00	0,80
Concrete Stationary Pump	6	440	0.79	2.64	11,88	1,06
Bulldozer	2	220	0.18	0.44	1,98	0,18
Excavator	16	260	1.66	4.16	18,72	1,66
Wheeled Loader	1	200	0.08	0.20	0,90	0,08
Tracked Loader	1	200	0.08	0.20	0,90	0,08
Backhoe Loader	4	200	0.32	0.80	3,60	0,32
Truck (26 m <sup>3</sup> )	36	250	3.60	9.00	40,50	3,60
Truck (20 m <sup>3</sup> )	9	250	0.90	2.25	10,13	0,90
Lorries (18-wheeler)	2	250	0.20	0.50	2,25	0,20
Hi-Ups (30 tons)	2	250	0.20	0.50	2,60	0,35
Tractor	4	60	0.10	0.24	1,08	0,10
Grader	1	200	0.08	0.20	0,90	0,08
Air Compressor	7	10	0.04	0.18	0,35	0,04



Forklift	4	75	0.12	0.30	1,56	0,21
Telescopic Forklift	3	125	0.15	0.38	1,69	0,15
Generator (250 kV)	15	250	1.50	3.75	16,88	1,50
Generator (400 kV)	5	400	0.60	2.00	9,00	0,80
Roller	1	50	0.03	0.13	0,25	0,03
Paver	1	225	0.09	0.23	1,01	0,09
Bobcat	2	60	0.05	0.12	0,62	0,08
Mobile Crane	10	200	0.80	2.00	9,00	0,80
Concrete Placing Boom	10	270	1.08	2.70	12,15	1,08
Water Tanker	4	200	0.32	0.80	3,60	0,32
Total			13,57	35.70	160.54	14.51

### **Dust Emissions**

During the construction activities the emission scenario will be mainly related to the dust suspension generated by the levelling and grading, the temporary stockpiling of the material, the vehicles movement to transport construction material to the construction areas.

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

For the site preparation, 3,000,000 m<sup>3</sup> of excavation will be required.

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 / m<sup>3</sup>. A total of 3,000,000 m<sup>3</sup> (3,000,000 m<sup>3</sup> x 1.6 ton / m<sup>3</sup> = 4,800,000 ton) material will be produced during the construction works in the project area.

Dust emission shall be resulting from 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

	<b>Uncontrolled</b>	<b>Controlled</b>
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
Fragmentation	-	0.08 kg/ton

For Rock Fragmentation

Within the scope of the rock fragmentation process for one pulse, there will be 40 holes with the distance of 3 m with each other. There will be 20 fragmentations in a month. There will not be any fragmentation study at weekends

Amount of Rock Fragmented : 3,000,000 m<sup>3</sup> (4,800,000 ton)

Duration of Rock Fragmentation : 12 months

Daily Working Time : 10 hours/day

Amount of Hourly Excavation Material : ~2,000 tons/hour (4,800,000 ton / 12 / 20 / 10)

**Dust Emission During Fragmentation**

Dust emission (Controlled) = 2,000 tons/hour x 0,08 kg/ton = 160 kg/hour

For Excavation:

Amount of Excavation : 3,000,000 m<sup>3</sup> (4,800,000 ton)

Duration of Excavation : 12 months

Daily Working Time : 10 hours/day

Amount of Hourly Excavation Material : ~1,333 tons/hour (4,800,000 ton / 12 / 30 / 10)

**Emission Values:**

**Dust Emission During Dismantling**

Dust emission (Uncontrolled) = 1,333 tons/hour x 0,025 kg/ton = 33,3 kg/hour

Dust emission (Controlled) = 1,333 tons/hour x 0,0125 kg/ton = 16,6 kg/hour

**Dust Emission During Loading**

Dust emission (Uncontrolled) = 1,333 tons/hour x 0,01 kg/ton = 13,3 kg/hour

Dust emission (Controlled) = 1,333 tons/hour x 0,005 kg/ton = 6,6 kg/hour

**Dust Emission During Unloading**



Dust emission (Uncontrolled) = 1,333 tons/hour x 0,01 kg/ton = 13,3 kg/hour

Dust emission (Controlled) = 1,333 tons/hour x 0,005 kg/ton = 6,6 kg/hour

**Dust Emission During Transportation**

The distance between project site and the excavation storage site is 15 km. However, only 1,000 m of the total of 15,000 m is stabilized road.

Dust emission (Uncontrolled) = (15 trip/day x 0.7 kg/km x 2 km) / 10 hour/day = 2.1 kg/hour

Dust emission (Controlled) = (15 trip/day x 0.35 kg/km x 2 km) / 10 hour/day = 1.05 kg/hour

**Table 97: Total Dust Emissions**

	Controlled (kg/hour)	Uncontrolled (kg/hour)
Dust Emission During Dismantling	16,6	33,3
Dust Emission During Loading	6,6	13,3
Dust Emission During Unloading	6,6	13,3
Dust Emission During Transportation	1.05	2.1
<b>Total</b>	<b>30,85</b>	<b>62</b>

In total, the amount of dust emission will be 30,85 kg/hour if it is controlled and 62 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 modelling 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 250 m x 250 m cells within the 64.000.000 m<sup>2</sup> area (with the dimension of 8000 m x8000 m).

Meteorological data

According to the İzmir Meteorological Station 1960-2014 data, wind rose regarding to the long term wind numbers is shown below. Besides, the wind rose which is determined according to the 2005 İzmir wind direction numbers is also shown below. It is obvious that wind roses of long term and year of 2005 are shown lots of similar characteristic with respect to dominant wind directions and distribution of wind. Therefore, 2005 year of meteorological data was determined to be representative for the wind characteristics of the area and used for AERMOD.

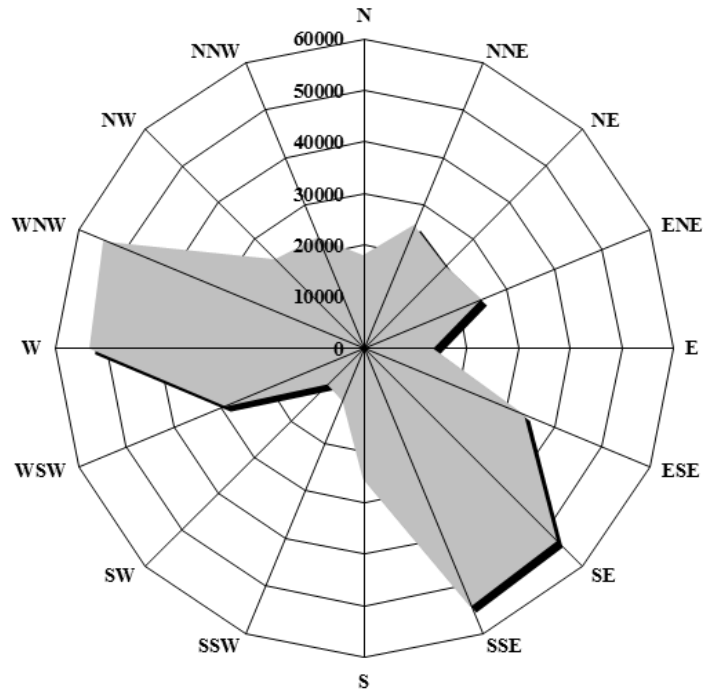


Figure 58: Annual number of winds at Izmir Meteorological Station

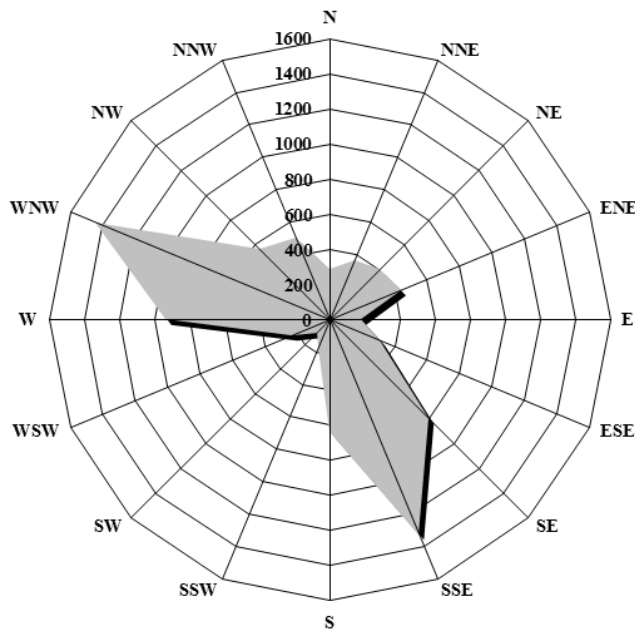


Figure 59: Number of winds at year of 2005 Izmir Wind Number

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 İzmir 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 İzmir Meteorological Station.

Model Results

*PM<sub>10</sub>*

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 98: Modelling Results**

Scenario	Maximum Annual Emission Value (µg/m <sup>3</sup> ) and Location	Limit Value (µg/m <sup>3</sup> )	Maximum 24 Hours Average Emission Value (µg/m <sup>3</sup> ) and Location	Limit Value (µg/m <sup>3</sup> )
Controlled	0.3 (514475-4259875)	56	7.47 (514225-4259125)	90
Uncontrolled	0.6 (514475-4259875)		14.9 (514225-4259125)	

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 99: Settled Dust**

Parameter	Conc. (max)		Limit Value
	Controlled	Uncontrolled	
Settled Dust	15.97 mg/m <sup>2</sup> day (515725-4259625)	31.93 mg/m <sup>2</sup> day (515725-4259625)	390 mg/m <sup>2</sup> -gün



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.

*Rock Fragmentation*

**Table 100: Fragmentation**

Scenario	Maximum Annual Emission Value ( $\mu\text{g}/\text{m}^3$ ) and Location	Limit Value ( $\mu\text{g}/\text{m}^3$ )	Maximum 24 Hours Average Emission Value ( $\mu\text{g}/\text{m}^3$ ) and Location	Limit Value ( $\mu\text{g}/\text{m}^3$ )	Settled dust ( $\text{mg}/\text{m}^2\text{-gün}$ )	Limit Value ( $\text{mg}/\text{m}^2\text{-gün}$ )
Controlled	47,2 (515725, 4259625)	56	990,9 (513475, 4259375)	90	4.092 (515725, 4259625)	390

As seen in the table above all emission values to be released due to the operations to be performed during the rock fragmentation are above the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution except from the annual emission value. Due to the nature of the fragmentation process, these results are normal and the dust emissions precipitate quickly. Rock fragmentation process creates sudden and intense emissions as well as the sudden precipitation.

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.

Cumulative Impact

In order to assess the cumulative impacts, contribution of ambient  $\text{PM}_{10}$  and settled dust measurements to the model results were studied.  $\text{PM}_{10}$  was simulated annually and daily separately. Ambient  $\text{PM}_{10}$  air quality measurements were conducted for 24 hours. Therefore, 24 hour  $\text{PM}_{10}$  measurements are converted to the annual values by using the England Environmental Agency Annex-F. Converted measurement results are shown in below table.

**Table 101: Converted Concentrations**

Measurement No:	Concentration (24 hour), ( $\mu\text{g}/\text{m}^3$ )	Concentration (annual), ( $\mu\text{g}/\text{m}^3$ )
PM10-1 ( $\mu\text{g}/\text{m}^3$ )	18,1	15.3 ((18,1/0,59)*0,5)
PM10-2 ( $\mu\text{g}/\text{m}^3$ )	18,8	15.9 ((18,8/0,59)*0,5)
PM10-3 ( $\mu\text{g}/\text{m}^3$ )	19,2	16.2 ((19,2/0,59)*0,5)
PM10-4 ( $\mu\text{g}/\text{m}^3$ )	19,1	16.1 ((19,1/0,59)*0,5)

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

**Table 102: Cumulative Values of  $\text{PM}_{10}$  and Settled dust**

Measurement No:	AERMOD Conc.		Background Measurements	Cumulative Value	Limit Values
PM10-1 ( $\mu\text{g}/\text{m}^3$ )	Controlled daily	1.24	18.1	19.34	90 ( $\mu\text{g}/\text{m}^3$ )



Measurement No:	AERMOD Conc.		Background Measurements	Cumulative Value	Limit Values
PM10-2 (µg/m³)	Uncontrolled daily	2.48	18.8	20.58	56 (µg/m³)
	Controlled daily	0.98		19.78	
PM10-3 (µg/m³)	Uncontrolled daily	1.96	19.2	20.76	
	Controlled daily	1.36		20.56	
PM10-4 (µg/m³)	Uncontrolled daily	2.72	19.1	21.92	
	Controlled daily	1.42		20.52	
PM10-1 (µg/m³)	Uncontrolled daily	2.85	15.3	21.95	
	Controlled annual	0.18		15.48	
PM10-2 (µg/m³)	Uncontrolled annual	0.35	15.9	15.65	
	Controlled annual	0.07		15.97	
PM10-3 (µg/m³)	Uncontrolled annual	0.14	16.2	16.04	
	Controlled annual	0.08		16.28	
PM10-4 (µg/m³)	Uncontrolled annual	0.17	16.1	16.37	
	Controlled annual	0.11		16.21	
SD-1 (mg/m²-day)	Uncontrolled annual	0.21	62.3	16.31	
	Controlled settled dust	9.96		72.26	
SD-2 (mg/m²-day)	Uncontrolled settled dust	19.9	65.6	82.2	390 (mg/m²-day)
	Controlled settled dust	3.60		69.2	
SD-3 (mg/m²-day)	Uncontrolled settled dust	7.20	51.5	72.8	
	Controlled settled dust	5.90		57.4	
SD-3 (mg/m²-day)	Uncontrolled settled dust	11.80		63.3	
	Controlled settled dust				

As seen from above table, cumulative values for both controlled and uncontrolled situations are below the limit values.



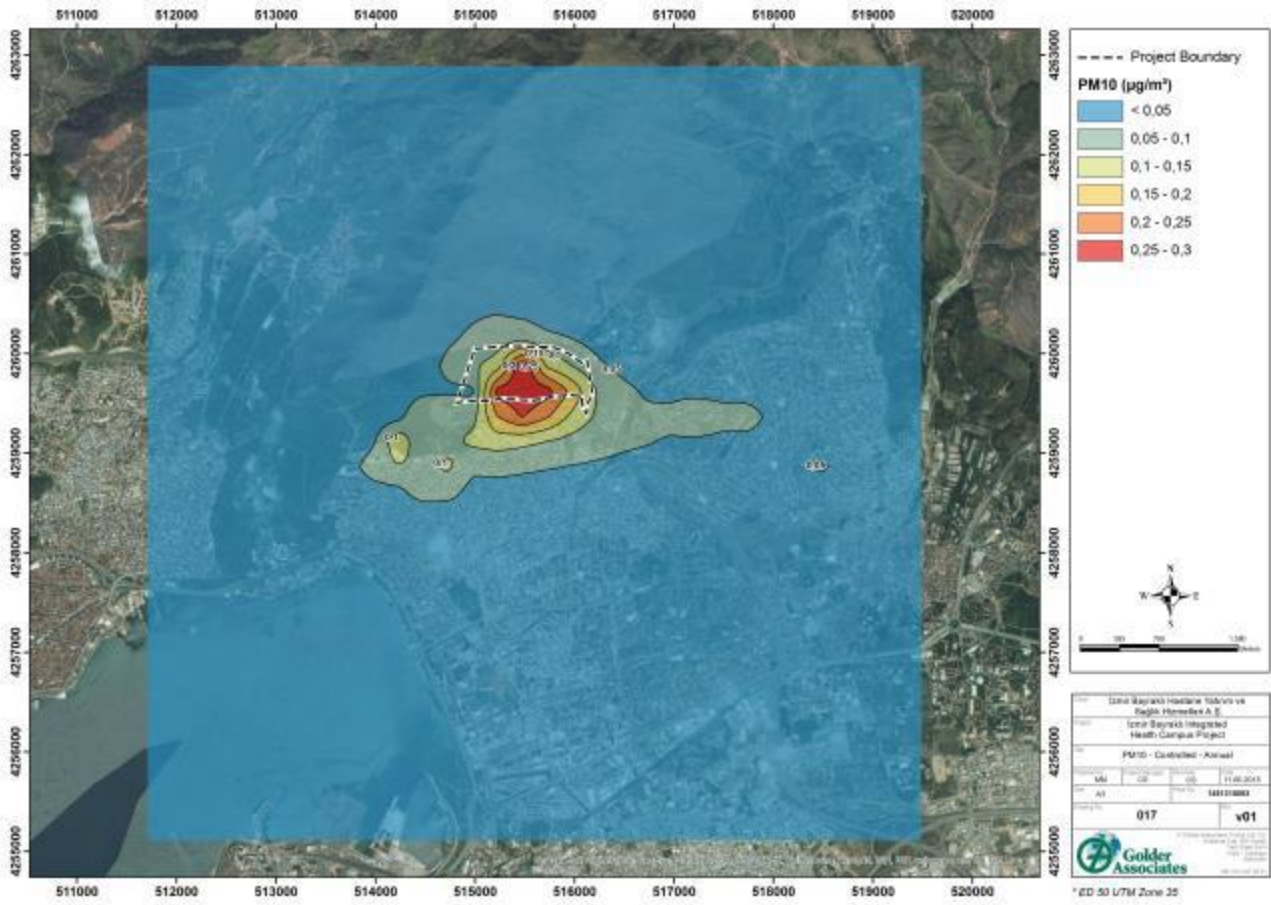


Figure 60: Controlled Annual

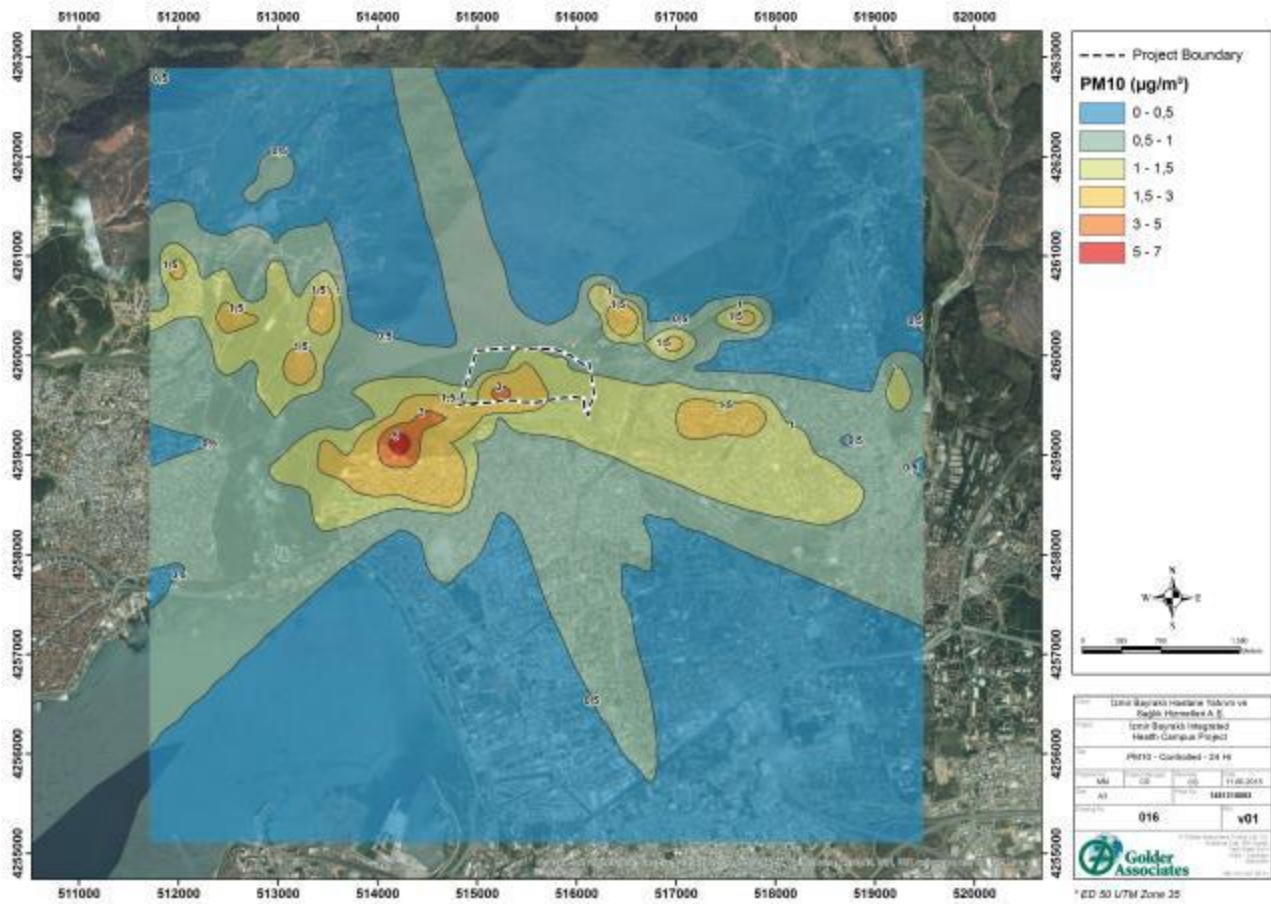


Figure 61: Controlled Daily

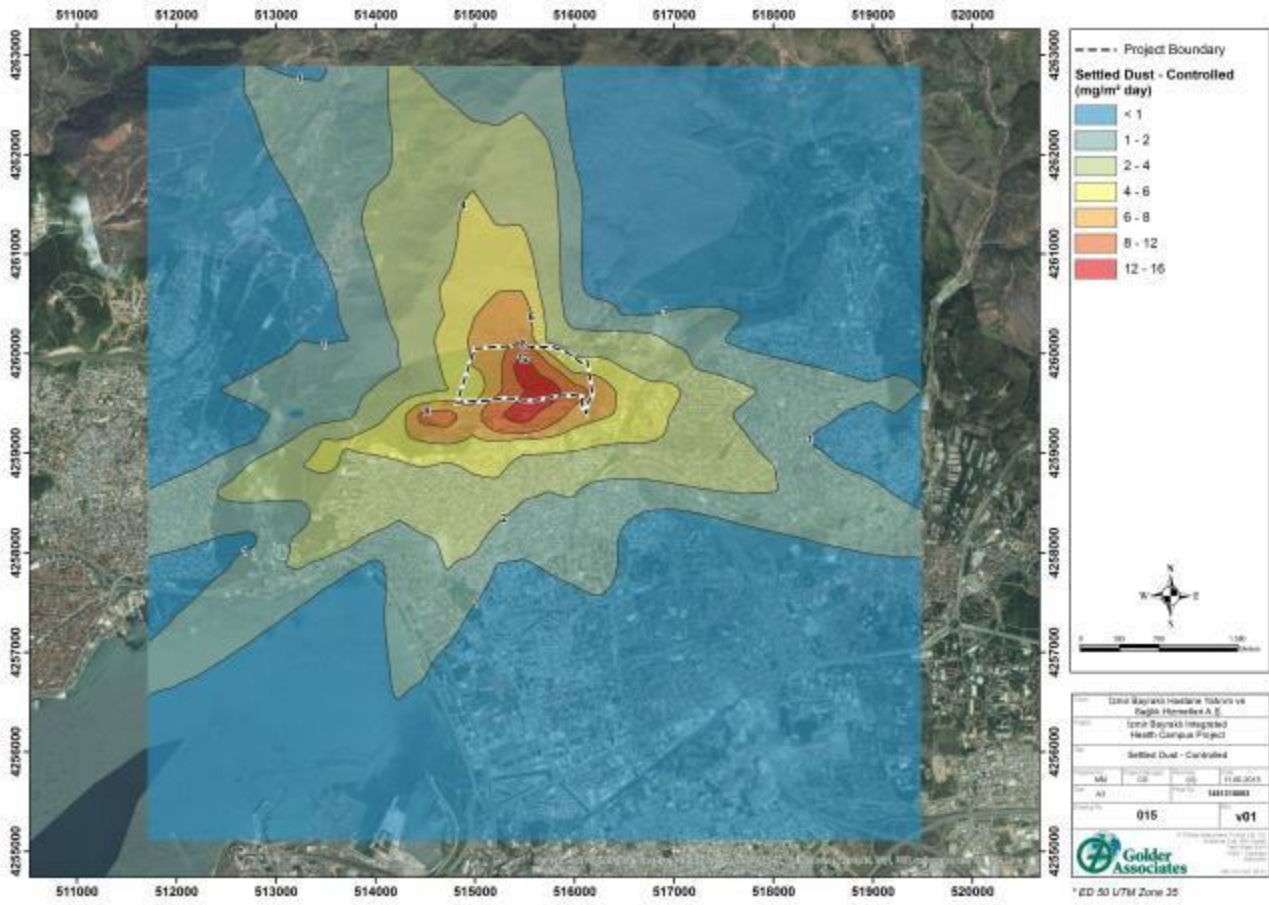


Figure 62: Controlled Settled Dust



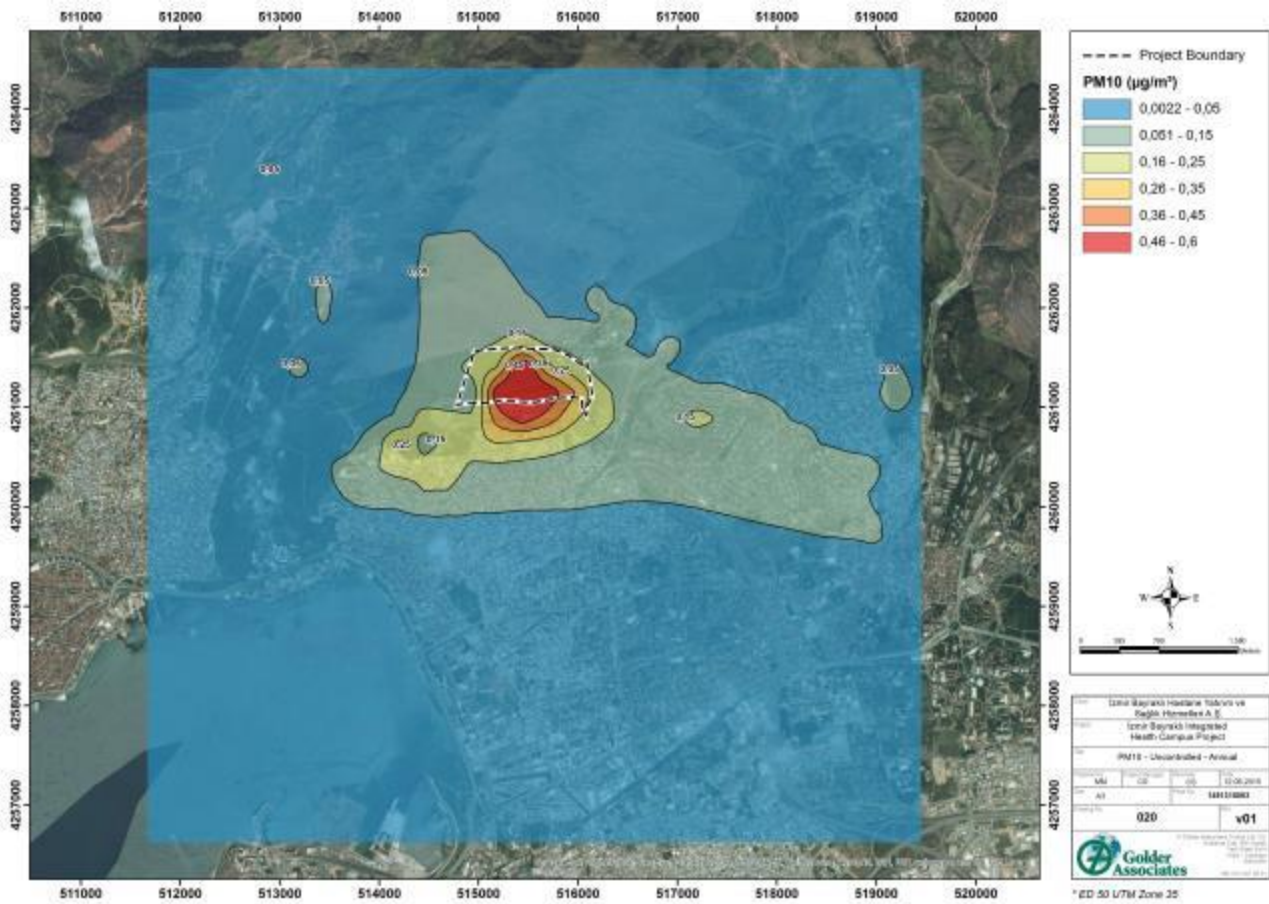


Figure 63: Uncontrolled Annual

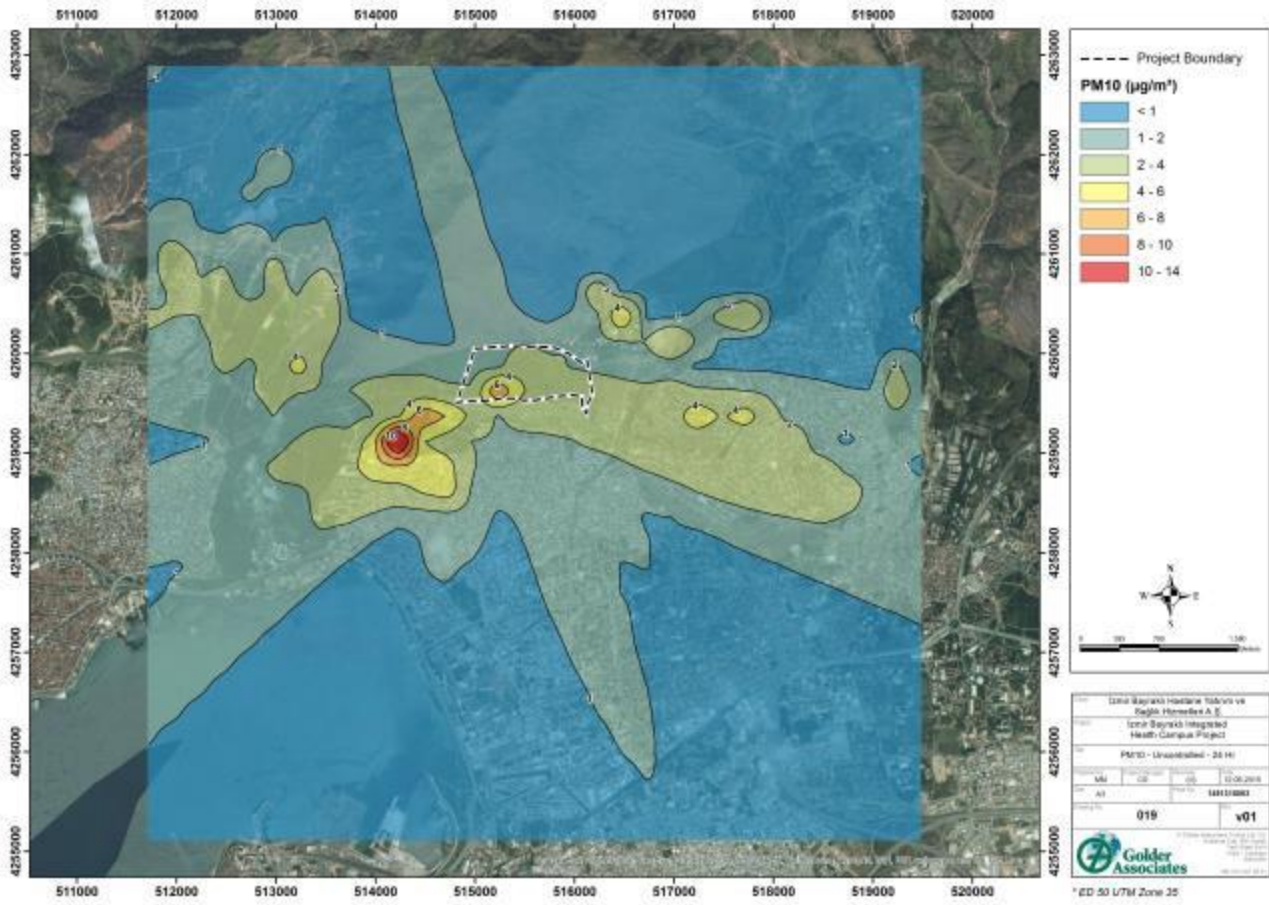


Figure 64: Uncontrolled Daily

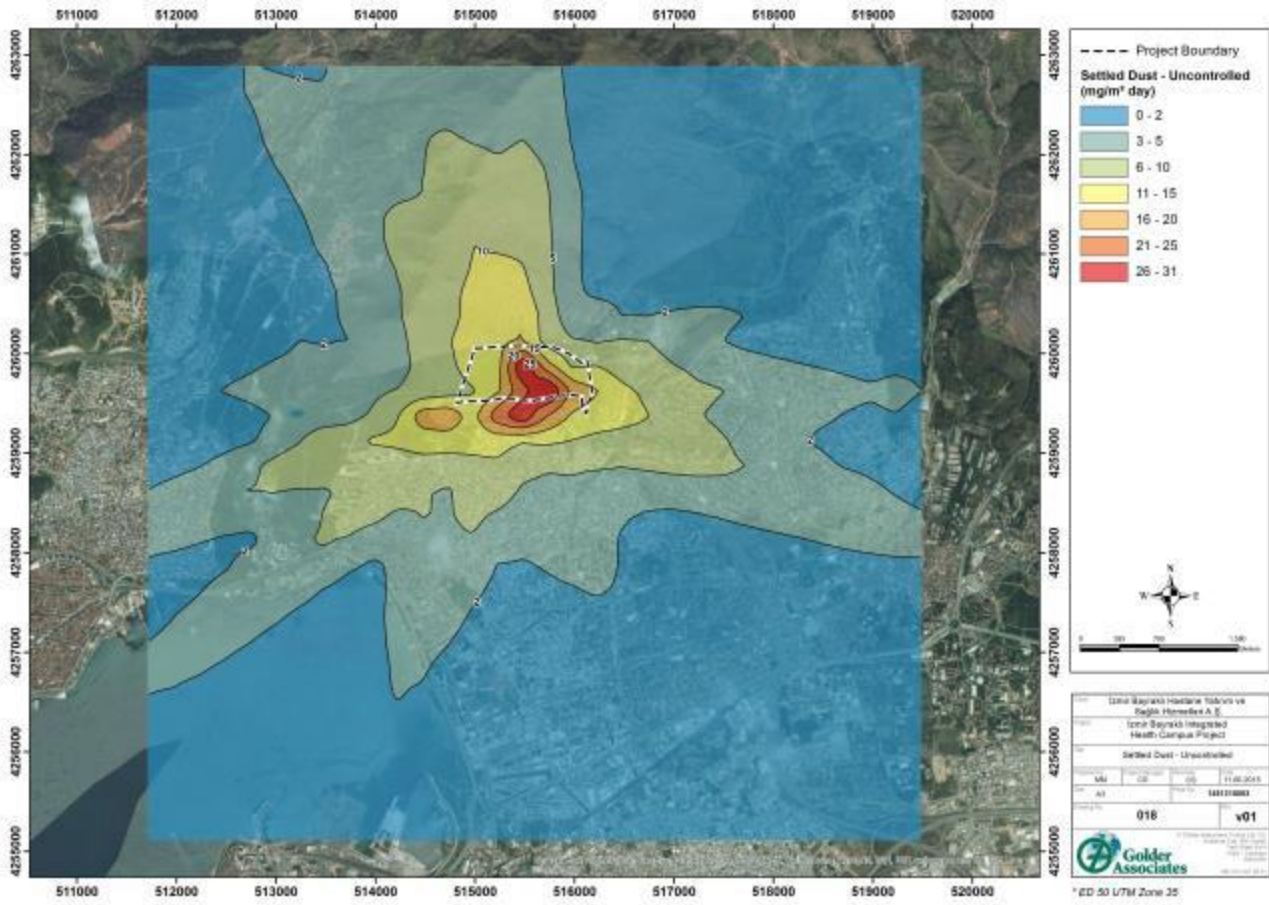


Figure 65: Uncontrolled Settled Dust



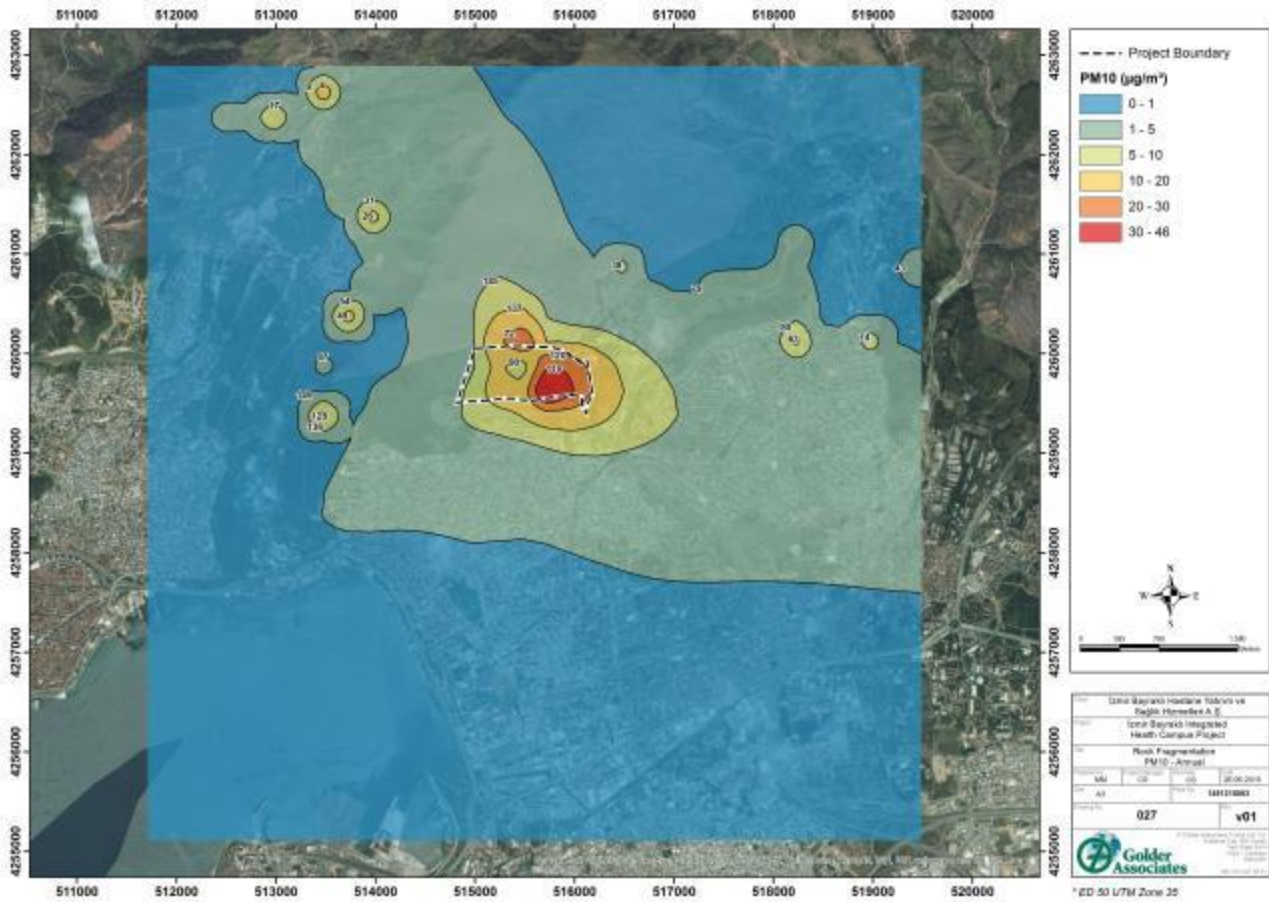


Figure 66: Fragmentation Annual

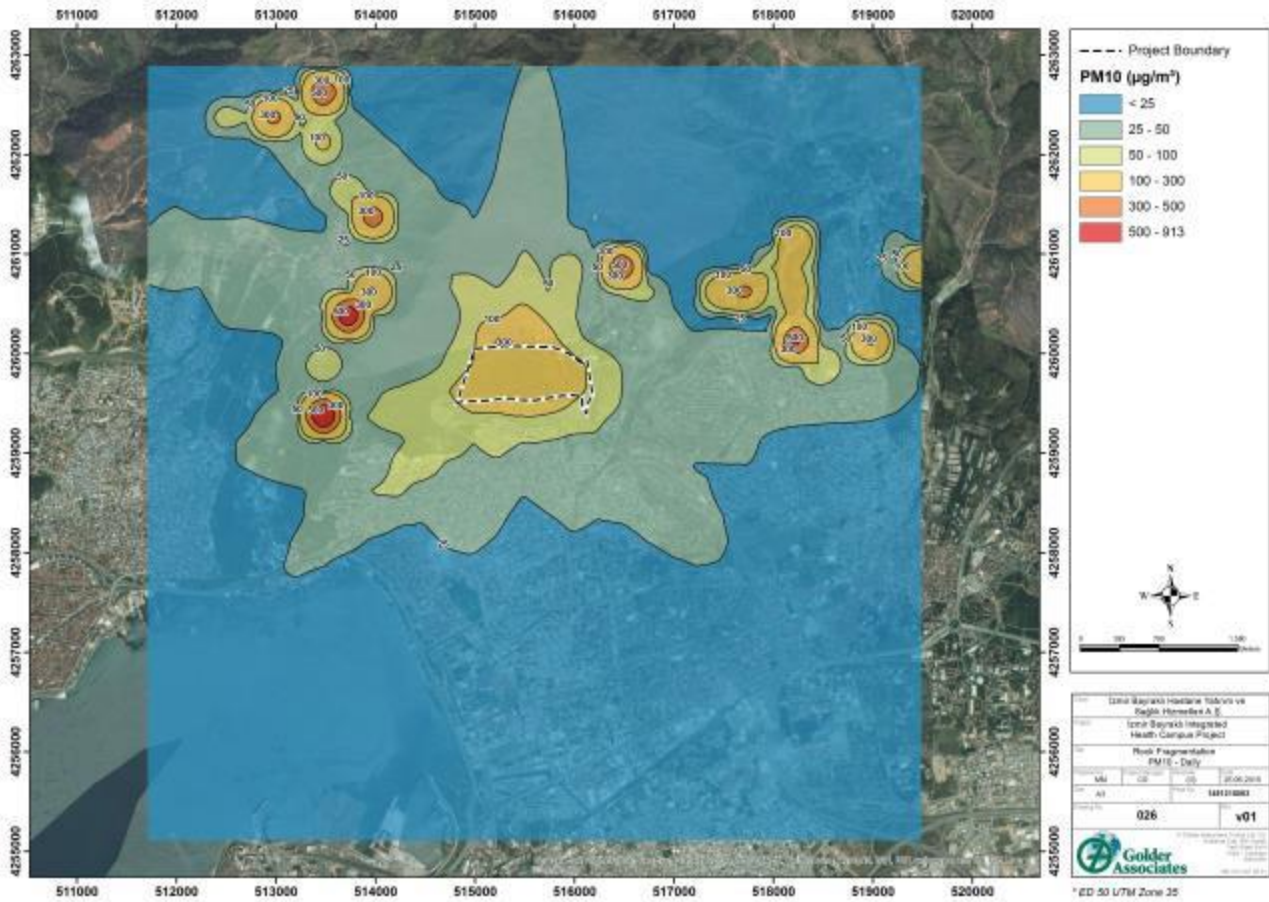


Figure 67: Fragmentation Daily

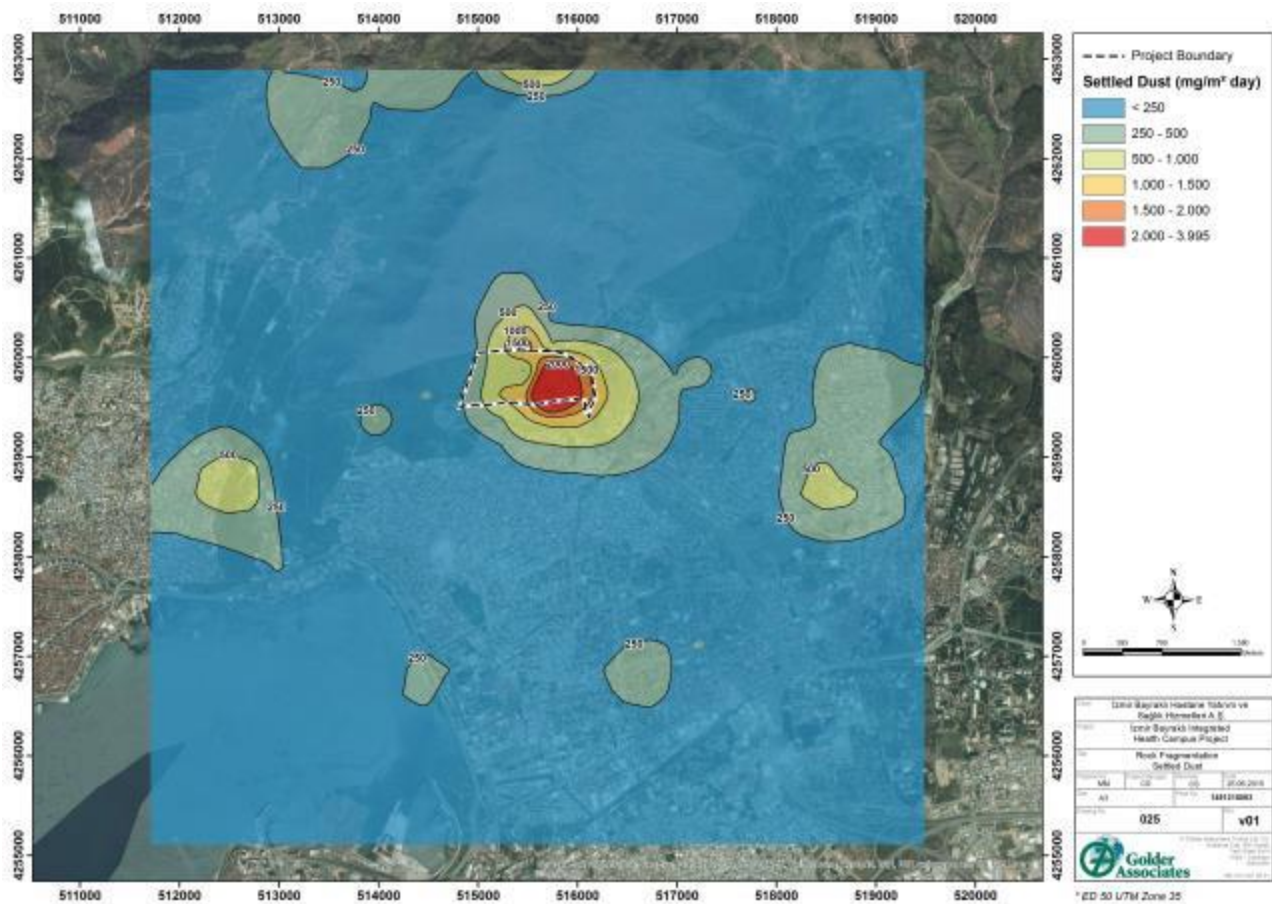


Figure 68: Fragmentation Settled Dust

## COMMISSIONING AND OPERATIONAL PHASE

In order to evaluate impacts on air quality due to the project during the commissioning and operational phase in comparison to existing ambient air quality conditions and to set the most suitable stack heights, an air dispersion model has been developed.

Regarding air pollutants measured within the impact zone of the Project, those used as impact descriptors are represented by nitrogen oxides ("NO<sub>x</sub>"), sulphur dioxide ("SO<sub>2</sub>").

Air dispersion modelling has been conducted using AERMOD. For each pollutant, concentration values at ground level were calculated needed to make comparisons with the expected air quality standards.

Within the model domain there are not air quality monitoring stations.

The Project is to produce part of its own power through a Trigeration plant with an estimated maximum installed capacity of 4 MWt thermal capacities. The Trigeration plant will comprise two gas engines each with an installed capacity of maximum 2 MWt. The Trigeration system is to use natural gas supplied by the city network. There will also be 5 boilers with the each capacity of 2.24 MWt.

By using AERMOD, the worst case scenario has been developed regarding all gas engines and boilers operated at the same time.

Stack properties for the Project is shown below table.



**Table 103: Stack Properties**

	Parameter	Value
Gas Engines	NO <sub>2</sub>	40 mg/Nm <sup>3</sup> (1 kg/h)
	SO <sub>2</sub>	60 mg/Nm <sup>3</sup> (1.5 kg/h)
	Flow rate	25,000 Nm <sup>3</sup> /h
	Stack Gas Exit Temperature	100°C
	Stack Gas Exit Velocity	8 m/s
	Stack Internal Diameter	0.6 m
	Stack Height	10 m
Boilers	NO <sub>2</sub>	40 mg/Nm <sup>3</sup> (0.3 kg/h)
	SO <sub>2</sub>	60 mg/Nm <sup>3</sup> (0.45 kg/h)
	Flow rate	7,500 Nm <sup>3</sup> /h
	Stack Gas Exit Temperature	150°C
	Stack Gas Exit Velocity	2.5 m/s
	Stack Internal Diameter	0.5 m
	Stack Height	13 m

The sensitive points and topography was divided into grids by 250 m x 250 m cells within the 64.000.000 m<sup>2</sup> area (with the dimension of 8000 m x8000 m).

Model Results

NO<sub>2</sub> & SO<sub>2</sub> concentrations have been calculated in accordance with the AERMOD. Maximum values are shown in below table corresponding to the related coordinates.

**Table 104: Maximum NO<sub>2</sub>&SO<sub>2</sub> concentrations**

NO <sub>2</sub> (µg/m <sup>3</sup> )					SO <sub>2</sub> (µg/m <sup>3</sup> )				
	Model results	Location	Limit Value (National)	Limit Value (IFC)		Model results	Location	Limit Value (National)	Limit Value (IFC)
Hourly	107.8	(513475-4260625)	200	200	Daily	72.6	(513475-4260625)	125	125
Annual	3.66	(517725-4260375)	40	40	Annual	5.24	(517725-4260375)	20	-

As seen in the table above all emission values to be released due to the operations to be performed during the operation phase are below the limit values specified in (Annex-2 Table 2.1) the Regulation on the Control of Industrial Air Pollution and IFC, WHO Ambient Air Quality Guidelines.

Cumulative Impact





In order to assess the cumulative impacts, contribution of background SO<sub>2</sub>&NO<sub>2</sub> measurements to the model results were studied. SO<sub>2</sub> and NO<sub>2</sub> were simulated annually and daily separately. Ambient SO<sub>2</sub>&NO<sub>2</sub> air quality measurements were conducted for two periods.

Model results at the background measurement locations and ambient air quality measurement results are assessed cumulatively in below table:

**Table 105: Annual Cumulative Values of SO<sub>2</sub> and NO<sub>2</sub>**

Measurement No:	AERMOD Conc.		Background Measurements		Cumulative Value		Limit Values	
	SO <sub>2</sub>	NO <sub>2</sub>	SO <sub>2</sub>	NO <sub>2</sub>	SO <sub>2</sub>	NO <sub>2</sub>	SO <sub>2</sub>	NO <sub>2</sub>
P-1 (µg/m <sup>3</sup> )	0.13	0.09	2.74	23.45	2.87	23.54	20	40
P-2 (µg/m <sup>3</sup> )	0.17	0.12	2.68	49.44	2.85	49.56		
P-3 (µg/m <sup>3</sup> )	0.09	0.06	2.19	46.07	2.28	46.13		
P-4 (µg/m <sup>3</sup> )	0.04	0.03	1.83	17.62	1.87	17.65		
P-5 (µg/m <sup>3</sup> )	0.11	0.08	1.62	26.68	1.73	26.76		
P-6 (µg/m <sup>3</sup> )	0.08	0.06	-	37.67	-	37.73		
P-7 (µg/m <sup>3</sup> )	0.1	0.07	2.23	21.89	2.33	21.96-		
P-8 (µg/m <sup>3</sup> )	0.13	0.09	1.8	16.5	1.93	16.59		
P-9 (µg/m <sup>3</sup> )	0.12	0.08	2.10	29.73	2.22	29.81		
P-10 (µg/m <sup>3</sup> )	0.1	0.07	1.46	14.27	1.56	14.34		
P-11 (µg/m <sup>3</sup> )	0.04	0.03	1.59	15.7	1.63	15.73		
P-12 (µg/m <sup>3</sup> )	0.1	0.07	1.46	10.88	1.56	10.95		

As seen from above table, cumulative values for both SO<sub>2</sub> and NO<sub>2</sub> concentration results are below the applicable limit values except from the NO<sub>2</sub> results for P-2 and P-3. This results from the heavy vehicular traffic on the stabilised road during the measurement period. The mitigation measures are provided in chapter 9.1.6.2.

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. SO<sub>2</sub>&NO<sub>2</sub> distribution maps are shown below figures.

.

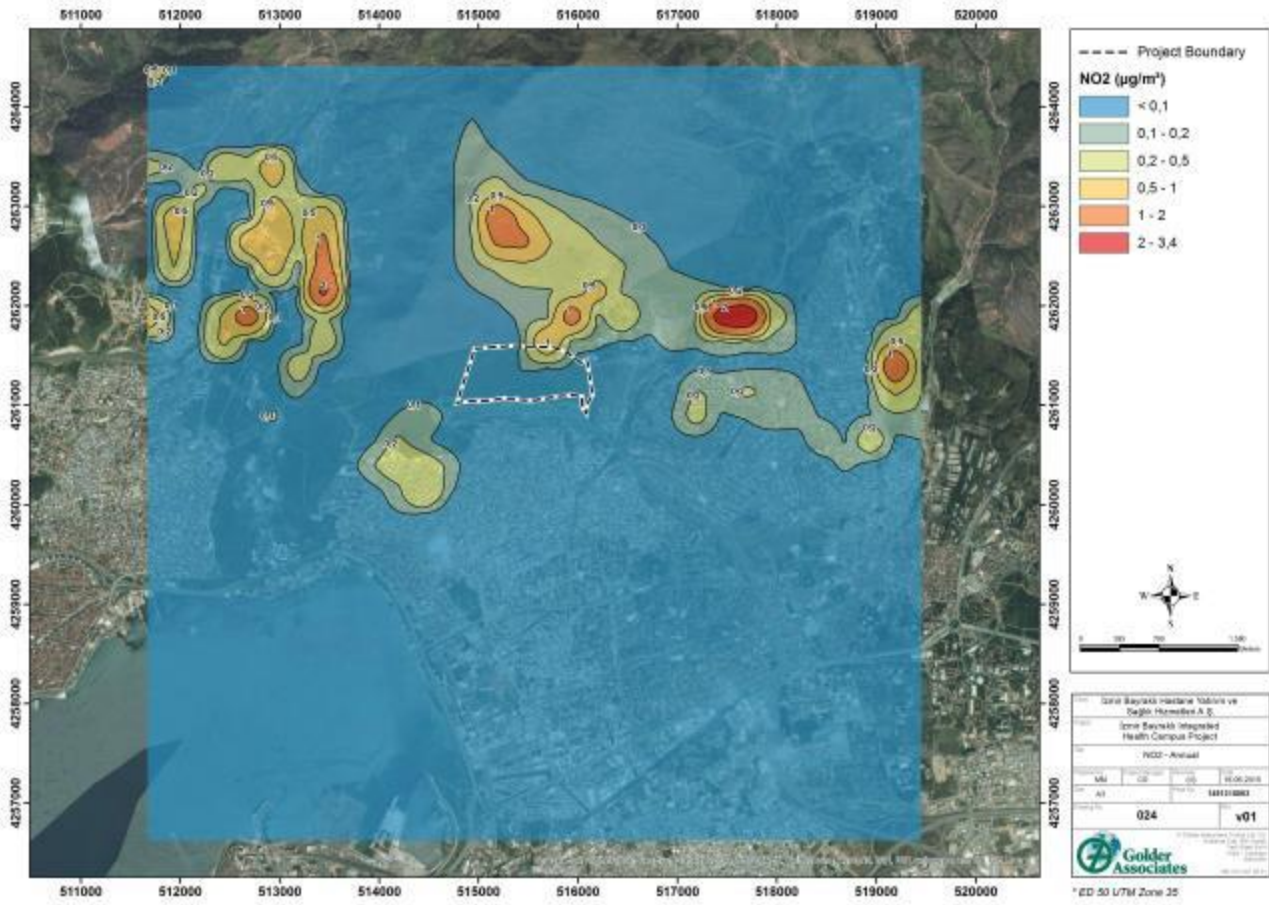


Figure 69: NO<sub>2</sub> Annual



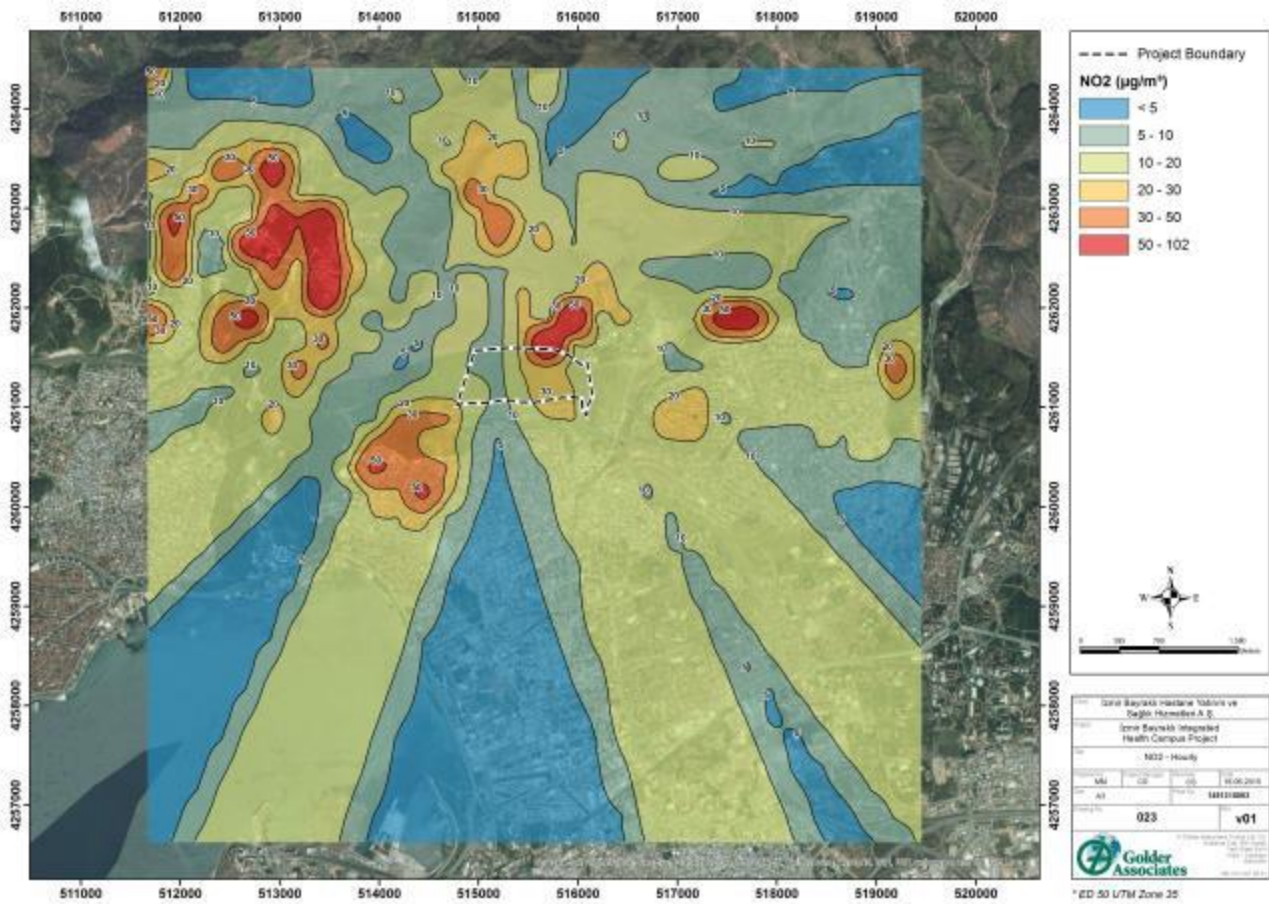


Figure 70: NO<sub>2</sub> Hourly

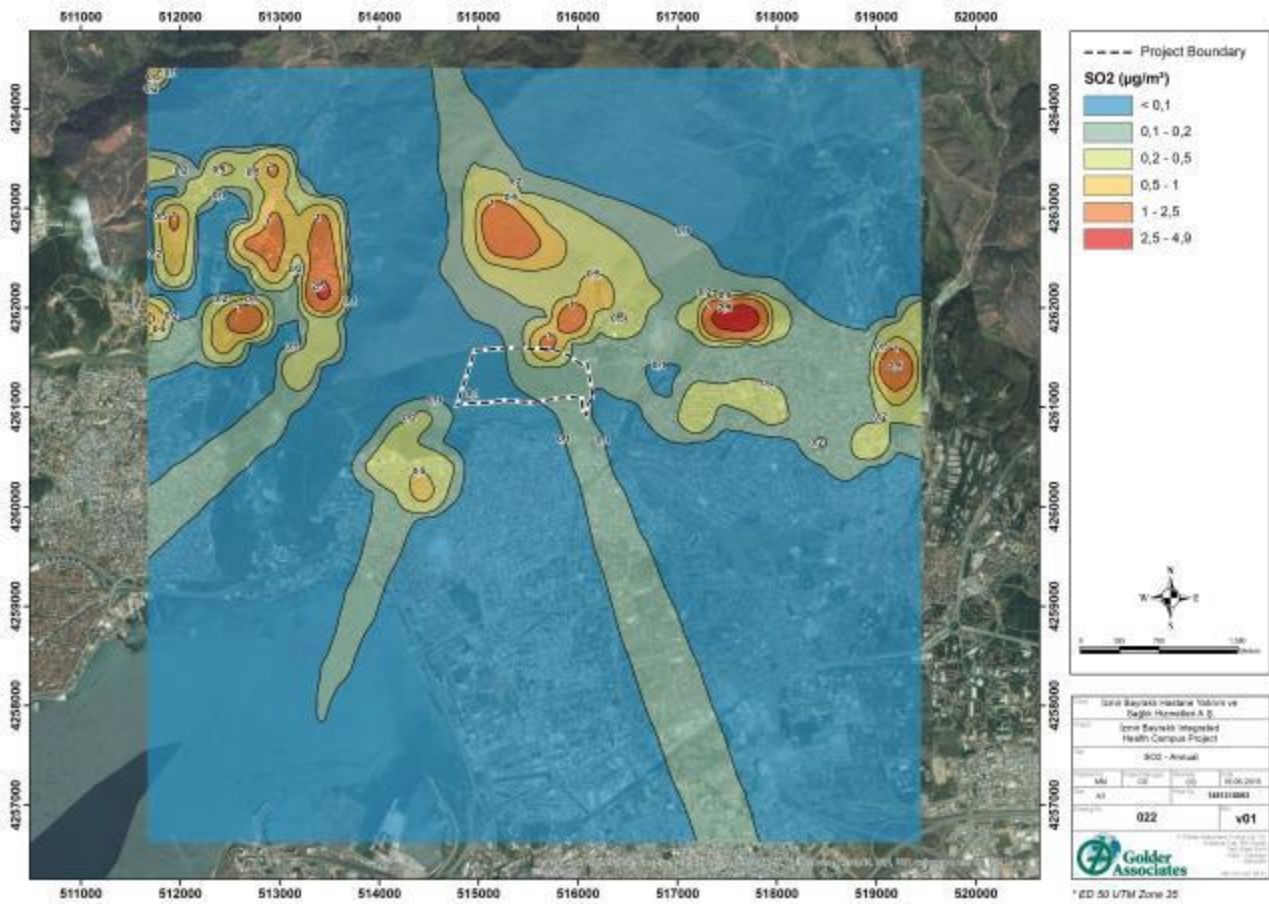


Figure 71: SO<sub>2</sub> Annual

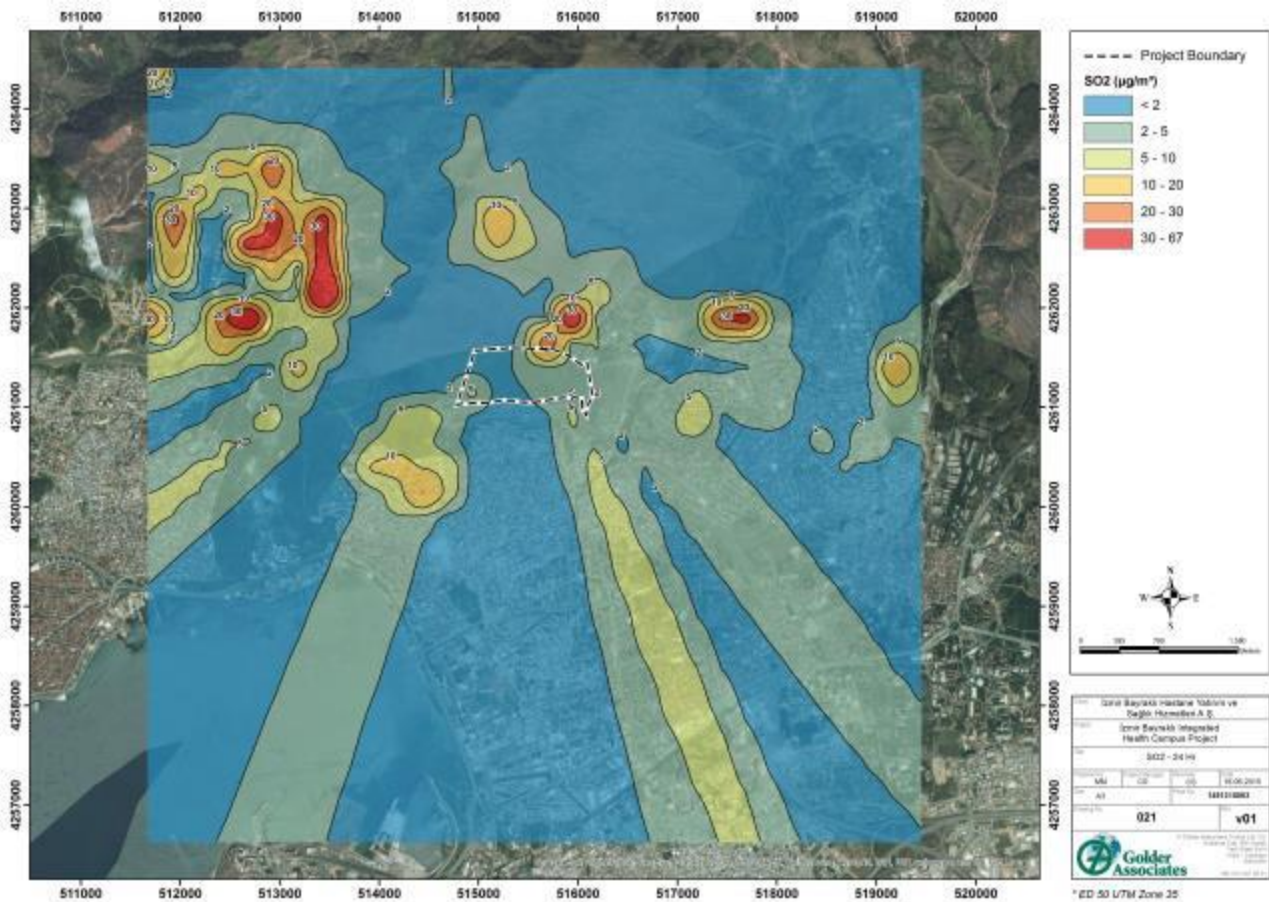


Figure 72: SO<sub>2</sub> Daily

## NOISE EMISSION MODELLING

### Construction Phase

Exact number of construction machinery cannot be estimated at this phase of the project. For the purpose of assessment for the worst case, maximum amount of machinery and equipment is located in the project area and this scenario is modelled where all noise sources are working at the same time.

The sound power levels of construction machinery are obtained from library of SoundPLAN Essential 3.0 software as given below table and figures.

**Table 106: Expected Sound Levels of Machinery and Equipment to Be Used During Construction**

Machinery / Equipment	Number	Expected Sound Level dB (L <sub>w</sub> ) (*)
Concrete Mobile Pump	5	109
Concrete Stationary Pump	6	109
Bulldozer	2	114
Excavator	16	105
Wheeled Loader	1	113





Tracked Loader	1	115
Backhoe Loader	4	111
Truck (26 m3)	36	94
Truck (20 m3)	9	94
Lorries (18-wheeler)	2	94
Hi-Ups (30 tons)	2	116
Tractor	4	94
Grader	1	114
Air Compressor	7	103
Forklift	4	100
Telescopic Forklift	3	100
Generator (250 kV)	15	102
Generator (400 kV)	5	102
Roller	1	112
Paver	1	112
Bobcat	2	105
Tower Crane	23	105
Mobile Crane	10	105
Elevator	7	
Concrete Placing Boom	10	71.6
Water Tanker	4	93.7

Noise calculations are undertaken to predict noise levels due to the proposed project works at the closest noise sensitive receptors which are the residential buildings. The residential buildings are very close to the east and south of the boundary of the project area as shown in Figure 10. The predicted sound levels were compared with the measured ambient noise levels in the project area and at the sensitive receptors. Noise modelling study has been conducted using SoundPLAN Essential 3.0 software and according to ISO 9313-2:1996.<sup>59</sup>

The model calculation area (i.e. study area) has dimensions of 2.5 x 1.7 km and covers receptors 500 m away from the project area as shown below figure. The calculation area covers the residential buildings around the project area.

<sup>59</sup> ISO 9613-2: Acoustics -- Attenuation of sound during propagation outdoors - Part 2: General method of calculation, ISO, 1996

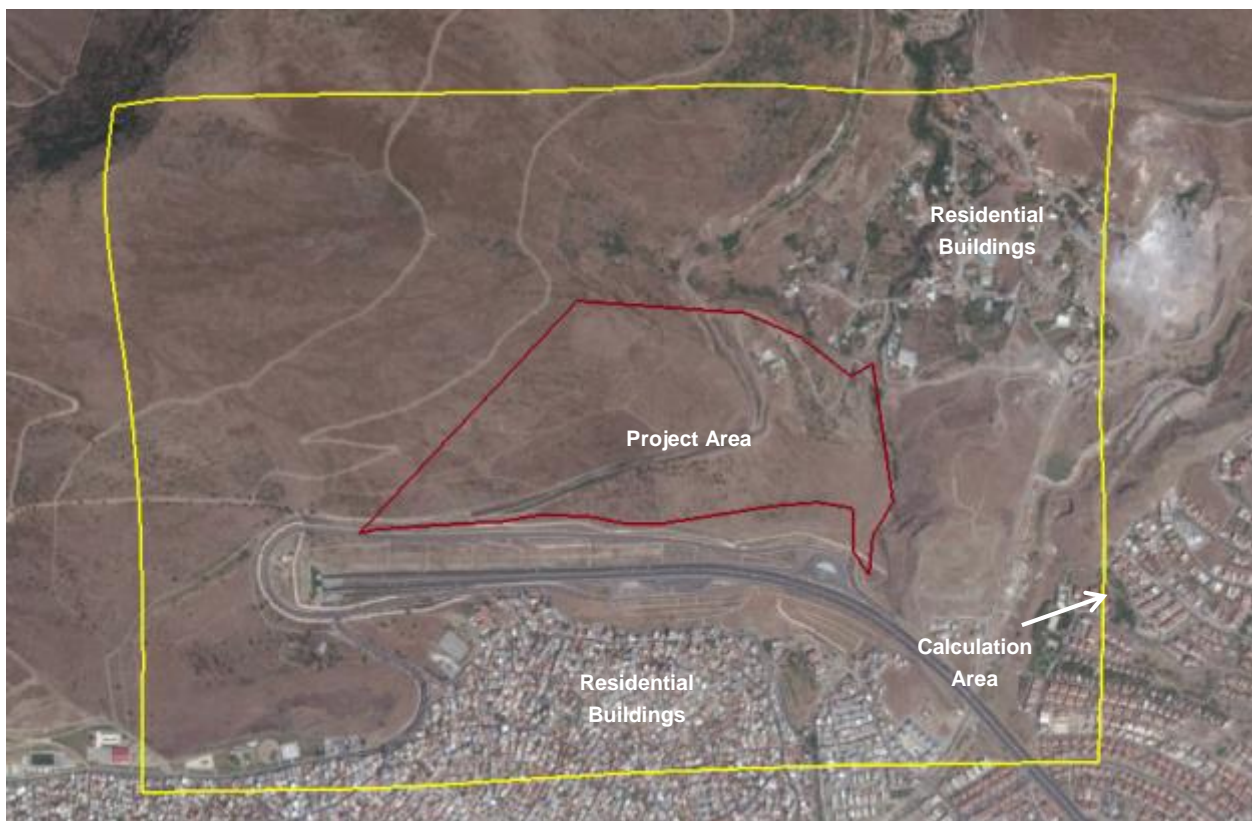


Figure 73: Model domain

To run the model it is necessary to provide some input information about meteorological conditions, source details and receptors. The data used in SoundPLAN software to create the model is given in below table.

Table 107: Model Inputs

Model Input	Data Source
Receptor Locations	Established from aerial photo of the surrounding area (Google Earth view) and site visits
Machinery and Equipment	Number and type of the machinery/equipment are provided from the project owner and sound levels of them are determined from SoundPLAN software
Topography	1/25,000 scaled topographical map from General Command of Mapping
Calculation Method	ISO 9613-2: 1996
Temperature (°C)	17.9
Relative Humidity (%)	61.6
Air Pressure (bar)	1011



Following conditions are assumed during modelling study:

- The model provides for the prediction of sound pressure levels based on down-wind (worst-case) conditions and other conditions favourable for noise distribution according to the ISO standard. In case of a wind blowing from the receptor towards the noise source, noise levels will be significantly lower than the calculated level;
- Weather conditions which may create additional noise (rain, wind etc.), existing trees or buildings are not considered during the model.
- It is assumed that all noise sources will be operating continuously with a 100% on-time. Consequently, the noise level predictions are considered to be conservative, that is, levels higher than what would be expected from actual operations.

As mentioned above, topographical information of the project area and surrounding are entered to the model. Each noise source is used as single point source in the noise model as shown below figure. The closest residential regions to the project area are entered as receptor in the model to calculate sound level there. The closest residential building is located about 35 m north-east of the project area.

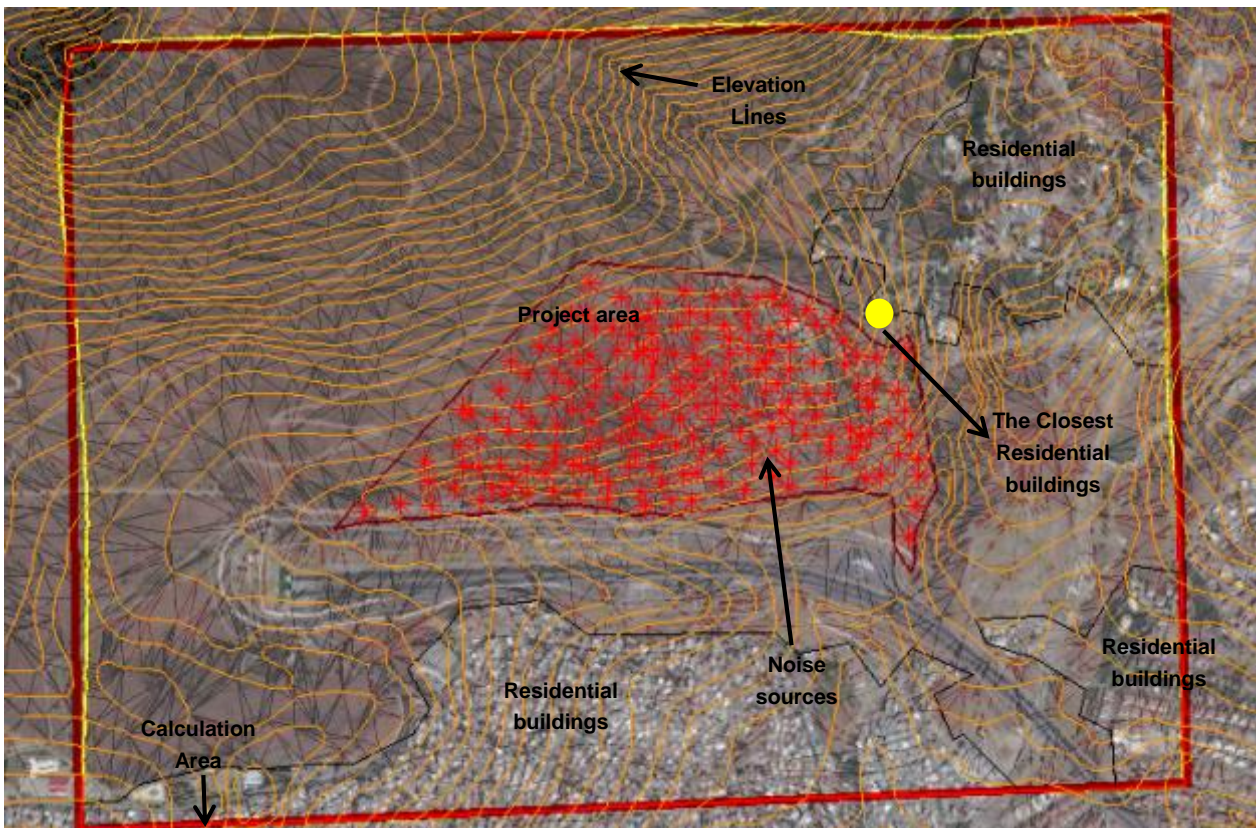


Figure 74: Model layout for construction phase

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

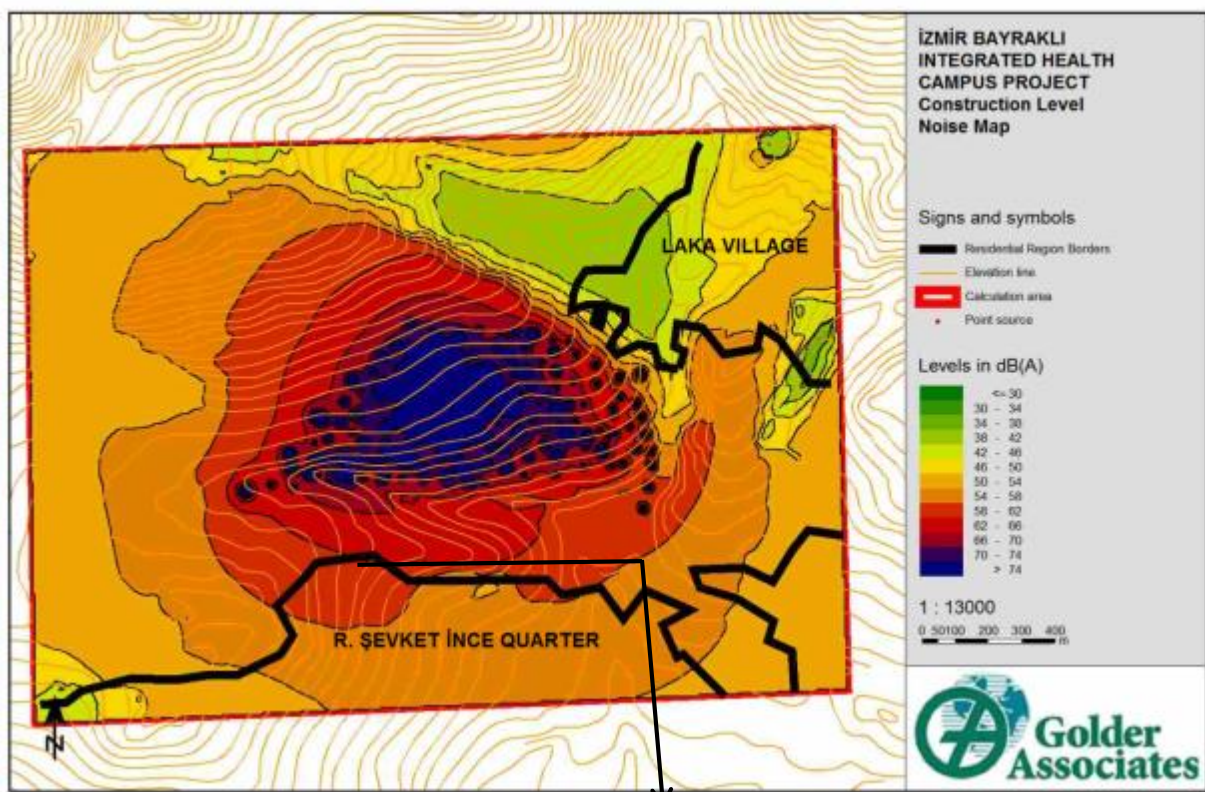




Table 108: Ambient Noise Limits of Turkish Legislation for Construction Sites

Activity (construction, demolition and renovation)	L-day (dBA) Day-time
Building	70
Road	75
Other Sources	70

Based on the calculations, the highest noise level in the residential region is about 62 dBA at south of the project area as shown in below figure. This result complies with the 70 dBA limit. The actual noise levels at Project Site is expected to be lower than the calculated value since all equipment/machinery will not be operated at the same time in the project area and natural noise barriers like trees, vegetation or meteorological conditions will prevent noise to be dispersed.



The highest noise level calculated in the residential region

As described under the baseline results in Section 8.1.8 and as it is seen from Figure 10, N(24)-4 is the nearest measurement location to the point where the highest noise level is calculated. Day time noise levels measured at this location are 67.5 dBA (09:00 – 17:00) and 67.4 dBA (07:00 - 22:00). Hence, calculated noise level is not greater than the baseline level and will not create additional noise higher than the regulatory limit.



### Commissioning and Operation Phase

Only project unit having possibility to create noise is the trigeneration plant with an estimated maximum installed capacity of 4 MWt, described in Section 4.2.1. Estimated noise level of the trigeneration plant is 92 dBA according to the from library of SoundPLAN Essential 3.0 software<sup>60</sup>. As compared to the construction phase model results, operation phase noise level in the surroundings will be much lower and no exceedances in relation applicable standards are expected in the ambient noise levels.

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

The sound power levels for operation phase are obtained from library of SoundPLAN Essential 3.0 software as given below table and figures.

**Table 109: Expected Sound Levels of Machinery and Equipment to Be Used During Construction**

Machinery / Equipment	Number	Expected Sound Level dB (L <sub>w</sub> ) (*)
Trigeneration Plant	2	92
1 helicopter	1	112.1
Ambulance	5	102.5

Noise calculations are undertaken to predict noise levels due to the proposed project works at the closest noise sensitive receptors which are the residential buildings. The residential buildings are close to the east and south of the boundary of the project area as shown in Figure 10. The predicted sound levels were compared with the measured ambient noise levels in the project area and at the sensitive receptors. Noise modelling study has been conducted using SoundPLAN Essential 3.0 software and according to ISO 9313-2:1996.<sup>61</sup>The model calculation area (i.e. study area) has dimensions of 2.5 x 1.7 km and covers receptors 500 m away from the project area are as shown below figure. The calculation area covers the residential buildings around the project area.

To run the model it is necessary to provide some input information about meteorological conditions, source details and receptors. The data used in SoundPLAN software to create the model is given in below table.

**Table 110: Model Inputs**

Model Input	Data Source
Receptor Locations	Established from aerial photo of the surrounding area (Google Earth view) and site visits
Machinery and Equipment	Number and type of the machinery/equipment are provided from the project owner and sound levels of them are determined from SoundPLAN software
Topography	1/25,000 scaled topographical map from General Command of Mapping
Calculation Method	ISO 9613-2: 1996
Temperature (°C)	17.9
Relative Humidity (%)	61.6

<sup>60</sup> Power Stations (Generator Turbine Room)

<sup>61</sup> ISO 9613-2: Acoustics -- Attenuation of sound during propagation outdoors - Part 2: General method of calculation, ISO, 1996



Model Input	Data Source
Air Pressure (bar)	1011

Following conditions are assumed during modelling study:

- The model provides for the prediction of sound pressure levels based on down-wind (worst-case) conditions and other conditions favourable for noise distribution according to the ISO standard. In case of a wind blowing from the receptor towards the noise source, noise levels will be significantly lower than the calculated level;
- Weather conditions which may create additional noise (rain, wind etc.), existing trees or buildings are not considered during the model.
- It is assumed that all noise sources will be operating continuously with a 100% on-time. Consequently, the noise level predictions are considered to be conservative, that is, levels higher than what would be expected from actual operations.

As mentioned above, topographical information of the project area and surrounding are entered to the model. Each noise source is used as single point source in the noise model as shown below figure. The closest residential regions to the project area are entered as receptor in the model to calculate sound level there. The closest residential building is located about 35 m north-east of the project area.



**Model Layout for Operation Phase**

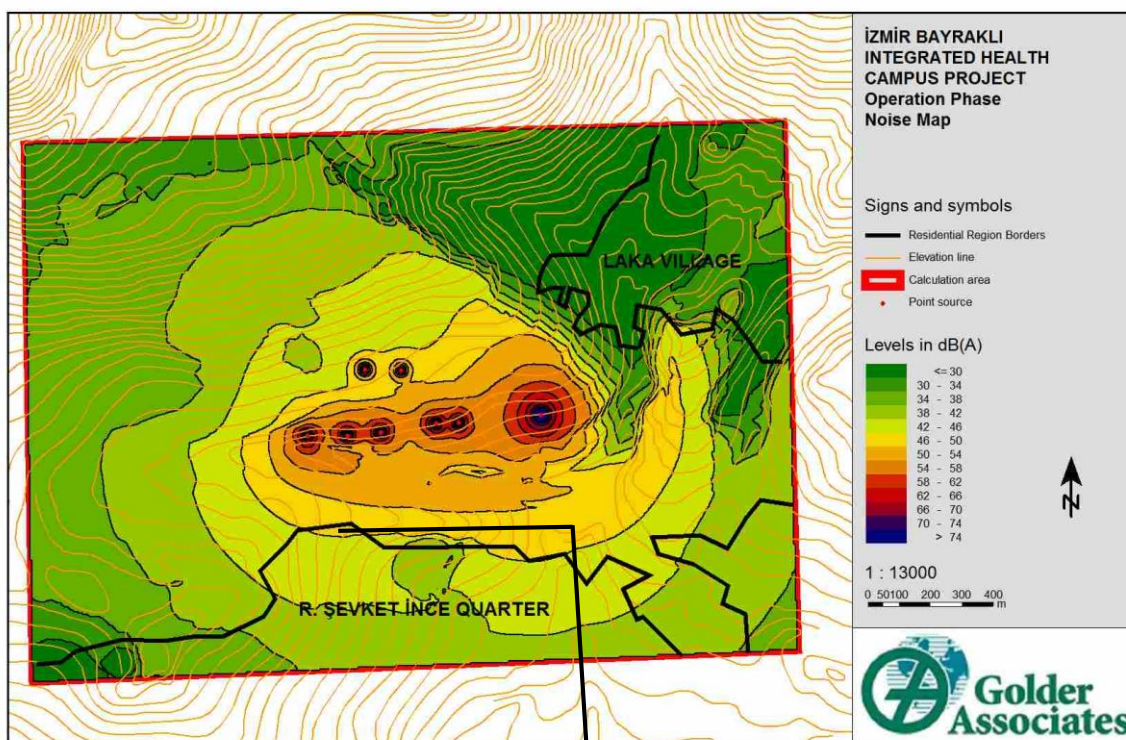
The Regulation on Assessment and Management of Environmental Noise provides noise emission limits for “Noise sensitive areas where education, culture and health facilities and recreational areas are densely





located” as presented in the Table 13. Accordingly, level of the noise generated by the operation of the Project should not exceed 65 dBA. The Noise level modelled at the closest residential building (35 m north of the project site) is 34 dBA.

Based on the calculations, the highest noise level in the residential region is about 46 dBA at south of the project area as shown in below figure. This result complies with the 65 dBA limit. The actual noise levels at Project Site is expected to be lower than the calculated value since all sources will not be operated at the same time in the project area and natural noise barriers like trees, vegetation or meteorological conditions will prevent noise to be dispersed.



The highest noise level calculated in the residential region

As described under the baseline results in Section 8.1.8 and as it is seen from Figure 10, N(24)-4 is the nearest measurement location to the point where the highest noise level is calculated. Day time noise levels measured at this location are 67.5 dBA (09:00 – 17:00) and 67.4 dBA (07:00 - 22:00). Hence, calculated noise level is not greater than the baseline level and will not create additional noise higher than the regulatory limit.

According to the IFC EHS Guideline, It should be maximum increase in background levels of 3 dB at the nearest sensitive receptor. Since it is the most stringent limit, IFC limit will be taken into consideration during the operation phase.

The Project is already located at nearby the highway. Current noise and model results for operation have been assessed cumulatively which reflects the total impact of noise related to highway and operation of hospital. Golder aware that, there will be additional traffic movements related to operation of the hospital. In addition, Golder also took all machinery and equipment work at the same time and a specific point location into consideration at construction phase. According to the Golder's experience and specialist, it is



conveniently thinkable that additional traffic at operational stage will not be an issue in terms of noise due to the below justifications:

- The road is a divided highway, which means that the direction of the traffic flow is both from east – west and west – east.
- There has already been public transportation services to the Project area.
- Lack of the assessment of how many heavy grant and light vehicle movements will occur during the operation phase in and nearby the hospital campus.
- Emission sources are not point source.
- Lack of knowledge of the average speeds of the passing cars.

There will also be monthly noise monitoring at sensitive receptors during the operation phase. In case of any exceedance of limit values, as a stakeholder the Metropolitan Municipality will be informed and SPV will coordinate with the Municipality to set up noise barriers.



# APPENDIX N

## Environmental and Social Action Plan (ESAP)





# APPENDIX O

## Correspondences

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

For more information, visit [golder.com](http://golder.com)

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](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

**Golder Associates (Turkey) Ltd. ŞTI**  
**Hollanda Cad. 691. Sok. Vadi Sitesi No:4**  
**Yıldız 06550 Ankara**  
**Turkey**  
**T: +90 312 4410031**

