



# Environmental and Social Impact Assessment for the İstanbul İkitelli Integrated Health Campus Project

Draft ESIA Report

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Sağlık Hizmetleri  
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A Company of



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## 1.0 INTRODUCTION

### 1.1 Background and Objective

This document is the Draft Environmental and Social Impact Assessment (ESIA) Report for the İstanbul İkitelli Integrated Health Campus Project (IHC or Project) located in the Basakşehir District of İstanbul Province in Turkey. The Project location is provided in Figure 1-1. The Project will be developed by IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.



Figure 1-1: Project location (yellow shaded area and yellow lines indicate the boundaries of the Project site)

The Project will comprise of the construction of a General Hospital, a Children's Hospital, a Women's Hospital, an Oncology Hospital, a Neurological and Orthopedic Sciences Hospital, a Cardiovascular Hospital, a Psychiatric Hospital and a Physical Therapy and Rehabilitation Hospital with a total capacity of 2,682 beds. The Project will also include a diagnostic and treatment block, one technical service building, administration area and conference hall and a cogeneration unit building. In addition, social and commercial areas, a hotel and convention centre, a medical hotel

and a mosque will be developed within the Project area in the future, however planning of these units are still ongoing.

The Ministry of Health (MoH) has tendered a bid for the implementation of the Project as a public private partnership model, which was awarded to a joint venture whose members established a Special Purpose Vehicle named IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC). The Project's agreement has been signed between the MoH and IHIC on March 25<sup>th</sup>, 2013.

Under the terms of the agreement with the MoH, IHIC will be responsible for the design, construction, equipping, financing, maintenance and operation of the IHC (jointly with the MoH) for a 28-year contract period (covering a construction period of 3 years and an operation period of 25 years). IHIC will be responsible from support services and clinical support services, while the provision of clinical services will be under the responsibility of the MoH during the operation period. At the end of the contract period, the IHC will be transferred to the MoH. Further details of the Project are provided in *Chapter 2: Project Description*.

The purpose of the ESIA is to describe the Project, identify the environmental and social impacts that will or may occur as a result of the Project and determine mitigation measures that can be taken to avoid and/or minimize the adverse impacts.

IHIC is seeking financing from multinational financial institutions (FIs) including export credit agencies to fund the development of the Project. In order to meet the requirements of various international institutions, IHIC has commissioned ELC Group Consulting and Engineering Inc. (ELC) to undertake the ESIA study.

## **1.2 National Environmental Impact Assessment Requirements**

In terms of the Turkish regulatory requirements, hospital projects were scoped out from the 2008 Turkish Environmental Impact Assessment (EIA) Regulation (Official Gazette date/number 17.07.2008/26939). This regulation has been recently replaced with a new EIA Regulation (Official Gazette date/number 03.10.2013/28784) that now requires hospital projects to conduct an EIA study. Correspondence conducted with the Ministry of Environment and Urban Planning (MEUP) as part of the ESIA stakeholder engagement process revealed the following condition: "When hospital projects that were included in the public investment program are evaluated, it is found appropriate to scope out these projects from the EIA Regulation if it is documented that the project bidding process is completed before the issue date of the EIA Regulation. In order to record and evaluate the scoped-out activities by "Online EIA Process Management System", detailed information related to the Project (name, province, location of the Project, name and address of the Project owner, tax office and tax ID Number of the Project owner, capacity of the Project, summary of the Project, partnership Agreement with the Ministry of Health (if available), detailed information about the bidding process) needs to be submitted to MEUP". The official correspondence MEUP letter is included in Annex A. IHIC has submitted an application to MEUP (dated 31.01.2014) informing MEUP about the completion of the bidding process before the issue date of new EIA regulation and asking for obtaining an EIA exemption letter. However, apart from the main Project, associated facilities such as concrete plants, cogeneration plant may be subject to Turkish EIA requirements depending on their capacities. These conditions are discussed in relevant section of Annex B: Environmental, Health, Safety and Social Legislation Review.

### 1.3 ESIA Requirements

IHIC has approached international lenders for project financing, which require the assessment of environmental and social impacts and risks of the Project through an ESIA study as well as proposing mitigation measures appropriate to the nature and scale of the Project to be included in the accompanying Environmental and Social Management Plan (ESMP). The ESIA report and the ESMP will then be used as a basis by the lenders for the environmental and social appraisal of the Project. The ESIA has been prepared to meet the requirements of the following international standards:

- IFC Performance Standards on Social and Environmental Sustainability (1 January 2012)
- IFC General Environmental, Health and Safety Guidelines (30 April 2007)
- IFC Environmental, Health and Safety Guidelines for Healthcare Facilities (30 April 2007)

In addition to these standards, the Project must comply with the Turkish environmental and social legislation. The applicable national laws and regulations have been compiled in a regulatory framework document provided in Annex B.

### 1.4 Key Steps of the ESIA process

#### 1.4.1 Overview

The integration of environmental and social considerations into the project cycle is an essential part of all projects that aim to contribute to sustainable development. An ESIA process is accepted as being the most effective way of achieving this integration. ESIA is a systematic process that predicts and evaluates the impacts of a project on various aspects of the physical, biological, cultural and socioeconomic environment. This is followed by the identification of appropriate mitigation measures to avoid, reduce, remedy, offset or compensate for adverse impacts relevant to the nature and scale of the project. The key steps of the ESIA process are presented in Figure 1-2.

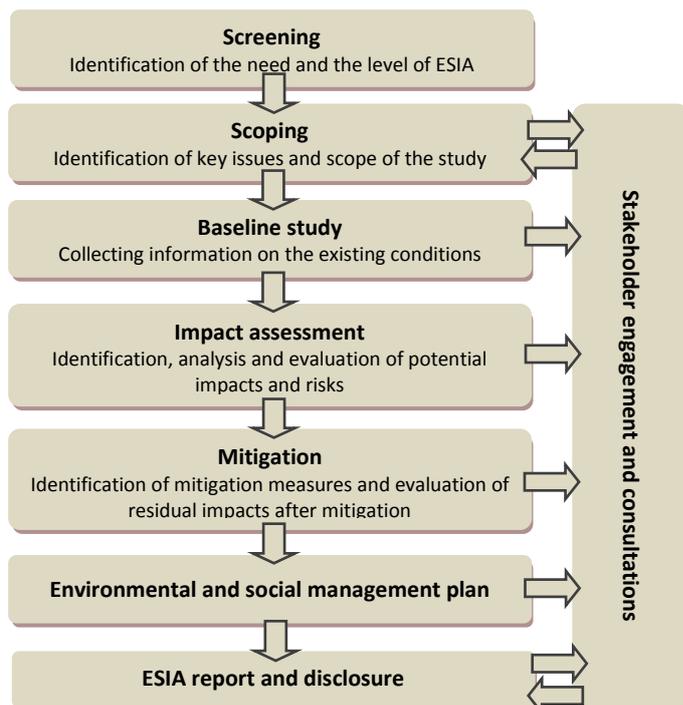


Figure 1-2: ESIA process

Information provided in the following sections describes the key steps outlined above and presents the approach adopted by the present ESIA study.

### 1.4.2 Screening

The first step in the ESIA process is the screening stage which determines whether an impact assessment is required to be undertaken for a specific project. This is in general determined by referring to the FIs categorization lists, including types of activities and if the project activity is found to be included in these lists, then an ESIA is undertaken. As IHC has approached potential lenders who require an ESIA study, there is a need to undertake this study to meet the requirements of the lenders.

### 1.4.3 Scoping

Scoping is a crucial step in an ESIA process that identifies the key issues to be addressed in the ESIA study. Scoping involves defining the impact topics that should be addressed in the assessment as well as those of little or no relevance to the project. Scoping is the stage at which consultations with stakeholders are initiated, which is an important part of the ESIA process.

The following topics are important in undertaking the scoping and assessment study:

**Area of Influence:** The area of influence covers all activities in the primary project site and the ancillary facilities to be installed/used as part of the project. The IHC Project's area of influence has been identified to include:

- all hospitals and diagnostic and treatment block
- ancillary facilities (cogeneration plant)
- surrounding communities and facilities
- the construction activities of the Project including construction traffic, material supply and waste disposal, and infrastructure used during the construction of the IHC
- the operational activities of the Project including operational traffic and waste disposal, and infrastructure used during the operation of the IHC

**Aspects of the environment:** The environmental aspects include the physical environment (e.g. geology, hydrology, hydrogeology, soils, air, noise, vibration, light), the biological environment (e.g. aquatic and terrestrial habitats and flora/fauna, protected areas), the cultural environment (e.g. archaeological sites), the socioeconomic environment (e.g. people, employment, income), and health and safety of the workers and patients.

**Types of impacts:** Types of impacts resulting from the Project include the following:

- impact outcome: beneficial or adverse
- time aspect: permanent impacts (e.g. loss of land), temporary impacts (e.g. dust during construction phase) and long-term impacts (e.g. noise during the operation phase)
- nature of impact: Direct impacts arising from the project (e.g. air, noise pollution), indirect impacts as a consequence of other changes that occur by the project (e.g. influx of population due to workforce), and induced impacts (e.g. industrial development stimulated by the project)
- non-routine impacts (e.g. earthquakes, accidental events)

- cumulative impacts arising from further planned development of the project or any other existing/planned projects

A scoping study has been conducted as part of the ESIA study and a Scoping Report was issued in November 2013. The report is based on the review of the available project documentation provided by IHIC, environmental and social information collected through secondary sources and field surveys, and review of international standards. The results of the scoping study are presented in *Chapter 4: Scope of the ESIA and Stakeholder Engagement*.

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

The next step of the ESIA process is the collection of data to establish the existing baseline conditions (i.e. conditions in the absence of the proposed development), whereby the impacts of construction and operation of the project can be assessed against. In undertaking the ESIA study, information on the current environmental and social baseline conditions was gathered using the following sources:

- technical reports prepared by IHIC and its consultants
- secondary data sources (existing published materials and documents, maps by the government agencies, research organizations and other relevant organizations)
- review of aerial photographs of the Project area and its surroundings
- field study results

The baseline data collection started during the scoping phase and continued to support the assessment process. Baseline studies and their results are described in the relevant chapters of the ESIA.

#### **1.4.5 Assessment of Impacts**

Assessment of likely impacts is undertaken by determining the value/sensitivity of resources/receptors that are affected, predicting the magnitude of impacts and evaluating the significance of impacts. This is followed by proposing mitigation measures for key significant impacts and assessing whether any residual impacts remain after the implementation of the mitigation measures.

Assessment of impacts was undertaken based on the results of the scoping study. The assessment evaluates environmental and social changes as a result of the Project from the established baseline. The assessment reviews all of the possible impacts and determines which impacts are likely to be significant.

The impact magnitude depends on the degree and extent to which the project changes the environment and usually varies according to the project phase. There are various factors to be considered in determining the magnitude of impact, including but not limited to the following:

- area of influence
- deviation from existing baseline conditions
- sensitivity and importance of the receptors and resources
- nature, scale, extent, frequency and duration of the change
- duration and timing of the project

The impact magnitude is quantified on the basis of the factors listed above to the extent practicable. Depending on the nature of impact, the impact magnitude is predicted by mathematical models (e.g. noise, air quality) and by professional judgment for those impacts that cannot be represented by mathematical models (e.g. impacts on ecology). The criteria to determine the impact magnitude for physical, biological, cultural and social environments are described in Table 1-1 below. When determining the impact magnitude, conservative assumptions are often used to ensure that impacts are not underestimated.

Table 1-1: Criteria used to determine the impact magnitude

<b>Magnitude</b>	<b>Description</b>
<b>Physical Environment</b>	
Negligible	Impacts that lead to imperceptible changes in baseline conditions
Small	Temporary or short term impacts that are localized to the immediate project area that physical environment will return to its original conditions once the impact ceases
Medium	Temporary or short term impacts that go slightly beyond the limits of the project area and/or that are above the defined regulatory limit values, however long term integrity of any resource/receptor/process is not threatened
Large	Impacts that result in an order of magnitude change on physical environment in a wider scale, that exceed the defined regulatory limit values and irreversible
<b>Biological Environment</b>	
Negligible	Impacts that lead to imperceptible changes in baseline conditions
Small	Temporary impacts on a number of species that are common in the area and does not affect overall population, localized habitat loss
Medium	Impacts resulting in changes in the population of the species that are common in the area, long term integrity of the population is not threatened
Large	Impacts on legally protected and rare/threatened/endangered species and there is no possibility of recovery
<b>Cultural Environment</b>	
Negligible	No direct impact on assets
Small	Minor changes to assets with limited number of damages
Medium	Moderate changes to assets with important number of damages
Large	Severe damage or loss of assets
<b>Socio-economic Environment</b>	
Negligible	Impacts that are imperceptible to communities or socio-economic values
Small	Temporary impacts that are reversible and do not affect communities or socio-economic values
Medium	Impacts to communities or socio-economic values that bring change in status but do not threaten overall stability of communities or assets
Large	Impacts to communities or socio-economic values that bring long term change in status

Criteria related to the value/sensitivity of the resources/receptors are described in Table 1-2.

Table 1-2: Criteria related to value/sensitivity of the resources/receptors

Value or sensitivity of the affected resource or receptor	Description
<b>Physical Environment</b>	
Negligible	Physical resources/receptors that are resistant to change
Low	Physical resources/receptors that can return to its original conditions after the impacts and that are not important to the wider physical environment
Medium	Physical resources/receptors that are important in the region and can return to original conditions naturally over time after the impacts
High	Physical resources/receptors that cannot return to their original conditions after the impacts
<b>Biological Environment</b>	
Negligible	Biological environment component that has no or very limited importance
Low	Biological environment component that are common to the area and not under protection
Medium	Biological environment component that are common and experiencing decline and not under protection
High	Biological environment component that are protected by national regulations and international standards and listed as rare, threatened or endangered
<b>Cultural Environment</b>	
Negligible	Assets/sites with very little or no surviving archaeological interest
Low	Assets/sites of limited value, undesignated assets/sites of local importance
Medium	Designated or undesignated assets/sites that are regionally important
High	Assets/sites that are protected by national legislation or included in UNESCO World Heritage Site lists
<b>Socio-economic Environment</b>	
Negligible	Assets are not significant regarding their resource, economic, cultural and social value
Low	Assets are not significant regarding their resource, economic, cultural and social value, and there are nearby alternatives to the affected assets
Medium	Assets are not significant in the overall project area but have local significant roles (asset base, livelihoods)
High	Assets are protected by national and international legislation

The significance of the impacts is decided upon once the impact magnitude and the value/sensitivity of the resource/receptor are determined. The impact significance is the product of (i) the value, importance or sensitivity of the resource or the system that might be impacted, and (ii) the magnitude of impact on that resource and system.

The impact significance has been assessed by taking into account the following:

- legislation, policies, guidelines and standards
- area of influence
- amount of resource affected
- persistence of impacts
- status of resources
- sensitivity of resources, regulatory status
- societal value

The evaluation of significance is illustrated in Table 1-3.

Table 1-3: Evaluation of significance

Value or sensitivity of the affected resource or receptor	Magnitude of impact			
	Negligible	Small	Medium	Large
Negligible	Not significant	Not significant	Not significant	Minor
Low	Not significant	Not significant	Minor	Moderate
Medium	Not significant	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

For the purposes of this assessment, impacts have been categorized as follows:

- Not significant: Impact does not require any control.
- Minor Impact: Impact can be controlled using good practice management measures.
- Moderate Impact: Impact can be reduced to a reasonable level (as low as reasonably practicable) by applying feasible and cost effective mitigation measures.
- Major Impact: This is an impact for which no further mitigation is possible and there is a requirement to provide compensation or offset measures.

Significance criteria for each type of impact are presented in the relevant chapters of this report, as needed. Impacts have been assessed for key phases of the Project from initial site preparation and advance works, through construction to operation of the IHC. Decommissioning of the Project is not assessed as the IHC is envisaged to remain in place and in operation for the foreseeable future.

#### 1.4.6 Identification of Mitigation Measures

A principal objective of the ESIA is to identify ways of reducing the impacts of development. For this reason, subsequent to the assessment of identified impacts, mitigation measures for each impact are defined in order to avoid, minimize or remedy the significant impacts. Mitigation measures also include measures to provide environmental and social benefits. The residual impacts that are likely to remain after implementation of mitigation measures are then assessed based on the same criteria mentioned in Section 1.4.5.

Mitigation can be carried out by changes in the design, engineering modifications, and adoption of measures to address the specific impacts. During the ESIA, mitigation measures have been identified based on the Turkish regulatory requirements, IFC requirements and international best practice. The identified measures are discussed and agreed with IHIC and are presented in the ESMP provided in Annex C. Implementation of the measures identified in the ESMP will be monitored by IHIC during the construction and operation phases of the Project in order to ensure the effectiveness of these measures.

#### 1.4.7 Uncertainties

This ESIA is prepared based on the Project information received from IHIC and a description of the Project is made in *Chapter 2* according to this information. The description of the Project is based on the bidding documentation and conceptual design documents made available to ELC. The detailed design of the Project is currently ongoing. Due to the fact that the designs are still in

progress, there is a possibility that unaccounted aspects may arise as the designs are finalized. However, significant changes in the design of the hospitals are not expected to occur, and all the hospitals and other abovementioned units will be located within the identified Project area and have been considered during the scope of impact assessment. It is not expected therefore that the present uncertainties will have a considerable effect on the identified impacts of the Project. On the other hand, in order to address the uncertainties, monitoring will be undertaken by IHIC to understand whether the identified mitigation measures are sufficient or there is a need for refinement of any mitigation measure(s).

#### **1.4.8 Environmental and Social Management Plan (ESMP)**

The ESMP is a significant part of an ESIA in which all the identified mitigation measures are outlined for the adverse impacts for each phase of the project. An ESMP has been developed as part of the ESIA study, which includes description of the mitigation measures, responsible parties for the implementation of the mitigation measures, the timing, monitoring and audit requirements. The ESMP focuses on the avoidance of impacts, and where this is not possible, presents technically and financially feasible and cost-effective mitigation measures to minimize or reduce possible impacts to acceptable levels. The ESMP of the Project is presented in Annex C of this report. The ESMP will be kept up to date with any required additional mitigation throughout the Project.

Implementation of the ESMP will be accomplished by conducting a Project specific Environmental and Social Management System (ESMS) during the construction and operation phases of the Project, which will be developed by IHIC in accordance with the requirements of international standards (i.e. for quality: ISO 9001, for environment: ISO 14001 and for occupational health and safety: OHSAS 18001). Brief information on the environmental and social management is presented in *Chapter 17: Environmental and Social Management*.

#### **1.4.9 Stakeholder Engagement**

The stakeholder engagement is an integral and crucial part of an ESIA process, aiming to provide an opportunity to affected and/or interested individuals, groups and organizations to express their views and concerns about the project, which are taken into account during the assessment of impacts and identification of mitigation measures. According to international best practice, stakeholder engagement is recommended to start with the scoping phase and to continue throughout the ESIA process. IFC Performance Standard 1 describes stakeholder engagement as an on-going process during the life of project involving the disclosure of information.

A stand-alone Stakeholder Engagement Plan (SEP) has been developed for the Project, to help structure a systematic communication with the stakeholders during the ESIA study (dated November 2013). Within the scope of the SEP, stakeholders were identified including governmental authorities and non-governmental organizations (NGOs) at national, regional and district level, and local communities. A Project Information Document and a Project Information Leaflet were prepared and sent to the identified stakeholders via mail, and they were asked to comment on the Project, its potential impacts and to provide information that may be important for the ESIA study. Responses that were received from some of the stakeholders are compiled in a register and presented in Annex D. The details of stakeholder engagement activities undertaken as part of the ESIA study are presented in *Chapter 4: Scope of the ESIA and Stakeholder Engagement*. Furthermore, a Project specific website has been established where the Project Information

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Document, Project Information Leaflet and comment forms are made available to the public (<http://www.ikitellisehirhastanesippp.com/>).

## 1.5 Next Steps

The Non-Technical Summary of the Final Draft ESIA Report will be made available in Turkish to the public for review and comments. A public meeting to be announced at least two weeks in advance, may be held to inform the public on the results of the impact assessment study and the mitigation measures to be implemented. Comments received during the consultation process will be considered by the Project and the ESIA team, in consultation with the lenders. Appropriate comments will be taken into account to address the issues raised and the ESIA will be finalized accordingly. After completion of the ESIA process, IHIC will continue to engage with the stakeholders during construction and operation of the Project and outline plans for this are set out in the SEP.

## 1.6 Outline of the ESIA Report

The remaining chapters of the ESIA report are as follows:

- Chapter 2: Project Description
- Chapter 3: Institutional and Regulatory Framework
- Chapter 4: Scope of the ESIA and Stakeholder Engagement
- Chapter 5: Land Use and Zoning
- Chapter 6: Geology, Soils and Contaminated Land
- Chapter 7: Hydrology and Hydrogeology
- Chapter 8: Material Resources and Waste Management
- Chapter 9: Air Quality
- Chapter 10: Noise
- Chapter 11: Traffic Assessment
- Chapter 12: Ecology
- Chapter 13: Archaeology
- Chapter 14: Socio-economy
- Chapter 15: Community Health and Safety
- Chapter 16: Labor and Working Conditions
- Chapter 17: Environmental and Social Management

The ESIA report is supported by the following annexes:

- Annex A: Official Letter from Ministry of Environment and Urban Planning related to Turkish EIA Requirements
- Annex B: Environmental, Health and Safety and Social (EHSS) Legislation Review
- Annex C: Environmental and Social Management Plan (ESMP)
- Annex D: Stakeholder Engagement Activities
- Annex E: Project Description Supporting Information
- Annex F: Geology, Soils and Contaminated Land Supporting Information
- Annex G: Waste Management Plan
- Annex H: Air Quality Supporting Information
- Annex I: Noise Supporting Information

- 
- Annex J: Traffic Assessment Supporting Information
  - Annex K: Ecology Supporting Information
  - Annex L: Archaeology Supporting Information
  - Annex M: Socio-economy Supporting Information
  - Annex N: ESIA Team

## 2.0 PROJECT DESCRIPTION

### 2.1 Project Overview

#### 2.1.1 The Project Proponent

The Project Proponent IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC) was established as a Special Purpose Vehicle (SPV) by the members of a joint venture and was selected as the preferred bidder for the design, financing, construction, procurement and operation of the İstanbul İkitelli Integrated Health Campus (İkitelli IHC), under a Public Private Partnership (PPP) Agreement. Currently, IHIC is comprised of ten companies: Emsaş İnşaat Turizm Ticaret ve Sanayi A.Ş., Sürat Bilişim Teknolojileri Sanayi Ticaret A.Ş., PBK Architects Inc., Ascension Group Architects L.P., Allen Shariff Corporation, Meinhardt Group, May Eczane, Forcimsa Empresa Constructora, S.A., Consortio Intenational Engineering Consultants and Şahin Tıp.

The core Sponsor, Emsaş, is currently holding advanced negotiations with interested international counterparties (Potential Shareholders) with the aim to bring in experienced sector operators and investors to the Project as shareholders of the Project Company and also as supplier of the medical equipment and as project operator. These parties are envisaged to acquire 45% of the shares while the original Sponsors will still remain the main shareholders of the Project Company with an aggregate of 55% shares. As stated in the table above, the foreseen new Shareholder Structure will consist of the following international counterparties:

- General Electric Co. (“GE” or “General Electric”, S&P AA+; Moody’s Aa3) will own 5%, and will provide medical equipment through its subsidiary GE Healthcare;
- Carillion Plc (“Carillion”), a UK company delivering facilities management and maintenance services for both hospitals and community health facilities, will own 20% through Carillion Construction Ltd; and
- Lloyds Bank European Infrastructure Partners LP (“LBEIP”), a fund investing equity in greenfield economic and social infrastructure projects, will own the remaining 20%. LBEIP is managed by Scottish Widows Investment Partnership (“SWIP”), one of Europe’s largest asset management firms.

The Project will comprise of the construction of a General Hospital, a Children’s Hospital, a Women’s Hospital, an Oncology Hospital, a Neurological Sciences and Orthopedic Hospital, a Cardiovascular Hospital, a Psychiatric Hospital and a Physical Therapy and Rehabilitation Hospital with a total capacity of 2,682 beds. The Project will also include a diagnostic and treatment block, one technical service building, administration area and conference hall, and a cogeneration building.

The Project’s agreement has been signed between the MoH and IHIC on March 25<sup>th</sup>, 2013. IHIC will be responsible for the design, construction, equipping, financing and maintenance as well as the provision of clinical support services and support services of the İkitelli IHC during the 28-year project period under the terms of the agreement with MoH; while the provision of clinical services will be the responsibility of the MoH. At the end of the 28-year contract period, the İkitelli IHC will be transferred to the MoH.

### 2.1.2 Background

The healthcare system in Turkey is being transformed under the Health Transformation Program (HTP) which was initiated in 2003. The purpose of this program is to increase the quality and efficiency of the healthcare system and enhance access to healthcare facilities with the introduction of a number of reforms. Within the scope of the HTP, the MoH has planned to develop 30 Health Campuses with different sizes and bed capacities in 22 provinces. The health campuses will serve 29 health regions in Turkey, which were determined based on the need for health services, geographical structure, patient flow, accessibility and socioeconomic conditions. For each health region, a province as the center of the health region and sub-provinces to be connected to the center province was identified. In the case of Istanbul Province, six different health regions have been established due to the high population of the province. Until now, 20 health facility projects have been initiated which are currently at different stages of planning and construction. İkitelli IHC Project is one of these 20 projects and will serve the 29<sup>th</sup> health region that covers Buyukcekmece, Kucukcekmece, Beylikduzu, Basaksehir, Silivri, Catalca, Esenyurt and Avcilar districts of Istanbul Province.

As part of the HTP, the MoH has considered health campus planning as a need based on the four main reasons as below:

- Effectiveness of health services across the country;
  - expanding the variety of treatment across the country and providing easy access
  - completing regional development in the field of health
  - improving the quality of service
  - providing cost-effective health services
- Needs of society;
  - sufficient number of beds and suitability of bed quality
  - service of specialized team for surrounding area
  - application of new treatment technologies
  - development of new concepts for treatment services (such as outpatient surgery, day hospital)
- Patients;
  - shortening the length of hospitalization
  - reducing patient transfers
  - reducing hospital infections
  - enhancing the safety of the patients
  - increasing patient satisfaction
- Workers;
  - increasing the safety and satisfaction of employees
  - increasing workforce and service quality
  - improving health service performance

Health campuses are regarded as health complexes that incorporate various types of hospitals with specialized staff, research and development laboratories and centers, social and cultural facilities, hotel, logistic support units, high levels of transport connectivity and parking facilities, accommodation and open space usage as a whole.

As mentioned above, the İstanbul İkitelli IHC will be implemented as a PPP model which is a Build-Lease-Transfer model that includes construction of health campuses in return for a rent not exceeding forty nine years, by the successful bidders based on a preliminary design and technical standards provided by the MoH. The relevant legislation for the PPP model is briefly discussed in *Chapter 3: Institutional and Regulatory Framework*. The PPP model is an investment and service model that is based on the long-term engagement between the government and private sector. Application of the PPP model in the health sector involves key elements including using financial resources of the private sector in public investments, integration of rapid decision-making and decision implementation skills of the private sector into the project process, sharing the risks between the government and private sector and shortening of the construction period for the health campuses which may take up to 10 years if implemented by the public sector.

### 2.1.3 Need for the Project

Istanbul Province is located in the Marmara Region of Turkey with a surface area of 5,343 km<sup>2</sup>, of which 1,864.21 km<sup>2</sup> is located on the Thracian side and 3,478.79 km<sup>2</sup> is located on the Anatolian side. Istanbul Province is the most crowded city in Turkey with a population of 13,854,740 (2012 data) which is equal to 18% of the total population of the country. Total number of potential patients in Istanbul Province is high due to high per capita healthcare spending of the residents of Istanbul and high rate of urbanization in the province. Istanbul is also a healthcare hub for neighboring regions. Citizens in the surrounding provinces travel to Istanbul due to its central location and the lack of healthcare facilities in their hometowns. Accordingly, the occupancy rates exceed 100% in many hospitals run by the MoH in Istanbul.

As of 2013, there are 55 hospitals, 949 health centers, 3 health houses, 187 emergency response stations, 12 oral and dental health centers, 32 child and mother health and family planning centers, 4 public health centers, 28 tuberculosis combat centers and 28 blood centers in Istanbul that are affiliated with the MoH. Table 2-1 shows the numbers and bed capacities of hospitals affiliated with the MoH, university hospitals, private hospitals, and hospitals affiliated with the Ministry of Defence. As presented in Table 2-1, the total bed capacity of these hospitals is 32,999 (dated August 2013).

Table 2-1: Distribution of hospitals in Istanbul province

Type of Hospital	Number of Hospitals	Number of Beds
Hospitals affiliated with Ministry of Health	55	15,621
University Hospitals	12	4,239
Private Hospitals	159	11,903
Hospitals affiliated with Ministry of National Defence	3	1,236
<b>Total or Average</b>	<b>229</b>	<b>32,999</b>

Source: MoH, General Directorate of Health Services (according to the list dated 28.08.2013)

The bed occupation rates, average stay in hospitals and bed turnover information in the hospitals of the MoH are presented in Table 2-2. As can be seen in Table 2-2, the bed occupation rate in hospitals in Istanbul is higher than the Turkish average. In addition, when the hospitals of MoH are reviewed individually (excluding emergency observation and dialysis beds), it can be seen that the bed occupation rates in many clinics exceed 100% which results in delays in admission of patients to the hospitals and therefore affecting their treatment process.

Table 2-2: Comparison of hospital bed occupation rate and average stay durations

	Turkey		Istanbul	
	2002	2012	2002	2012
Bed Occupation Rate (%)	60.6	66.4	73.9	70.1
Average stay in hospital (days)	5.7	4.3	8.7	4.9
Bed turnover rate (patient)	38.5	56.3	31.0	52.0

Source: Ministry of Health, Annual Health Statistics – 2012

Although the number of patient beds is increasing in Turkey over the years, the number of beds per 10,000 people is decreasing as shown in Table 2-3. This reveals that the health investments provided between 2002 and 2012 were not sufficient to meet the needs as a result of increased population (10,553,738 in 2002 and 13,854,740 in 2012). Moreover, the value for the number of beds per 10,000 people is also low when compared to values in the world and European Union, as shown in Table 2-4. In order to close the gap across Turkey and in Istanbul Province, it can be confirmed that there is a need for undertaking new health investments.

Table 2-3: Comparison of hospital bed capacity per 10,000 People

	Total Number of beds				Number of beds per 10,000 people			
	2002		2012		2002		2012	
	MoH	All Hospitals	MoH	All Hospitals	MoH	All Hospitals	MoH	All Hospitals
Turkey	107,394	164,471	122,322	200,072	16.3	24.9	15.4	26.5
Istanbul	-	27,827*	15,621	32,999	16.2	28.6	11.1	23.3

Source: Ministry of Health, Annual Health Statistics – 2012, \*MoH, Inpatient Health Institutions, Annual Statistics 2002.

Table 2-4: Comparison of hospital bed capacity per 10,000 people with EU and World

World*	European Union*	Turkey (2012 data)	Istanbul (2012 data)
30	55.4	26.5	23.3

Source: Ministry of Health, Annual Health Statistics – 2012, \*2011 data.

Istanbul as the most crowded province of Turkey lacks modern healthcare infrastructure to meet the demand of its rapidly developing population with an expectation of high quality healthcare services. The hospitals affiliated with the MoH are listed in Table 2-5 with information on construction years, number of beds, total land area, closed area and closed area per bed. Existing hospitals affiliated with the MoH in Istanbul Province are very old and out-dated (i.e. Haydarpaşa Numune Hospital, one of the largest hospitals in terms of number of beds, is 118 years old). In addition, hospitals are located in the most built-up parts of the city and therefore are unable to physically expand. Moreover, these hospitals do not have adequate parking and green areas. Patient rooms are generally ward type. The ratio of available special rooms with one, two or maximum three beds that have a proper toilet facility is only 15% in MoH hospitals. Due to physical constraints, hospitals lack the flexibility to reduce the number of beds in patient rooms. Another important issue in the existing hospitals of the MoH is the lack of intensive care units. The total number of intensive care beds is 1,207 out of 15,621 beds making 7.7% of all beds in MoH hospitals which is lower than the MoH objective of 10%.

Table 2-5: Hospitals belonging to MoH in Istanbul

Hospital Name	Construction Year *	Number of beds	Total Land Area (m <sup>2</sup> )	Construction footprint area (m <sup>2</sup> )	Closed Area (m <sup>2</sup> )	Closed Area per bed (m <sup>2</sup> )
Arnavutkoy State Hospital	2009	211	17,000	5,742	30,350	144
Bagcilar Education and Research Hospital (ERH)	2006	498	48,879	15,800	62,200	125
Bakirkoy Dr. Sadi Konuk ERH	1987-2009	377	43,174	8,360	69,102	249
Bakirkoy Mazhar Osman Psychiatric ERH	1914-1983	1,472	630,000	53,558	84,121	57
Baltalimani Osteopathic Hospital	1840-2001	133	11,159	4,758	9,888	74
Basaksehir State Hospital	1999-2008	100	17,219	1,610	11,771	118
Bayrampasa State Hospital	1970-1991	100	15,000	3,153	10,863	109
Besiktas Sait Ciftci State Hospital	1972-1992	50	2,235	620	2,480	50
Beykoz State Hospital	1976	300	51,915	2,500	6,200	103
Buyukcekmece State Hospital	1991	50	2,373	451	1,804	36
Catalca Ilyas Cokay State Hospital	1992-2006	50	21,388	1,493	6,816	136
Lepra Dermatological-Venereal Diseases Hospital	1961-1985	50	33,245	1,750	3,850	77
Skin and Reproduction Diseases Hospital		31				
Dr Lutfi Kirdar Kartal ERH	1987-2008	706	180,000	19,064	55,449	79
Dr.Siyami Ersek ERH	1964-2007	525	18,000	5,126	31,848	61
Erenkoy Physical Therapy and Rehabilitation Hospital	1990	101	10,667	1,190	8,330	82
Erenkoy Psychiatry ERH	1938	250	96,839	7,189	12,505	50
Esenyurt State Hospital	2006	175	11,297	3,628	15,631	89
Eyup State Hospital	1952-2007	140	8,877	2,361	10,239	73
Fatih Sultan Mehmet ERH	1948-1991	300	124,276	7,404	31,223	104
Gaziosmanpasa Taksim ERH	2012	249	24,493	11,060	53,118	213
Goztepe ERH	1972- 1976	682	110,914	16,672	66,919	98
Haseki ERH	1924 -2010	536	23,360	9,865	49,646	93
Haydarpasa Numune ERH	1894-2007	709	64,624	15,715	60,130	85
Istanbul ERH	1960-1994	504	31,633	7,123	36,634	73
Istanbul Physical Therapy and Rehabilitation ERH	1979-2009	267	67,235	13,943	20,490	77
Istanbul II Ozel Idaresi Dental Hospital	2003	25	3,000	1,100	6,000	240
Istanbul Kanuni Sultan Suleyman EAH	2011	648	90,000	16,761	107,297	166
Istanbul Occupational Diseases Hospital	1977	52	8,000	2,370	4,500	87
Istinye State Hospital	1948-1998	128	3,803	1,895	7,380	58
Kagithane State Hospital	2003	51	2,597	1,500	8,905	175
Kartal Kosuyolu High Specialty ERH	2005	465	55,000	9,279	40,138	86
Kartal Yavuz Selim State Hospital	1966-2000	256	20,902	2,831	22,320	87

Hospital Name	Construction Year *	Number of beds	Total Land Area (m <sup>2</sup> )	Construction footprint area (m <sup>2</sup> )	Closed Area (m <sup>2</sup> )	Closed Area per bed (m <sup>2</sup> )
Kucukcekmece M.Akif Ersoy Cardiovascular Surgery Hospital	2008	260	67,545	6,300	31,500	121
Maltepe State Hospital	2010	50	2,315	1,500	7,728	155
Maltepe Penal Institution State Hospital		30				
Pendik State Hospital	1990-2001	100	2,390	932	5,453	55
The MoH Marmara University Pendik ERH	2010	568	63,196	15,000	119,027	210
Prof.Dr.Necmi Ayanoglu Silivri State Hospital	2009	223	12,000	2,870	16,008	107
Prof.Dr.Resat N.Belger Beyoglu Ophthalmological Education and Research Hospital	1860-1976	100	2,776	1,859	7,459	75
Sariyer Ismail Akgun State Hospital	1968-2007	40	615	1,047	2,894	72
Silivri Penal Institution State Hospital		30				
Sultangazi Lutfiye Nuri Burat State Hospital	1978-2010	75	2,628	1,340	7,500	100
Suleymaniye Maternity and Gynaecology ERH	1994	74	2,811	866	5,129	69
Sureyyapasa Thoracic Diseases and Thoracic Surgery ERH	1955	605	1,474,001	13,143	81,998	136
Sile State Hospital	1974-1998	25	8,176	1,800	5,400	216
Şisli Hamidiye Etfal ERH	1955-1986	784	34,000	10,850	73,900	94
Şisli Okmeydani ERH	1971	753	96,000	17,082	55,081	73
Tacirler Egitim Vakfi Sultanbeyli State Hospital	1987-2003	100	5,364	2,173	9,169	92
Tuzla State Hospital	1997	38	2,257	413	2,885	76
Umraniye ERH	2002-2009	326	80,158	8,200	33,000	101
Uskudar State Hospital	1983	263	50,810	5,200	17,980	113
Yakacik Maternity and Children's Hospital	1935-1964	100	66,620	2,150	6,000	60
Yedikule Thoracic Diseases and surgery ERH	1905-2011	385	61,213	13,754	39,530	103
Zeynep Kamil Maternity and Children's Education and Research Hospital	1863-1973	501	30,000	7,539	19,078	38

Source: Number of beds from MoH, General Directorate of Health Services (according to the list dated 28.08.2013), the other information is obtained by IHIC from MoH, General Directorate of Health Services

\*Second year in rows indicate the year for the renewal or reconstruction of the hospitals

The MoH plans to increase the existing number of beds of 15,621 to 27,841 through construction of two integrated health campuses and other hospitals in Istanbul as well as making alterations in the existing hospitals by renovation, reconstruction and/or closures. Information related to potential hospital closures is explained in *Chapter 14: Socio-economy*.

When the hospitals in the 29<sup>th</sup> health region are considered, it is observed that there are a total of 2,962 patient beds in 27 hospitals serving health services to a population of 2,630,572 in this region. Eight of all hospitals are affiliated with the MoH and other 19 are private hospitals. Bed capacities of these hospitals and the planned bed capacities by the MoH are given in Table 2-6.

Table 2-6: Hospitals and bed capacities in 29<sup>th</sup> health region

Hospital Name	District	Existing Bed Capacity	Planned Bed Capacity
Private Avcilar Hospital	Avcilar	153	na
Private Medicana Hospitals Avcilar	Avcilar	63	na
Private Avcilar Anatolia Hospital	Avcilar	38	na
Bakirkoy Dr. Sadi Konuk ERH Avcilar Service Building	Avcilar	100	400
Istanbul Basaksehir State Hospital	Basaksehir	100	100
İkitelli Integrated Health Campus	Basaksehir	-	2,682
Private Beylikduzu Kolan Hospital	Beylikduzu	90	na
Private Medicana International Istanbul Hospital	Beylikduzu	186	na
Private One Diamond Eye Hospital	Beylikduzu	33	na
Private Beylikduzu Medlife Hospital	Beylikduzu	69	na
New Hospital	Beylikduzu	-	300
Istanbul Buyukcekmece State Hospital	Buyukcekmece	50	200
Private Buyukcekmece Kolan Hospital	Buyukcekmece	58	na
Istanbul Catalca Ilyas Cokay State Hospital	Catalca	50	100
Istanbul Esenyurt State Hospital	Esenyurt	175	450
Private Doga Hospital	Esenyurt	34	na
Istanbul Mehmet Akif Ersoy Cardiovascular Surgery Hospital	Kucukcekmece	260	500
Istanbul Kanuni Sultan Suleyman ERH	Kucukcekmece	648	650
Private Rumeli Hospital	Kucukcekmece	48	na
Private TEM Hospital	Kucukcekmece	61	na
Private Dr. Sadik Ahmet Hospital	Kucukcekmece	32	na
Private Dogan Hospital	Kucukcekmece	71	na
Private Halkali Kent Hospital	Kucukcekmece	48	na
Private Bati Bahat Hospital	Kucukcekmece	81	na
Private Istanbul Hospital	Kucukcekmece	66	na
Istanbul Silivri Prof. Dr. Necmi Ayanoglu State Hospital	Silivri	223	200
Istanbul Silivri Penal Institution State Hospital	Silivri	30	30
Private Silivri Kolan Hospital	Silivri	33	na
Private Silivri Hayat Hospital	Silivri	45	na
Private Silivri Anatolia Hospital	Silivri	117	na
<b>Total</b>		<b>2,962 (1,636)</b>	<b>5,612</b>

Source: MoH, General Directorate of Health Services (according to the list dated 28.08.2013)

There are not appropriate spaces in the hospital buildings of the 29<sup>th</sup> health region for supporting the changing and evolving technology of medical devices and equipment. As these areas are unable to be provided in existing buildings, there is a need for creating new spaces. Moreover, service units such as operating rooms, intensive care, emergency, laboratory, imaging center, polyclinics do not meet hospital standards in terms of physical structure and equipping. It also does not seem possible to effectively repair and renovate the existing hospitals due to the physical structure constraints. The MoH plans to increase the bed capacity in the 29<sup>th</sup> health region from 1,636 to

5,612. Based on the discussion with the Istanbul Provincial Health Directorate, there will be no hospital closures that are related with the İkitelli IHC Project.

Given physical space constraints and poor quality conditions, existing hospitals in Istanbul are unable to meet patient needs and to provide the quality of service which is expected from a standard hospital. A total of 31,756 bed capacity within the scope of 20 projects that have been initiated until now will be developed across Turkey, among which the İkitelli IHC will contribute 2,682 bed capacity, having rooms with one or two beds (clinical wards will have 66% single beds and 34% double beds and every intensive care unit room will have a single bed), to the health services. The campus is also planned to serve patients coming from other provinces of Turkey or from other countries as a part of health tourism.

#### *Need for Physical Therapy and Rehabilitation Hospitals*

Increasing population, improving technology, changes in health perception and people's expectations have resulted in changes in the health needs of the community. The need for Physical Therapy and Rehabilitation health services is also increasing due to an increase in aging and high rates of traffic and occupational accidents in the country. However, there is presently insufficient bed capacity specifically for providing active rehabilitation services across Turkey. The existing Physical Therapy and Rehabilitation Hospitals (currently 2,009 bed capacity) are able to provide physical therapy services only to the patients with little provision of rehabilitation services. Moreover, existing Physical Therapy and Rehabilitation Hospitals are located in large provinces such as Ankara and Istanbul resulting in the need for patients and patients' relatives to travel to those provinces from other cities. As part of the HTP, Physical Therapy and Rehabilitation Hospitals are planned so that people can have access to these services in their own provinces or in a region nearby which will facilitate easy access to these services, reducing treatment costs and preventing accumulation of patients in the hospitals located in large provinces.

Currently, there are 368 physical therapy and rehabilitation beds in two hospitals in Istanbul, which are 101-bed capacity Istanbul Erenkoy Physical Therapy and Rehabilitation Hospital and 267-bed capacity Istanbul Physical Therapy and Rehabilitation Education and Research Hospital. According to the plans of the MoH, a total of 3,586 bed capacity for Physical Therapy and Rehabilitation services will be introduced in the health regions across Turkey, of which 832 bed capacity is planned for Istanbul. 200 out of 832 bed capacity will be within the scope of the İkitelli IHC Project.

#### *Need for Psychiatry Hospitals*

There are 8 hospitals across Turkey (two of them are in Istanbul Province, the others are in Manisa, Bolu, Samsun, Adana, Elazig and Trabzon Provinces) that serve as psychiatric hospitals under the responsibility of the MoH. Psychiatric services are also provided in some of the general hospitals, university hospitals and private hospitals. Altogether, the total bed capacity in Turkey is 7,356 (2010 data) for psychiatric services including forensic, chronic, care and addiction treatments. The eight hospitals that belong to the MoH serve as regional hospitals that provide services for a number of provinces in a defined region. Patients whose diagnosis, treatment and rehabilitation cannot be provided in their own provinces, are sent to the regional hospital responsible from their province.

According to the statistics of the World Health Organization, Turkey has the second lowest ratio in European region with only 1.0 psychiatric beds per 10,000 people (2008 data). Current bed capacities are not enough to meet the demand of patients who are exposed to the long queues for admission to the hospitals. There are two psychiatric hospitals in Istanbul which are 250-bed capacity Istanbul Erenkoy Psychiatric Education and Research Hospital (ERH) and 1,472-bed capacity Bakirkoy Mazhar Osman Psychiatric ERH (total bed capacity of 1,722). Bakirkoy Mazhar Osman Psychiatric ERH is located in the European part of the Istanbul province and serves psychiatric services to 12,797,601 people living in this part of Istanbul together with five other cities (Edirne, Kırklareli, Tekirdag, Canakkale and Bursa). In order to provide better psychiatric services, the MoH plans to reorganize hospital bed capacities by reducing numbers of beds in the existing 8 hospitals and maintain these hospitals to serve only their own provinces. The MoH also plans to raise the total psychiatric bed capacity to 11,736. İkitelli IHC will contribute to this planning with a 128-bed capacity psychiatric hospital.

#### **2.1.4 Level of Planning Detail**

A preliminary design has been provided by the MoH as part of the bidding process for İkitelli IHC. The final and implementation design of the İkitelli IHC is under the responsibility of IHIC according to the agreement signed with the MoH. The design is currently being studied and has not yet been finalized. As reported by IHIC, discussions between IHIC and MoH are still ongoing to achieve final design. The preliminary design provided by the MoH has been changed by the IHIC after it is understood that a road (two lanes on each side) is passing within the boundaries of the Project area which is not included in the zoning plans and there is a 600-mm diameter natural gas pipeline with 20 bars operating capacity under this road. As reported, the natural gas pipeline is a main pipeline of Istanbul Gas Distribution Industry and Trade Inc. (İGDAŞ) feeding the European side of Istanbul and will not be relocated. IHIC has made an application to İGDAŞ to confirm any specific requirements that should be met during the construction and operation of the Project. Official response letter of İGDAŞ is provided in Annex E-1. In addition, due to the fact that the Project area is highly sloped (there is approximately 60 m elevation difference between east and west borders), the design is changed to locate the higher floor buildings at lower elevation and lower floor buildings at higher elevation in order to keep the intensive care units in all buildings at the same level with the surgery rooms to provide better health services. Moreover, the type of the hospital buildings has been changed from H-shaped to T-shaped hospital towers for better operational performance and the T-shaped designs were approved by the MoH. This ESIA study is based on the design dated August 2013. Significant changes in the design are not expected to occur, however if changes develop over time, these will be reviewed and assessed by IHIC and additional relevant mitigation measures may need to be identified and implemented as necessary if the impacts will differ from those identified in this ESIA Report.

## **2.2 Project Site Alternatives**

The current Project area is selected and presented to IHIC by the MoH within the scope of the bidding process. Due to the fact the site selection is the responsibility of the MoH, no alternative sites could be considered by IHIC. Information on the Project site has also been asked to the Deputy Health Director of the Istanbul Provincial Health Directorate during a face-to-face meeting as part of the ESIA stakeholder engagement process. The Deputy Health Director stated that the major factors in the selection of the current Project area include the following:

- The Project area belongs to the Treasury, it is large enough to locate an integrated health campus.
- The Project area is one of the best locations in Istanbul as the residential development of the city moves to the northern part and residents there can benefit from the planned İkitelli IHC.

According to the information given in the official letter issued by the Treasury (dated 11.06.2013 and numbered 23674), the right of superficies has been granted to IHC for 28 years (for 36 months of investment period and 25 years of operation period) by the Treasury with the approval dated 07.06.2013 and numbered 614.

## 2.3 Project Components and Design

### 2.3.1 Overview

The Project comprises of the development of an integrated health campus with a total capacity of 2,682 beds consisting of eight hospitals which are listed below:

- Main Hospitals
  - 443-bed General Hospital
  - 451-bed Children’s Hospital
  - 451-bed Women’s Hospital
  - 359-bed Oncology Hospital
  - 347-bed Neurological and Orthopedic Sciences Hospital
  - 303-bed Cardiovascular Hospital
- 128-bed Psychiatric Hospital
- 200-bed Physical Therapy and Rehabilitation Hospital.

The northern part of the Project area will include a diagnostic and treatment block that is surrounded by the Main Hospital towers, a technical service building, an administration area and a conference hall. This part will also include a cogeneration building. The southern part of the Project area will consist of Psychiatric Hospital and Physical Therapy and Rehabilitation Hospital. In addition, the southern part will be developed in the future to include social and commercial areas, a hotel and convention center, a medical hotel and a mosque, however planning of these units are still ongoing. Moreover, there will be a helipad and a heliport within the scope of the Project. The layout and 3D view of the hospitals and other units are shown in Figure 2-1, Figure 2-2 and Figure 2-3. The illustrations of the hospitals are presented in Annex E-2.

The Project area will cover a total of 789,031 m<sup>2</sup>. The gross areas, car parking areas and total gross areas of the hospitals are given in Table 2-7.

Table 2-7: Area usage of the hospitals

Land Use	Gross area (m <sup>2</sup> )	Car parking area (m <sup>2</sup> )	Total Gross Area (m <sup>2</sup> )
Main Hospitals and Technical Service Building	485,778	237,501 (Main Hospitals: 233,046m <sup>2</sup> Technical Service: 4,455m <sup>2</sup> )	723,279
Rehabilitation Hospital	38,915	21,120	60,035
Psychiatric Hospital	21,391	12,672	34,063
<b>Total</b>	<b>546,084</b>	<b>271,293</b>	<b>817,377</b>

The patient rooms within the İkitelli IHC will have either single beds or double beds. The total bed capacities of each hospital is given in Table 2-8.

Table 2-8: Bed capacities of each hospital

Land Use	Clinical Services	Intensive Care Unit (ICU)	Cardiovascular ICU	Burn Centre	Children Psychiatry	LDRP*	Newborn ICU	Bone Marrow Transplantation	Transplant	Trauma	Iodine Therapy Unit	VIP Beds	Total Bed Capacities
General Hospital	352	48	-	24	-	-	-	-	-	-	-	19	443
Children's Hospital	352	48	-	-	32	-	-	-	-	-	-	19	451
Women's Hospital	256	48	-	-	-	28	100	-	-	-	-	19	451
Oncology Hospital	256	48	-	-	-	-	-	24	-	-	12	19	359
Neurological and Orthopedic Sciences Hospital	256	60	-	-	-	-	-	-	-	12	-	19	347
Cardiovascular Hospital	192	48	24	-	-	-	-	-	20	-	-	19	303
Psychiatric Hospital	128	-	-	-	-	-	-	-	-	-	-	-	128
Physical Therapy and Rehabilitation Hospital	200	-	-	-	-	-	-	-	-	-	-	-	200
<b>Total</b>	<b>1,992</b>	<b>300</b>	<b>24</b>	<b>24</b>	<b>32</b>	<b>28</b>	<b>100</b>	<b>24</b>	<b>20</b>	<b>12</b>	<b>12</b>	<b>114</b>	<b>2,682</b>

\*Labor, Delivery, Recovery and Postpartum Rooms

It is estimated that approximately 106,462 people per day will visit the İkitelli IHC. The projected daily people circulation is given in Table 2-9.

Table 2-9: Daily people circulation of the İkitelli IHC

Definition	Number of People/Day
Hospitalized and released patients	671
Inpatient referral	4,291
Patients of the polyclinics	57,760
Patients of the emergency department	14,440
Visitors to the Patients	5,364
MoH Staff	4,300
IHC Staff	3,011
People visiting the commercial area	15,125
People visiting the mosque	1,500
<b>Total</b>	<b>106,462</b>

Source: Istanbul İkitelli Integrated Health Campus Traffic Study, Final Report, January 2014, Boğaziçi Proje Mühendislik Planlama ve İnş. San. Tic. Ltd. Şti.

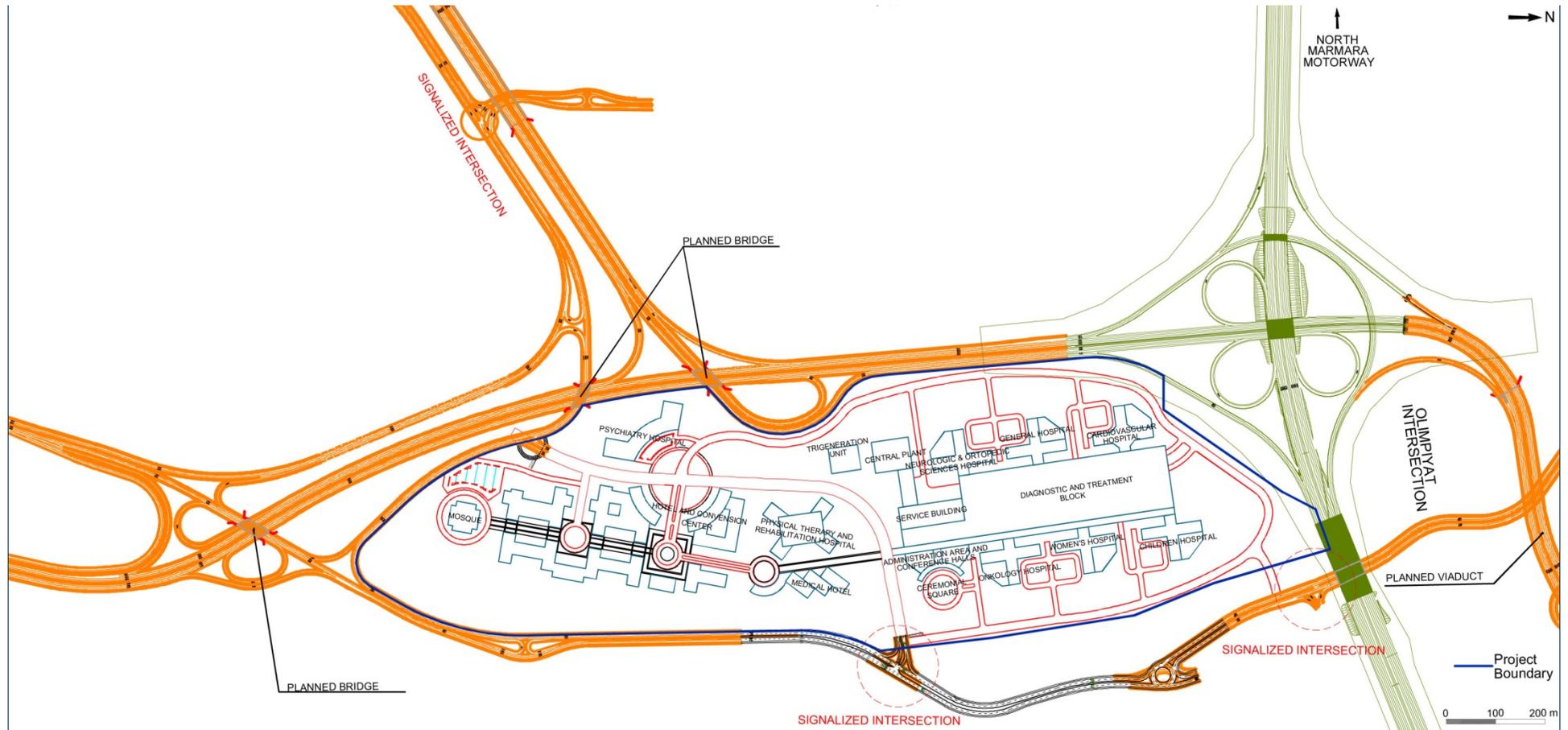


Figure 2-1: Layout of the hospitals (roads around the project area indicate the future planning)



Figure 2-2: Layout of the hospitals in the northern part of the Project area



Figure 2-3: Layout of the hospitals and other units in the southern part of the Project area

### 2.3.2 Main Hospitals

Main hospitals will consist of six different hospital towers as explained in above sections. There will be a diagnostic and treatment block located between the hospital towers. The total gross area of the Main Hospitals (including the technical service building) will be 723,279 m<sup>2</sup> including a 237,501 m<sup>2</sup> of car parking area. The layout of the main hospitals and diagnostic and treatment block are shown in Figure 2-4.

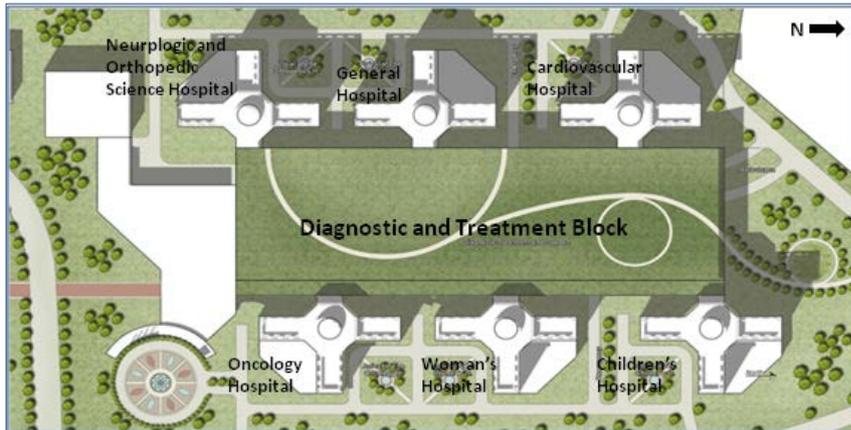


Figure 2-4: Layout of main hospitals and diagnostic and treatment block

The services and units within the main hospitals and the diagnostic and treatment block are given in Table 2-10.

Table 2-10: Units within the main hospitals and diagnostic and treatment block

Building	Units
Diagnostic and Treatment Block	Total Parental Nutrition, Satellite Environmental Services, Genetic Diseases Central, Advanced Pathology Unit, Hyperbaric Treatment Unit, Robotic Medicine Preparation Unit, Emergency Service, Hemodialysis Center, Radiology, Nuclear Medicine Unit, STAT Lab., Cardiovascular Intensive Care Units, Chemotherapy Unit, In vitro Fertilization Unit, Endoscopy Unit, Angiography / Cardiac Cath. Unit, Pre-Post operation Areas, Surgery, Burn Unit, Sterile Processing Department, Morgue, Technical Workshops, Central Pharmacy for inpatient, Administration and Conference Center.
General Hospital	Physician Offices, Exam rooms, Clinic support area, Acute Care Units, Intensive Care Units, VIP rooms, Mechanics.
Children's Hospital	Physician Offices, Exam rooms, Clinic support area, Acute Care Units, Intensive Care Units, Mother Home, Children Psychiatry, Autism, Children Observation Units, VIP rooms, Mechanics.
Women's Hospital	Physician Offices, Exam rooms, Clinic support area, Acute Care Units, Intensive Care Units, Pregnant Mother Training, Newborn Intensive Care Unit, Delivery Units, C-Section areas, VIP rooms, Mechanics.
Oncology Hospital	Physician Offices, Exam rooms, Clinic support area, Acute Care Units, Intensive Care Units, Bone Marrow Transplantation Unit for adults and children, Iodin Treatment Unit, VIP rooms, Mechanics.
Neurological and Orthopedic Sciences Hospital	Physician Offices, Exam rooms, Clinic support area, Acute Care Units, Intensive Care Units, Trauma Unit, VIP rooms, Mechanics.
Cardiovascular Hospital	Physician Offices, Exam rooms, Acute Care Units, Intensive Care Units, Transplant Unit, VIP rooms, Mechanics.

As explained before, there is an elevation difference up to 60 m between the western and eastern boundaries of the Project area and for this reason, the hospital towers will have different number of floors. The number of floors in each hospital is given in Table 2-11.

Table 2-11: The number of floors in each hospital

Hospitals	Number of floors (including basement)*
General Hospital	11
Children’s Hospital	14
Women’s Hospital	14
Oncology Hospital	13
Neurological and Orthopedic Sciences Hospital	10
Cardiovascular Hospital	9

\*Estimated numbers by the IHIC, exact number of floors to be clarified after the Project is approved by the MoH.

The hospital towers are designed as “T” shaped buildings. A typical layout of one floor of a tower is shown in Figure 2-5.

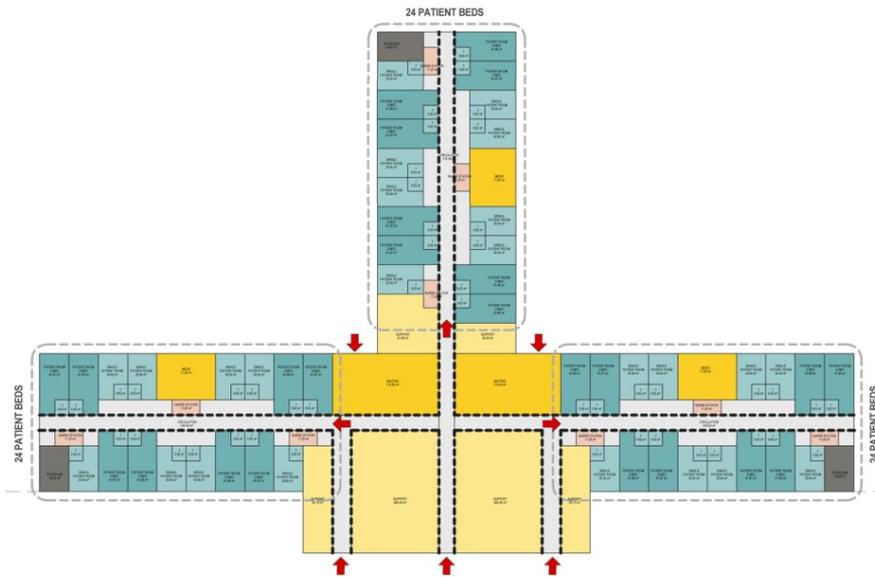


Figure 2-5: Layout of “T” type patient towers

The view of the main hospitals and the diagnostic and treatment block is given in Figure 2-6.

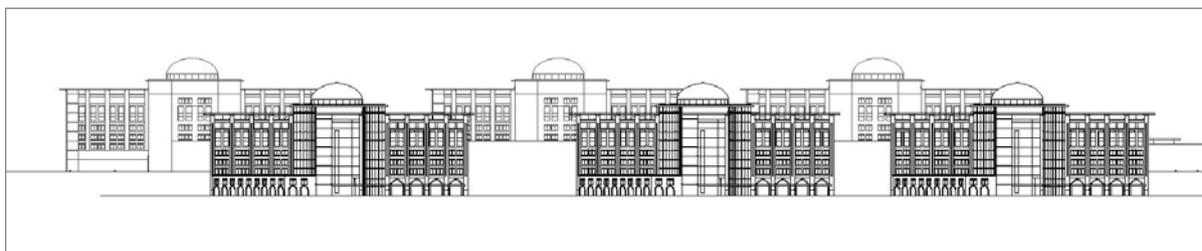


Figure 2-6: View of the main hospitals and the diagnostic and treatment block (view from west)

### 2.3.3 Physical Therapy and Rehabilitation Hospital (RH)

The Physical Therapy and Rehabilitation Hospital (RH) will have a 200-bed capacity and be located at the southern part of the Project area. The RH will be composed of inpatient wards located around the RH's own diagnostic and treatment block. The total gross area of the RH will be 60,035 m<sup>2</sup> including a 21,120 m<sup>2</sup> of car parking area. There will be two inpatient wards with 25-bed capacity each over four floors, all floors are above ground. The diagnostic and treatment block of the RH will also be distributed over four floors where two of the floors are below ground and two floors above ground. The core building of the RH will accommodate exam rooms, clinics, laboratories and some rehabilitation units and inpatient wards will have bed wards together with clinics. The units within the RH buildings are detailed in Table 2-12.

Table 2-12: The units within the RH buildings

Building	Units
Core Building	Stat Laboratory, Prosthetics & orthotics lab, Rehabilitation Radiology, Gymnasium, Electrophysiolog Lab-Izokinetic Unit, Urodynamic Lab. & Sexual Rehabilitation Clinic, Cardiopulmonary Rehabilitation Unit, Gait Lab, Haydrotherapy Unit, Psychotherapy, Algolojy clinic, Diet, Electrotherapy Unit, Speech Rehabilitation, VIP Rehabilitation, Hand Rehabilitation, Occupational Rehabilitation and mechanics.
Inpatient Ward-1	Rheumatic rehabilitation and 25 bed physical therapy ward
Inpatient Ward-2	Traumatic brain injury and 25 bed physical therapy ward
Inpatient Ward-3	Orthopedic Rehabilitation and 25 bed physical therapy ward
Inpatient Ward-4	Orthopedic Rehabilitation and 25 bed physical therapy ward
Inpatient Ward-5	Geriatric rehabilitation and 25 bed physical therapy ward
Inpatient Ward-6	Spinal cord injury rehabilitation and 25 bed physical therapy ward
Inpatient Ward-7	Oncologic rehabilitation and 25 bed physical therapy ward
Inpatient Ward-8	Pediatric rehabilitation clinic and 25 bed physical therapy ward

### 2.3.4 Psychiatric Hospital (PH)

The Psychiatric Hospital (PH) will have a 128-bed capacity and will be located at the west of the southern part of the Project area. The PH will also have its own diagnostic and treatment block with three floors, one of which will be located underground. The total gross area of the PH will be 34,063 m<sup>2</sup> including 12,672 m<sup>2</sup> of car parking area. There will be two inpatient wards with four floors of 16-bed capacity each. The PH will include patient rooms, intensive care units, psychiatric clinic, psychiatric rehabilitation area, psychiatry sport complex, clinic support area, patient admissions, shared support zones.

### 2.3.5 Technical Service Building

There will be a technical service building containing kitchen, laundries, transformers, material storage, technical workshops, maintenance workshops and logistics center.

### 2.3.6 Cogeneration Building

There will be a cogeneration building located to the west of the Project area. This building will house a cogeneration system with an estimated capacity of 16.745 MW that will consist of five gas turbines using natural gas with an installed capacity of 3.349 MW each.

### **2.3.7 Commercial Area**

There will be commercial areas within the İkitelli IHC to be developed in the future. Commercial areas are planned to include a medical hotel, hotel and convention center, a mosque and other social and commercial areas. These areas will be located in the southern part of the Project area and are still being developed. The location of the commercial areas is shown in Figure 2-3.

### **2.3.8 Heliport and Helipad**

There will be one heliport and one helipad within the scope of the İkitelli IHC.

### **2.3.9 Design Standards of the Hospitals**

The design of the hospitals will meet the following standards as a minimum:

- “Circular on the Minimum Technical Standards that should be met in Existing and New Health Facilities” issued by the Ministry of Health, Department of Construction and Maintenance (last update: 30.10. 2012)
- “Minimum Design Standards for Turkey’s Health Facilities, Guidebook for the year 2010”, issued by the Ministry of Health, Department of Construction and Maintenance
- “Ministry of Health, Public Private Partnership Program, İstanbul İkitelli Integrated Health Campus, Technical Specifications” provided by MoH during the bidding process that includes technical specifications for the following:
  - Part 1: Technical Specifications for Architectural and Construction Works – provides technical specifications for the concept scheme design and for construction works
  - Part 2: Mechanical and Plumbing Technical Specifications
  - Part 3: Electrical Technical Specifications

Technical specifications provided by the MoH (Technical Specifications hereafter) cover environmental, health and safety (EHS) based design criteria and infrastructure requirements as presented in Annex E-3.

### **2.3.10 Infrastructure**

#### *Plumbing system*

Plumbing systems are requested to be designed in accordance with the Turkish Standards Institution (TSE) Standards, and the requirements of Local Codes, Standards, and Authorities requirements, as stated in the Technical Specifications provided at the bidding stage. Plumbing systems and equipment necessary for a complete and properly functioning hospital are expected to be installed including but not limited to the following:

- Domestic hot and cold water systems
- Drainage, sanitary waste and vent system
- Drainage - storm water systems
- Natural gas systems
- Fuel oil systems
- Medical gas and vacuum systems

### *Heating, Ventilating, and Air Conditioning (HVAC) System*

As stated in the Technical Specifications, the HVAC system shall provide heating and cooling for every occupied space in the hospital and for all equipment and storage space that requires temperature and humidity control. The hospital HVAC systems are expected to operate at the extreme weather conditions and after catastrophic events such as earthquakes. The HVAC systems are requested to be designed in accordance with the following standards, as per the Technical Specifications:

- American Society of Heating and Air-Conditioning Engineers (ASHRAE) HVAC Design Manual for Hospitals and Clinics 2003
- Turkish Standards Institution Standards

Systems and equipment necessary for a complete and properly functioning HVAC system in a hospital are expected to include but are not limited to the following:

- Central Energy Plant
- Plant Steam System
- Plant Chilled Water System
- Low Temperature Surgery Chilled Water System
- Hospital Steam Systems
- Hospital Hot Water Heating System
- Air Handling Units and Systems
- Fan Coil Systems
- Air Distribution Systems
- Building Management System (BMS)
- Exhaust Systems
- Supplemental Cooling Systems
- Control Systems

### *Electrical systems*

The electrical systems are requested to be designed in accordance with the applicable sections of the following standards, codes, regulations, and recommendations, as stated in the Technical Specifications:

- Turkish Standards Institutions (TSE)
- National Fire Protection Association (NFPA)
- International Electro-technical Commission (IEC)
- Chartered Institution of Building Services Engineers (CIBSE)
- International Industry Association/Electronics Industry Association (TIA/EIA)
- Local authorities (Electricity, Telecommunication, Fire, etc.)

The electrical services will include the following systems as per the Technical Specifications:

- Normal power distribution
- Emergency power distribution
- Uninterruptable power supply system
- Isolated power system

- Grounding and earthing system
- Lightning protection system
- Electric heat trace/snow melt
- Indoor and outdoor lighting system
- Exit and emergency lighting system
- Automatic fire detection and alarm system
- Automatic voice evacuation and firefighting telephone system
- Security, closed circuit television system (CCTV) and access control system
- Master clock system
- Nurse call and code blue system
- Telemedicine system
- Public address system
- Telephone system
- Data communication system
- Audio-visual system

In addition to the above systems, the Project design will consider energy conservation systems to include solar energy panels that will be used to illuminate internal roads.

### **2.3.11 Fire Safety**

Health facility operations are exposed to life and fire safety risks, as they are accessible to the public. The IHC is being designed in accordance with the Regulation on the Fire Protection of the Buildings (Official Gazette Date/No: 19.12.2007/26735). The Technical Specifications also covered requirements related to fire protection to be integrated into the design, the requirements include the following:

- **Compartmentalization:** The standards for fire compartmentation between floors and between compartments will be 2 hours (120 mins) fire resistance.
- The fire separation shall be reviewed with local officials during the design process to verify compliance with local codes and regulations. The final compartmentation shall represent the regional fire fighting principals.
- **Sealents:** Intumescent sealants and fire stopping compounds will be used to plug smaller gaps around services penetrations in compartment walls and floors.
- **Smoke Barriers:** Proprietary mineral wool products as Rockwool will be used to maintain fire separation between compartment floors and walls, and to protect around services penetrations.

In addition to the above, Fire Suppression Systems shall be provided throughout the hospitals as required by Turkish and local codes, and the Fire Alarm System shall be designed and installed in accordance with the requirements of NFPA72 and local codes, as per the Technical Specifications.

## **2.4 Construction Stage**

### **2.4.1 Overview**

The planning of the Project is still ongoing. Construction is estimated to start in the 3<sup>rd</sup> quarter of 2014 and will take 36 months. The high-level construction program is given in Table 2-13.

Table 2-13: High-level construction program

Works to be undertaken	1 <sup>st</sup> year				2 <sup>nd</sup> year				3 <sup>rd</sup> year			
	1 <sup>st</sup> quarter	2 <sup>nd</sup> quarter	3 <sup>rd</sup> quarter	4 <sup>th</sup> quarter	1 <sup>st</sup> quarter	2 <sup>nd</sup> quarter	3 <sup>rd</sup> quarter	4 <sup>th</sup> quarter	1 <sup>st</sup> quarter	2 <sup>nd</sup> quarter	3 <sup>rd</sup> quarter	4 <sup>th</sup> quarter
Mobilization and Groundworks												
• Mobilization												
• Site clearance and excavation works												
Construction												
• Tower 1-6												
• Core Hospital Building												
• Rehabilitation and Psychiatric Hospitals												
• Landscaping and External Works												
Comissioning												

The construction work timeframe is estimated to be 10 hours per day (between 08:00 and 18:00 with one hour break) during main construction and 14 hours during the excavation activities. When necessary, work will be conducted in shifts for 24 hours for 7 days.

The construction site facilities (including offices, refectory, dorms, employee lounge, clinic, laundry, security) will be located inside the Project area. The types of construction buildings are given in Table 2-14.

All construction site facilities shall be constructed in accordance with the specifications and regulations of the Turkish and FI environmental, health and safety standards. IHIC shall ensure that the accommodation of the workers and provision of basic services to workers are managed in line with the guidance note on worker’s accommodation published by IFC and European Bank for Reconstruction and Development (EBRD) (Worker’s Accommodation: Processes and Standards). There will be no blasting or piling activities during construction works. There will be no requirement for additional land other than the defined Project area.

Table 2-14: Types of construction buildings\*

Building	Capacity (people)	Area (m <sup>2</sup> )	Number	Total Area (m <sup>2</sup> )
Employee Dorm	288	1,692	1	1,692
Office Building	350	1,699	1	1,699
Cafeteria	750	1,380	2	2,760
Worker Loung	-	387	1	387
Engineer Lounge	-	146	1	146
Mosque	-	204	1	204
Polyclinic	-	102	1	102
Laundry	-	98	1	98
Occupational Health and Safety Building	56	127	1	127

\*Sizes/capacities of these buildings may increase depending on the workforce.

### 2.4.2 Construction Equipment

Types and quantities of construction equipment with respect to various construction works are detailed in Table 2-15.

Table 2-15: Construction equipment deployment

Works	Equipment/machine	Number	Working Duration (days)
Land Preperation	Digger	2	60
	Loader	1	60
	Grader	1	60
	Bulldozer	1	60
	Truck	10	60
Excavation Works	Digger	15	180
	Loader	2	180
	Bulldozer	1	180
	Truck	150	180
Main Construction	Tower Crane	10	630
	Mobile Crane*	2	150
	Mobile Crane*	2	850
	JCB*	2	950
	Bobcat*	2	1,095
	8m <sup>3</sup> capacity truck*	2	1,095
	Grader	3	90
	Roller	4	180
	Sprinkler*	2	1,095
	Hiab *	2	1,095
	Small Truck	25	1,095
	Concrete Mixer	3	365
	Compressor*	2	1,095
	Mechanical Mixer (Hand type)*	5	365
	Stable concrete pump	6	180
	Mobile concrete pump	4	180
	Stable Diesel Generator (200 KVA)**	3	1,095
	Mobile Diesel Generator (100 KVA)**	1	1,095
	Concrete plant (65 m <sup>3</sup> /hour capacity)	1	830
	Concrete plant (30 m <sup>3</sup> /hour capacity)	1	1,095
Trucks for carrying materials	100	1,095	

\*The equipment will operate as necessary, \*\*Diesel generators will operate only during power-offs

### 2.4.3 Construction materials/quantities

The construction material required for the Project will include ready-mixed concrete, steel bar reinforcement, and formwork. All materials will be supplied by the purchasing unit of IHIC in line with the relevant IHIC policies to be developed. It is anticipated that approximately 560,000 m<sup>3</sup> of concrete, 61,000 tonnes of steel bar reinforcement and 1,300,000 m<sup>2</sup> of formwork will be used for the Project. Concrete will be supplied from “Bogazici Concrete Plant” operating with a 120 m<sup>3</sup>/hour capacity and located almost adjacent to the west boundary of the Project area. It is also planned to install two concrete plants in the Project area with capacities of 65 m<sup>3</sup>/hour and 30 m<sup>3</sup>/hour to meet additional concrete need. The locations of the existing and planned concrete plants are shown in Figure 2-7. There will be no need to open a quarry for the Project.



Figure 2-7: Location of the existing and planned concrete plants

As necessary, onsite temporary laydown areas for imported materials will be appropriately selected to avoid potential disturbance and run-off. Appropriate management practices for these materials will need to be adopted, as discussed in *Chapter 8: Material Resources and Waste Management*.

#### 2.4.4 Excavated Soils to be Disposed

It is anticipated that approximately 5,000,000 m<sup>3</sup> of excavated material will be generated, of which 1,500,000 m<sup>3</sup> will be used as fill material during the construction. The remaining excavated materials will require off-site disposal, which will be transported to a disposal area located approximately 500 m distance to the north border of the Project area. The disposal area is an old quarry site which is currently being rehabilitated. Necessary consent for using this disposal site shall be obtained from the Basaksehir Municipality and/or Istanbul Metropolitan Municipality (IMM) to ensure compliance with the Regulation on Control of Excavated Soil, Construction and Demolition Wastes (Official Gazette Date/No: 18.03.2004/25406). The excavated materials will be transported to the disposal area by 25 m<sup>3</sup> capacity trucks. These trucks will work for a total of 14 hours per day between 08:00-18:00 and 22:00-06:00 (as reported by IHIC, truck transportation is legalized by the Municipality only between these hours). The route for the transportation to the disposal site is shown in Figure 2-8.



Figure 2-8: Transportation route to the disposal site

#### 2.4.5 Traffic and Access Management

The Project area is located approximately 4 km north of the E-80 highway which connects Istanbul to the Thracian cities of Turkey. Currently, access to the Project area is from E-80 highway through connection of Olimpiyat Boulevard that is about 22 m wide, 2x2 cross-sectioned road which also passes through the Project area and connecting Basaksehir and Kayasehir settlements. There is also a current metro station (“Basak Konutlari” metro station) located approximately at a distance of 1,000 m to the east boundary of the Project area.

There is also another 1 km long road passing through the Project area, which is approximately 10 m wide and connects to the disposal area outside the Project area. As it is observed during the site visits, this road is used by the trucks carrying excavated materials to the disposal area to the north of the Project site. It is expected this road will also be used during construction by construction vehicles for accessing the site.

#### 2.4.6 Workforce

The peak workforce that is anticipated during the construction phase is 3,000 construction workers over a maximum period of 6 months when the concrete works are progressing in parallel with other trades. 346 white collar employees are expected on this project, 108 of 346 white collar employees will be foreigners for works requiring specialization, and the remaining 246 white collar employees will be Turkish. All 3,000 construction workers will be supplied locally by subcontractors. Appropriate pre-fabricated facilities will be provided at the west of the Project area (Figure 2-9) to the workers who need onsite accommodation. Other workforce will be transported to the Project site by shuttles. Further details and conditions pertinent to management of project labor are provided in *Chapter 16: Labor and Working Conditions*.



Figure 2-9: Office building and worker accommodation area

### 2.5 Operation Stage

#### 2.5.1 Responsibilities and Organizational Management

The management of the İkitelli IHC will be shared between the MoH and IHIC during the operation phase. The MoH will be responsible for providing doctors and the support health personnel, and

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the general management of the hospital will be undertaken by the administrative staff provided by the MoH. Staff other than the doctors and support health personnel will be provided by IHIC. IHIC will be responsible for the management of services classified as obligatory services (P1) and optional services (P2) as listed below:

- P1 - Obligatory services include building and land services, extraordinary maintenance and repair, utilities management, furnishing, ground and garden maintenance, and other medical equipment maintenance services.
- P2 - Optional services include *non-medical services* including pest control, car parking, cleaning, implementation and operation of the hospital information management system (HIMS), security, guidance and escort for patients/help desk/reception/carrying services, linen and laundry, catering, waste management; and *medical support services* including laboratory, imaging, sterilization and disinfection, and rehabilitation services.

The organizational chart of IHIC for the operation phase is provided in Figure 2-10.

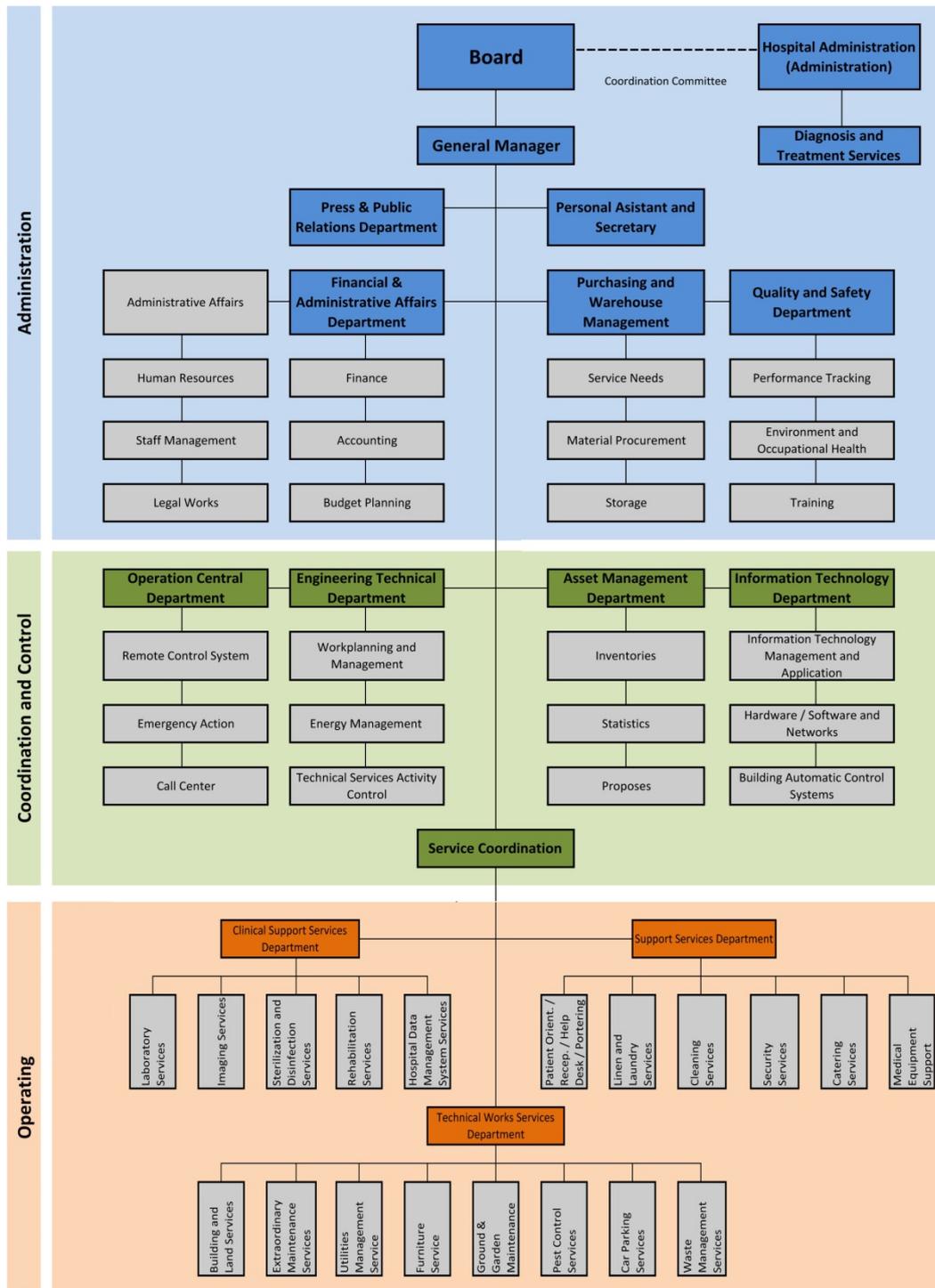


Figure 2-10: Organizational chart for IHIC during operation

### 2.5.2 Traffic and Access

It is estimated that 106,462 people per day will visit the IHC during operation. It is estimated by IHIC that 45% of visitors will use private cars, 25% will use public buses, 10% will use services and 20% will use the metro. Access to the Project area will be provided by the roads that are planned to be built around the Project area. A cloverleaf junction will be constructed to the north of the Project area which will be part of the connection road of the North Marmara Motorway to be built as part of the construction of 3<sup>rd</sup> Bosphorus Bridge by the Ministry of Transport, Maritime Affairs and

Communications. Regarding the construction of roads on the east, west and south part of the Project area, the responsibility will be under the IMM. The part of the existing Olimpiyat Boulevard will remain as an internal road within the IHC, which will be connected to the planned roads through intersections at the east and west directions. It is important to note that the planning of the mentioned roads started previously considering the development of the area related to olympic games and also future residential development of the area, and not directly related with the İkitelli IHC. The relevant authorities have indicated that they have completed the implementation design of the zoning roads, however completion dates of the mentioned roads have not been finalized yet.

The current metro line is planned to be extended by the IMM to include additional three stations, among which one of the stations is planned to be built within the IHC site. Further information on the planned roads and metro line is given in *Chapter 11. Traffic Assessment*. Furthermore, IHIC undertook a traffic study to identify necessary traffic arrangements around the Project site.

### **2.5.3 Emergency Preparedness and Response**

An Emergency Preparedness and Response Plan (EPRP) will be prepared by IHIC prior to operation as part of the Environmental and Social Management System to be established for the IHC. The EPRP will cover issues related to occupational accidents, fire, fuel and chemical spills, natural disasters such as flooding and earthquakes. For the preparation of the EPRP, the Business Continuity Plan can be considered which has been developed by IHIC to ensure operational continuity of the hospital services in case of certain threats and risks (e.g failures of certain units, extreme air conditions etc.) on various functions and services that are identified as critical.

### **2.5.4 Security**

Security arrangements for the IHC are described in the Technical Specifications. Accordingly, an electronic security system will be provided in the IHC and will consist of the following elements:

- Closed Circuit Television System (CCTV)
- Access Control System
- Intrusion Detection System
- Radio Frequency Identification System (RFID)

CCTV cameras will be located at the following locations:

- Exterior entrances
- Main entrance lobbies
- Elevator lobbies
- Car parks
- Loading docks
- Pharmacy
- Service corridors
- Material storage

The access control system will include proximity card readers, key pad or a combination of both at selected entrances to the building and to areas/rooms within the building. At doorways the system will include readers, sensors, and locks. All users of the facility will be issued an identification badge (ID) with photographs in order to facilitate entry. These badges in conjunction with the access

control system components will be used to gain entry to restricted areas. Examples where card readers or other access control devices are used include entrances, loading docks, critical utility areas, plant rooms, storage areas, parking garages, elevator lobby call buttons, and telecommunication rooms.

The intrusion detection system will consist of wall or ceiling mounted passive infrared (PIR) sensors, security alarms, and break-glass sensors. PIR sensors will be provided in specific areas within the buildings including pharmacy areas, material storage, financial offices, and retail areas.

The Radio Frequency Identification (RFID) system uses wireless and semiconductor based technology as a means of identifying and tracking items. It requires a transponder tag, tag programming equipment and a tag reader. When an RFID tag passes within a range of a reader, the tag is detected and interrogated for its information contents. The RFID technology will be used for child abduction security system and physical asset tracking system.

### **2.5.5 Operational Equipment**

Materials that will be used in medical services such as medicine, serum, vaccine and consumables of medical equipment as well as general consumables such as office consumables will be supplied by the MoH. IHIC will provide equipment within the scope of obligatory and optional services mentioned above from The United States of America and European countries.

### **2.5.6 Operational Employment**

The workforce requirement during the operation phase is anticipated to be approximately 7,311 in total, with 3,011 staff to be employed by IHIC and 4,300 health service personnel (750 of which will be doctors) to be employed by the MoH. The numbers of IHIC staff distributed among the obligatory and optional services is given in Table 2-16.

Table 2-16: Numbers of IHIC staff distributed among obligatory and optional services

<b>Services</b>	<b>Number of IHIC staff</b>
Building and Land Services	103
Extraordinary maintenance and repair *	-
Utilities Management	19
Furnishing	35
Ground and Garden Maintenance	20
Pest Control	12
Car Parking	35
Cleaning	826
Data Processing (HIMS)	533
Patient Referral / Reception / Help Desk / Carrying	485
Other Medical Equipment Maintenance Services	33
Linen and Laundry	40
Catering	165
Laboratory	100
Imaging	217
Sterilization and Disinfection	53
Rehabilitation	59
Waste Management	26
<b>Total</b>	<b>3,011</b>

\*There will be no need to employ workers for this service.

### 3.0 INSTITUTIONAL AND REGULATORY FRAMEWORK

This chapter summarizes the institutional and regulatory framework within which the Project will be developed.

#### 3.1 Turkish Institutional Framework

The key central, provincial and local governmental authorities relevant to the development and implementation of the Project are described in this section.

##### 3.1.1 Central Government Ministries

The main government ministries with an interest in the Project are as follows:

- Ministry of Health
- Ministry of Environment and Urban Planning
- Ministry of Forestry and Water Works
- Ministry of Labor and Social Security
- Ministry of Culture and Tourism

These are described below.

##### *Ministry of Health*

The Ministry of Health (MoH) coordinates, regulates and supervises healthcare services and takes required measures for the protection of the public health. The Ministry consists of several general directorates and some institutions including the following:

- *General Directorate of Health Investments* carries out the engineering services for the buildings to be used by the MoH and subsidiaries; prepares projects for these services and/or have them prepared; controls the construction of the buildings; conducts expropriation works for the immovables considered as to be required for the Ministry and similar work. The General Directorate is made up of five departments including *the Department of Public Private Partnership* which manages public-private partnership model health facility projects. The main roles and responsibilities of this Department include (i) determining the procedures and principles for commissioning the real persons or legal entities to be selected via a tender for constructing the healthcare facilities deemed necessary by the Higher Planning Board (*a body under the Ministry of Development*) on the lands owned by such persons/entities or owned by the Treasury, in return for the lease of such facilities to the constructing persons/entities against a predetermined amount of lease and for a certain period which cannot be more than forty-nine years; (ii) determining the leasing rate and duration; (iii) renewal of the healthcare facilities in return for undertaking operation of services other than the medical services; (iv) defining the tender methods, required qualifications for the Bidders, the scope of the contracts and similar.
- *General Directorate of Management Services* manages the planning and improvement of human resources; and personnel and administrative affairs of the MoH.
- *General Directorate of Emergency Health Services* plans, organizes and manages the health services in emergency situations and disasters.

- *General Directorate of Health Services* plans, regulates, and determines the standards of all kinds of protective, diagnosis, treatment and rehabilitation services; regulates/makes arrangements regarding the patient rights and occupational health issues; inspects the health institutions and organizations based on the relevant legislation and policy of the MoH.
- *Public Hospitals Institution* constitutes and operates the hospitals, oral and dental health centers and other health facilities of the Institution, and combines, separates, transfers or closes these facilities (if required); conducts administrative and financial services and purchasing, leasing, maintenance, repair, and archiving affairs of the Institution.
- *Public Health Agency* constitutes and coordinates family physician services; determines the technical and physical features of the family health centers, community health centers and similar; prepares programs and studies against the contagious diseases and health threats; makes research to protect and improve employees' health, develop national health policies and similar.

The Ministry is represented at Governorship level by the Provincial Health Directorates.

#### *Ministry of Environment and Urban Planning*

The Ministry of Environment and Urban Planning (MEUP) is made up of several directorates, including the following:

- *General Directorate of Environmental Impact Assessment (EIA), Permitting and Auditing* organizes the procedures of EIA and follow-up in coordination with Governorship structures at the local level.
- *General Directorate of Environmental Management* is the primary authority in environmental protection and monitoring procedures, holding the authority for assessment, supervision, and sanctioning in coordination with Governorship structures at the local level.
- *General Directorate of Spatial Planning* identifies the procedures and guidelines related to the preparation of all kinds of physical spatial development plans and environmental management plans in all scales; approves these plans and ensures that those plans are applied and monitored.
- *General Directorate of Natural Assets Protection* is responsible for identifying and managing natural assets (except movable ones, natural archeological sites and the related protection areas).
- *Provincial Environment and Urban Planning Directorates* represent the Ministry within each Governorship and form part of the Provincial Administration. They act in accordance with the Ministry's and the Governorship's activities with regard to environmental issues.

#### *Ministry of Forestry and Water Works*

The Ministry of Forestry and Water Works is made up of directorates including General Directorate of Nature Protection and Natural Parks, General Directorate of Water Management and General Directorate of Combating Erosion and Desertification. The Ministry has several affiliated institutions which include State Hydraulic Works (DSI), State Meteorological Works (DMI) and Turkish Water Institute. The Ministry is responsible of:

- determining policies on protection, improvement, operation, rehabilitation and maintenance of forest areas; combating desertification and erosion; reforestation and pasture improvement on forestry,
- determining policies regarding nature conservation and designation of protected areas; to protect, manage, improve, operate (or having them operated) national parks, nature parks, nature monuments, nature reserve area, wetlands, biological diversity and to protect wildlife,
- determining policies on conservation and sustainable use of water resources,
- determining policies and strategies related with monitoring meteorological events and taking relevant measures.

#### *Ministry of Labor and Social Security*

Under the organization of Ministry of Labor and Social Security, there are several divisions which are responsible from occupational health and safety including:

- *General Directorate of Occupational Health and Safety* defines standards of health and safety and coordinates all aspects associated with occupational health and safety.
- *Labor Inspection Board* functions through its labour inspectors, monitoring all activities related to health and safety at the workplace and reporting to the Ministry.
- *Regional Labor Directorates* are ministerial agencies at regional level, conducting monitoring and enforcement of labor law, particularly occupational health and safety.

#### *Ministry of Culture and Tourism*

The Ministry of Culture and Tourism is the responsible body for protection of cultural heritage in Turkey at the national level. As part of the Ministry, the High Commission for the Protection of Cultural Assets is responsible for protecting and restoring the immovable cultural and natural assets. There are also Cultural Assets Protection Regional Boards at regions defined by the Ministry of Culture and Tourism, which are responsible for the protection of cultural heritage within their respective jurisdictions.

#### **3.1.2 Provincial Administration (Istanbul Province)**

The highest authority at the provincial level is the Governor, who is directly responsible to the Ministry of Internal Affairs. Governors represent central government (i.e. the Council of Ministers) at the provincial level. Provincial directorates represent their respective ministries at provincial level and form the Provincial Administration under the authority of the Governor.

#### **3.1.3 Local Administration (Basaksehir District)**

Mayors and Muhtars are the heads of urban (over 2,000 inhabitants) and rural (under 2,000 inhabitants) settlements, respectively. A Mayor is the head of the municipal organization (Municipal Assembly and Municipal Council) and represents the municipality. In urban areas, each neighbourhood also has a Muhtar (neighborhood headman). Both Mayor and Muhtar are elected officials.

## 3.2 Turkish Regulatory Framework

### 3.2.1 Turkish Legal Framework

The legal framework in Turkey is governed by the Turkish hierarchy of norms, which defines the different categories of Parliamentary Act and controls legal precedence in cases of any conflict.

All parliamentary acts have to comply with Constitutional provisions and the constitutionality of these acts can only be contested at the Constitutional Court (*Anayasa Mahkemesi*). Parliamentary Acts are made up of Code Law (*Kanun*) and Decree Law (*Kanun Hukmunde Kararname*). Code Law forms the backbone of the Turkish legal system and is the fundamental reference point for all courts. Decree Laws are legislation prepared by the Council of Ministers and authorized by the Parliament.

Public administrative bodies, such as Ministries, are responsible for the execution of Parliamentary Acts and as such have the authority to develop secondary legislation to ensure implementation of these Acts. Secondary law includes:

- By-laws (*Tuzuk*): Ministries (and in practice the Council of Ministers) are entitled to issue decrees. These regulatory acts are examined by the Council of State (*Danistay*) before they are issued.
- Regulations (*Yonetmelik*): These are issued by Ministries as well as other public bodies with authority of execution. Regulations have to be in compliance with the relevant decrees. Even though they occupy a lower grade than Decrees in the hierarchy of norms, they are usually substituted for Decrees and tend to form the bulk of Turkish legislative documents.
- Circular orders (*Genelge*) and Communiqués (*Tebliğ*). These are legislative documents issued by administrative bodies to ensure implementation of parliamentary acts. They are considered minor legislation, though prominent in certain fields.

### 3.2.2 Applicable Turkish Environmental, Health, Safety and Social Legislation

The key provisions of Environmental, Health, Safety and Social (EHSS) legislation considered relevant to the Project are summarized in Table 1 of Annex B in tabular format. The key permit requirements for the Project are indicated in the table along with the relevant provisions.

#### *Key Applicable Laws on Environmental, Health, Safety and Social Issues*

The current environmental legal policy framework of Turkey is built on the *Environmental Law* (Law no. 2872). This law provides a legal framework for many regulations scattered throughout the Turkish legislation that seek to clarify and elaborate its intentions, including the Environmental Impact Assessment Regulation.

Labor, health and safety issues are collectively ruled by the *Labor Law* (Law No. 4857), *Occupational Health and Safety Law* (Law No. 6331) and associated regulations.

#### *Key Applicable Legislation for the Health Sector*

*The Health Services Basic Law* (Law No. 3359) regulates the fundamental principles related to health services and states that "health institutions and organizations are planned, coordinated,

*financially supported and developed by the Ministry of Health considering the opinions of other relevant Ministries".* Basic principles for the establishment of the health facilities by Public Private Partnership model were initially introduced with the Additional Article 7 (with the amendment in the Law by the *Law on The Addition of a New Provision to the Health Services Basic Law* (Law No. 5396). Based on the Additional Article 7 of the Health Services Basic Law (Law no. 3359), the *Regulation on the Construction of New Healthcare Facilities against Lease and the Renovation of Existing Healthcare Facilities against Operation of Non-Medical Services and Functional Areas of Activity* was prepared and entered into force on 27.02.2007. This regulation covers and is applicable to the healthcare facilities which are decided by the Higher Planning Board needed to be constructed, and those existing healthcare facilities which are decided by the MoH needed to be renovated, within the framework of the Additional Article 7 of the Health Services Basic Law (Law No. 3359). Additional Article 7 was then abolished with the entry of *The Law on Facility Construction, Renewal and Obtaining Service by the Ministry of Health with the Public Private Sector Cooperation Model and Amendments of Certain Laws and Decrees* (Law No. 6428) that come into force on 09.03.2013. This new Law regulates the processes in the construction or renewal of the health facilities such as land use and transfer, tendering, contracting and obtaining certain services (i.e. consultancy).

There are other several general regulations that apply to the health institutions including the *Regulation on the Operation of Inpatient Treatment Institutions* (Official Gazette date/number: 13.01.1983/17927) which defines the implementation principles of several services in inpatient health institutions and the roles and responsibilities of the personnel; and the *Regulation on Providing Patient and Personnel Security* (Official Gazette date/number: 06.04.2011/27897) which establishes procedures and principles to ensure and maintain a secure environment for the patients and personnel within the health institutions.

Regarding patient's rights, there is one regulation which is the *Patient Rights Regulation* (Official Gazette date/number: 01.08.1998/23420) that regulates the procedures and principles for benefiting from patient rights, protection of people from breaches and use of legal protection means, if needed.

### **3.2.3 International Conventions Ratified by Turkey that are Relevant to the Project**

Turkey has ratified several international conventions and agreements with respect to environmental conservation. Those conventions and agreements that could have relevance to the Project are listed below:

- Kyoto Protocol to the United Nations Framework Convention on Climate Change, Kyoto (1997) (Turkey made the Ratification Accession on 28 May 2009 and it entered into force 26 August 2009. Turkey is party to the United Nations Framework Convention on Climate Change)
- Vienna Convention for the Protection of Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987)
- Bern Convention on the Conservation of European Wild life and Natural Habitats (1976)
- CITES Convention on Trade in Endangered Species of Wild Flora and Fauna (1975)
- Convention on Biodiversity - Biological Diversity (1992)

### 3.3 International Requirements

IHC is seeking financing from multinational financial institutions including export credit agencies to fund the development of the Project. It has been agreed with IHC that the ESIA report will be prepared to comply with the requirements of International Finance Corporation's (IFC) Performance Standards (PSs) on Social and Environmental Sustainability (dated 1 January 2012) as given below:

#### ***IFC Performance Standards (dated 1 January 2012)***

- PS 1: Social and Environmental Assessment and Management Systems
- PS 2: Labour and Working Conditions
- PS 3: Pollution Prevention and Abatement
- PS 4: Community Health, Safety and Security
- PS 5: Land Acquisition and Involuntary Resettlement
- PS 6: Biodiversity Conservation and Sustainable Natural Resource Management
- PS 7: Indigenous Peoples
- PS 8: Cultural Heritage

IFC PS 1 establish the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project. IFC PS 2 through 8 provide guidance on particular topic areas that maybe relevant to an assessment, such as biodiversity conservation, resettlement or cultural heritage issues. The applicable IFC PSs are discussed in *Chapter 4: Scope of the ESIA and Stakeholder Engagement*.

In addition to the IFC PSs, the following guidelines will also be applicable for the Project:

- IFC General Environmental, Health and Safety Guidelines (30 April 2007)
- IFC Environmental, Health and Safety Guidelines for Healthcare Facilities (30 April 2007)

### 3.4 Comparison of Turkish and International Environmental Thresholds

Comparison of the Turkish and international environmental thresholds is summarized in Table 2, Table 3, Table 4 and Table 5 of Annex B.

## 4.0 SCOPE OF THE ESIA AND STAKEHOLDER ENGAGEMENT

### 4.1 Overview

Scoping is an important preliminary step in an ESIA process that identifies the key issues to be addressed in the ESIA study. Scoping allows defining which relevant issues should be addressed in the assessment and which issues are of little or no relevance to the Project. In this respect, a scoping study has been carried out for the Project to comply with the requirements of the IFC Performance Standards (PS). In addition, IFC General EHS Guidelines and IFC EHS Guidelines for Healthcare Facilities were taken into account during the scoping study.

The scoping study was performed with the following aspects in accordance with IFC PS1:

- environmental and social risks and impacts of the Project including labor, and health and safety of the workers and the community,
- key stages of the Project including construction and operation, and for accidents and emergencies,
- all elements of the project (including facilities, infrastructure and activities associated with the project)
- applicable laws and regulations,
- cumulative impacts from further planned development of the Project or any other existing or planned developments, as appropriate.

An ESIA scoping report has been issued in November 2013 which was based on the above mentioned international standards, review of readily available information, reconnaissance site visits conducted by the ESIA team and specific experts. Stakeholder consultations also started during the scoping phase.

#### *Categorization of the Project*

International lenders evaluate projects according to their category based on the scale and nature of potential impacts and risks. Projects are categorized as follows:

- Category A: Projects with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented;
- Category B: Projects with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and
- Category C: Projects with minimal or no social or environmental impacts.

Currently, the view is that the project is likely to fall into category A or category B which will be verified by the lenders.

The rest of this chapter presents the results of scoping and stakeholder engagement activities undertaken to date.

## 4.2 Scoping Results

The following topics were considered during the scoping study:

- Air quality and climatic factors
- Noise and vibration
- Geology, soils and groundwater
- Wastewater
- Waste management
- Material resources
- Terrestrial ecology
- Surface water
- Cultural Heritage
- Traffic and transport
- Socio-economic impacts
- Workers/Healthcare personnel
- Community health, safety and security

Potential impacts/sources, proposed scope for the ESIA and examples of mitigation measures have been identified for each topic given above. Based on the results of the scoping study, the following potential environmental and social impacts have been identified as key issues:

- **Air quality:** Impacts during construction may occur as a result of dust and exhaust emissions caused by construction activities, transportation of construction materials and resources, transport of excavated soils outside the Project area, vehicles movement, stockpiles, unpaved surfaces, ancillary facilities (such as concrete plant operation up to 95 m<sup>3</sup>/h). The operational phase impacts include increase in emissions from road traffic; exhaust air from heating, ventilation and air conditioning systems; ventilation of medical gases and fugitive emissions released from sources such as medical waste storage areas, medical technology areas and isolation wards; emissions related to the power generation.
- **Noise and vibration:** The Project has the potential to cause noise during construction by equipments, working vehicles and construction traffic which may affect nearby residential areas. Potential noise during operation is related with the increase in road traffic and operation of cogeneration system and generators.
- **Wastewater:** Sanitary wastewater will be generated by the workers during construction and by workers/healthcare personnel and patients during operation. Contaminated wastewater may result from discharges from medical wards and operating theatres, laboratories, pharmaceutical and chemical stores, cleaning activities and X-ray development facilities. Wastewater may also result from autoclaving, microwave irradiation and chemical disinfection.
- **Waste management:** There will be waste generation during construction activities that include excavated soils, solid wastes, construction wastes (such as steel, cables) and hazardous wastes (such as waste oil, oily rags) which will require disposal. During operation, there will be generation of domestic wastes, general hazardous wastes and healthcare wastes (such as infectious wastes containing pathogens; sharps such as needles,

scalpels, knives; pharmaceutical wastes; genotoxic/cytotoxic wastes that may have mutagenic, teratogenic or carcinogenic properties; and chemical wastes generated through the use of chemicals during diagnostic/experimental work, cleaning, housekeeping and disinfection; radioactive wastes that may be generated by activities such as imaging, radiotherapy, and research laboratory procedures; waste with high content of heavy metals such as batteries, broken thermometers, blood pressure gauges; pressurized containers).

- **Cultural heritage:** A project area specific cultural heritage walkover survey has been conducted during the scoping phase of ESIA by archaeology experts. It was found that the project area might bear archaeological potential which has required further investigation.
- **Traffic and transport:** The Project may have the potential to result in a traffic increase in local roads used by hospital traffic during operation which may require specific management measures.
- **Socio-economic impacts:** The Project will create employment opportunities and may affect positively the local businesses during construction and operation phases.
- **Worker/Healthcare personnel health and safety:** Activities during construction carry the risk of injury or damage to workers. Related to operation, impacts may occur through exposure to infections, diseases, hazardous materials/waste, radiation; and through fire risks related to storage, handling and presence of chemicals and flammable substances.
- **Community health, safety and security:** There will be dust, noise and vibration generation during construction activities which may affect nearby communities. Impacts during operation phase are related to the increase in road traffic and management of healthcare wastes.

Cumulative impacts were reviewed as part of the scoping study. There are two projects close to the Project area that are known at the time of preparation of the Draft ESIA Report. These are the planned road projects around the Project area and the planned construction of the metro station within and/or near the Project area. Based on the discussions conducted with relevant departments of the Greater Metropolitan Municipality of Istanbul as part of the ESIA stakeholder engagement activities, the road projects were previously planned independently of the Project considering the development of the area related to olympic games and also future residential development of the area. Moreover, there is a planned clover leaf junction at the north of the Project area which will be connecting to the 3<sup>rd</sup> bridge which is presently under construction. Cumulative impacts with these developments were not assessed in the ESIA due to the fact that it was not clear at this stage when the construction of the road projects and metro project will start and when they will become operational, making it unclear whether there will be any overlap between the construction periods of the IHC Project and the road/metro projects. Reportedly, the road projects were still not tendered for selection of construction contractors. Since the planning of the road projects are still in progress and the traffic in those roads will not be only related with the IHC traffic and also is not known at this stage, relevant impacts could not be considered. It should be pointed out that the constructions of the planned road projects as well as the metro line are independent of the IHC Project. These initiatives have been planned and are to be implemented as part of the infrastructure development and investment of the government authorities.

The other topics that are considered during the scoping are also discussed in relevant chapters of the ESIA.

### 4.3 Applicable IFC PSs

Based on the results of the scoping study, those IFC PSs that are envisaged to be triggered by the Project are presented in Table 4-1:

Table 4-1: Applicable IFC PSs

IFC PS	Applicability	Notes
PS 1: Social and Environmental Assessment and Management Systems	Yes	In order to meet the requirements of the international lenders, there is a need to identify and evaluate the potential environmental and social impacts of the Project and to identify relevant mitigation measures, which is the scope of this ESIA study. The ESIA study included engagement with stakeholders which is also required by IFC PS1.
PS 2: Labour and Working Conditions	Yes	The Project is required to establish and maintain a sound worker-management relationship through compliance with national labor, occupational health and safety legislation and following of international guidelines on these issues.
PS 3: Pollution Prevention and Abatement	Yes	The Project is required to identify and implement necessary pollution prevention and abatement measures for the protection of the environment and the people.
PS 4: Community Health, Safety and Security	Yes	The Project is required to identify risks and potential impacts to the health and safety of the communities by the project activities, and to establish preventative measures to address them in a manner commensurate with the identified risks and impacts.
PS 5: Land Acquisition and Involuntary Resettlement	No	No expropriation, resettlement and/or economic displacement have occurred related to the Project. The Project area is owned by the Treasury and has been allocated to IHIC for 28 years. In addition, the Project site is included as a "Health Area" in the zoning plans and in the 1/100,000 scaled Istanbul Environmental Plan.
PS 6: Biodiversity Conservation and Sustainable Natural Resource Management	Yes	An ecological walkover survey and literature studies have been conducted by flora and fauna experts. Flora and fauna species were evaluated according to international guidelines. Two local endemic flora species were observed at the site, which are found within Istanbul provincial borders. Related to fauna species, one species that is under vulnerable category and one species that is under near threatened category were observed.
PS 7: Indigenous Peoples	No	PS7 is not applicable as no indigenous peoples were found to inhabit the Project area and/or the surroundings.
PS 8: Cultural Heritage	Yes	An archaeological walkover survey at the Project site and desk research have been conducted by the archaeology experts, which revealed archaeological potential at the site. This has led to further investigation through archaeogeophysical study and contact with the relevant Cultural Heritage Protection Board to clarify the situation. An archaeology advisory committee was appointed by IHIC to undertake necessary management and coordination. There is a possibility to encounter artifacts during the construction phase. Moreover, Istanbul 1st Cultural Assets Protection Regional Board Directorate issued a decision stating that comprehensive surface investigation needs to be undertaken by the Istanbul Archaeological Museums Directorate with the technical support by the ownership (General Directorate of Health Investments of the MoH) of the site, and the issue can only then be evaluated after the report and photographs of the surface investigation is submitted to the Regional Board Directorate.

#### 4.4 Stakeholder Engagement Activities during ESIA Study

Stakeholder engagement activities for the Project have started during the scoping stage and continued during the preparation of the ESIA report. A stand-alone Stakeholder Engagement Plan (SEP) (dated November 2013) has been developed for the Project, to help structure a systematic communication with the stakeholders during the ESIA study. Relevant stakeholders were identified including governmental authorities and non-governmental organizations (NGOs) at national, regional and district level, and local communities. The list of identified stakeholders is presented in Annex D-1. All these stakeholders were contacted during the ESIA study.

The main communication methods and mechanisms that were used to consult with key stakeholders included:

- Information about the Project and potential impacts to be provided to stakeholders via project document and leaflets during the scoping stage
- Face-to-face meetings with selected stakeholders
- Public consultation meeting
- Local newspapers (for announcements related to public consultation meeting)
- Project website (for providing information about the Project)

The summary of consultation activities are provided below:

- Face-to-face meetings were held with the following governmental authorities:
  - Ministry of Health, Department of Public Private Partnership
  - Ministry of Health, General Directorate of Health Services
  - Ministry of Health, General Directorate of Management Services
  - Ministry of Health, Public Hospitals Institution
  - Istanbul Provincial Directorate of Health
  - Istanbul Metropolitan Municipality, Directorate of Transport Planning
  - Istanbul Metropolitan Municipality, Department of Rail Systems
  - Basaksehir Municipality
- Relevant selected NGOs were approached to conduct face-to-face meetings.
- Identified governmental authorities (107 agencies) and NGOs (53 agencies) were sent a Project Information Document together with a cover letter and asked to comment on the Project, its potential impacts and to provide information that may be important for the ESIA study. The letters were sent as certified mail with return receipt requested to ensure that all the letters were delivered.
- A project information pack (including 5 Project Information Documents, 25 Project Information Leaflets and 25 Comment/Grievance Forms) were sent together with a cover letter to headmen of 13 neighbourhoods located within a diameter of 10 km to the Project area to provide information on the planned Project and related impacts, ongoing environmental and social impact assessment and to provide opportunity to express views and concerns about the project, and to inform how views/concerns can be submitted. The letters were sent as certified mail with return receipt requested to ensure that all the letters were delivered.
- A Public Consultation Meeting was held on 3<sup>rd</sup> January 2014 in Basaksehir District. Eleven people participated the meeting. The meeting was announced via advertisements in one national newspaper sixteen days in advance on 18<sup>th</sup> December 2013, and the advertisement

was repeated at the same newspaper and also announced in a second national newspaper on 25<sup>th</sup> December 2013. A presentation was made in the meeting by a representative of the ESIA team. Representatives from IHIC was also available during the meeting.

- A Project specific email address ([ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)) to be used during the ESIA study was created to collect opinions via email.
- A Project specific website ([www.ikitellisehirhastanesipp.com](http://www.ikitellisehirhastanesipp.com)) was established where the Project Information Document, Project Information Leaflet and Comment/Complaint Form are made available to the public.

Examples of cover letters sent to governmental authorities, NGOs and headmen; the Project Information Document and the Project Information Leaflet; newspaper announcement and photos from the public consultation meeting are presented in Annex D-2.

The discussions made/information obtained during the face-to-face meetings, official response letters that were received from several governmental authorities in reponse to request for comment via sending out the cover letter and project information document, and a question raised by one participant during the public consultation meeting are compiled in a stakeholder register and presented in Annex D-3.

The key issues that were raised during the face-to-face meetings with governmental authorities and that were mentioned in the official response letters are presented below.

#### *Face-to-face meetings with governmental authorities*

- Information on the communication made with the Ministry of Environment and Urban Planning by the MoH reveals that “all health investments whose bidding process is completed before the enactment of the new EIA regulation” are exempted from the EIA regulation
- Previous plannings related to the Project area
- Planned road projects and metro extension around the Project area which are independent of the İstanbul İkitelli IHC Project
- Information on no hospital closures directly related with the İstanbul İkitelli IHC Project
- Presence of inadequate number of doctors in İstanbul

#### *Response letters from governmental authorities*

- Documentation of the completion of the project bidding process so that the Project is scoped out from the Turkish EIA Regulation
- Obtaining a certification system for the IHC related to sustainable (green) hospitals (certifications such as LEED for Healthcare, Practice Green Health, Health Care without Harm and American Society for Healthcare Engineering) or following the guidelines of the mentioned certifications during the implementation of the construction and operation phases
- Considering an alternative name for the Psychiatric Hospital or having the necessary services under the General Hospital, in order to minimize to pressure on patients and to increase the applications

- Planning during construction to have necessary infrastructure such as setting up computerized weighbridge system in order to weigh and deliver the medical waste for disposal during operation phase
- Waste management and disposal practices
- Compliance with Occupational, Health and Safety (OHS) Law and relevant OHS regulations
- Undertaking necessary measures to manage increases in traffic in local roads during operation of the IHC
- Need for the metro to become operational before the health campus starts operation
- Need for high-capacity parking in the IHC
- Provision of transportation between the units of the hospitals
- Suggestions to have hotel/accommodation services for patients and their relatives who come from out of town
- Inclusion of a dental polyclinic in the health campus
- Inclusion of day nursery for the children of the employees and housing/resting and sports facilities for the employees
- Need for undertaking comprehensive surface investigation followed by evaluation of the archaeological potential of the site based on the report and photographs of the surface investigation, by the Istanbul 1<sup>st</sup> Cultural Assets Protection Regional Board Directorate

#### *Public*

- Presence of commercial areas in the IHC where pharmacies, medical shops, optician shops and similar can be opened

The Non-Technical Summary of the Final Draft ESIA Report will be made available in Turkish to the public for review and comments. A public meeting to be announced at least two weeks in advance, may be held to inform the public on the results of the impact assessment study and the mitigation measures to be implemented. Comments received during the consultation process will be considered by the Project and the ESIA team, in consultation with the lenders. Appropriate comments will be taken into account to address the issues raised and the ESIA will be finalized accordingly. After completion of the ESIA process, IHIC will continue to engage with the stakeholders during construction and operation of the Project and outline plans for this are set out in the SEP.

## 5.0 LAND USE AND ZONING

### 5.1 Scope

This chapter describes the land use and discusses the available regional/local zoning plans covering the Project area. There is no land take related with this Project. However, the likelihood of impacts is assessed in this chapter.

The impacts on land use within the Project area are further addressed. The following approach is followed in the assessment:

- Identification of existing land uses within the Project area and its surrounding through site visits, aerial photographs
- Review of existing local zoning and regional plans covering the Project area
- Establishing whether there are impacts with regard to land use and zoning

The following information sources have been used during the assessment:

- 1/100,000 scaled Istanbul Environmental Plan (Approval Date/Board Decision Number: 13.02.2009/103)
- 1/5,000 scaled "Partial Revision Zoning Plan of North Ayazma Slum Prevention Area" approved by Istanbul Greater Metropolitan Municipality on 10.05.2006 and 05.06.2006
- 1/1,000 scaled "Partial Revision Zoning Plan of North Ayazma Slum Prevention Area" approved by Istanbul Greater Metropolitan Municipality on 22.11.2007, 26.11.2007, 21.01.2008 and 26.11.2009

### 5.2 Land Use Pattern

#### 5.2.1 Land Use inside the Project Area

The Project site is located within the boundaries of Basaksehir District of Istanbul Province. The Project site will cover an area of 789,031 m<sup>2</sup>. The Project site belongs to the Treasury and according to the information given in the official letter issued by the Treasury (dated 11.06.2013 and numbered 23674), the right of superficies has been granted to IHIC for 28 years (for 36 months of investment period and 25 years of operation period) by the Treasury with the approval decision dated 07.06.2013 and numbered 614 (Details related to zoning are described in Section 5.2.3). IHIC will sign a contract for right of superficies with the relevant financial office. Land use inside the Project area is shown in Figure 5-1.

The Project area is vacant and separated into two parts by a 22 m wide, 2x2 cross-sectioned road (indicated by blue line in Figure 5-1) which is connecting Basaksehir and Kayasehir neighbourhoods. Approximately one kilometer of the mentioned road passes through the Project area. This road is not included in the zoning plans of Istanbul and will be used as internal road as part of the İkitelli IHC during operation. There is an important aspect related with this road which is the presence of a 600-mm diameter natural gas pipeline with 20 bars operating capacity that is buried under the road and as reported, it is the main pipeline of Istanbul Gas Distribution Industry and Trade Inc. (İGDAŞ) feeding the European side of Istanbul. The pipeline will not be relocated. IHIC has made an application to İGDAŞ to confirm any specific requirements that should be met during the

construction and operation of the Project. Official response letter of IGDAS is provided in Annex E-1.

There is also a haul road (indicated by red line in Figure 5-1) which is approximately 10 m wide that enters the Project area from the south, passes through the Project area for a distance of 1 km and further proceeds to the disposal area outside the Project area. As it is observed during the site visits, this road is used by the trucks carrying excavated materials to the disposal area at the north of the Project site. It is expected that this road will also be used during construction of the Project by construction vehicles for accessing the site. This road will be removed within the scope of the Project.

The project area is highly sloped between the western and eastern boundaries of the Project area with an elevation difference up to 60 m. There is an area (green shaded area in Figure 5-1) within the Project site where excavated materials generated during metro construction in the vicinity, were previously stored. As reported by the Mayor of Basaksehir District, the disposal works were followed by the Greater Metropolitan Municipality of Istanbul (IMM) at the time. The Project area has not been previously used for industrial purposes. There are no ground water wells, surface waters, infrastructure (except for the gas pipeline) or upperstructure in the Project area.



Figure 5-1: Land use inside the Project area (yellow line shows the Project area boundaries)

Some illustrative pictures of the Project area are presented below.

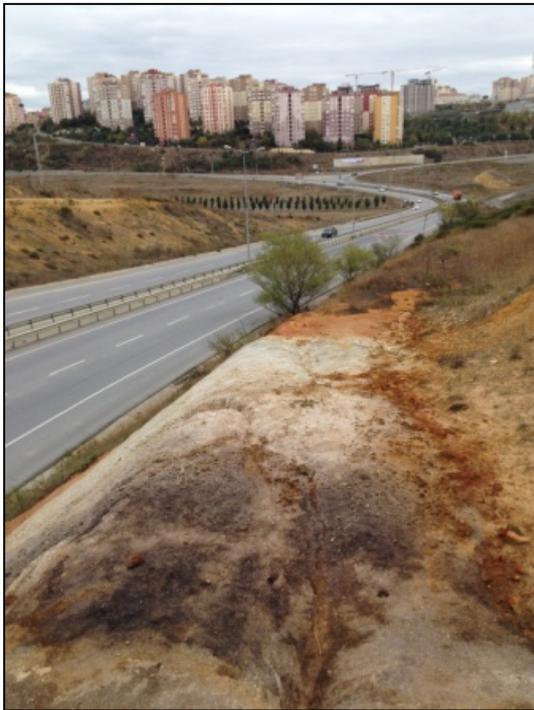
**Photo 1. View from the Project area**



**Photo 2. Area where excavated materials were previously stored**



**Photo 3. The road connecting Kayasehir and Basaksehir neighbourhoods**



**Photo 4. The haul road within the Project area**



### **5.2.2 Surrounding Land Use**

The surrounding land use is defined by site visits, use of aerial photographs and local zoning plans. An overview of the land use in the immediate surroundings of the Project area is presented in Figure 5-2.



Figure 5-2: Land use in the immediate surroundings of the Project area

There are a great number of mass housing complexes in the vicinity of the Project area, some of which are under construction. The closest settlements to the west boundary of the Project area (northern part of the Project area) are the houses located approximately at a distance of 200 m which were built by the Housing Development Administration of Turkey (TOKI). These houses are located in Kayasehir neighbourhood and generally have 10-12 floors. There is also a mosque in the same area with these houses. The TOKI houses and the northern part of the Project area is separated by the haul road that goes to the excavated material disposal area and currently being used by trucks carrying excavated materials. The general view of the TOKI houses is shown in Photo 5.

**Photo 5. View of TOKI houses**



There is an operating concrete plant (Bogazici concrete plant, Photo 6) located almost adjacent to the west boundary of the Project area (southern part of the Project area). As reported, Bogazici concrete plant has 200 h/m<sup>3</sup> capacity and will be used by the Project during the construction phase. There is an ongoing housing complex construction (named as “Bahcetepe Istanbul”) at a distance of 150 m to the southwest of the Project boundary. The housing complex is composed of 16 blocks containing 1,476 houses. The view of construction is given in Photo 7.

**Photo 6. View of Bogazici concrete plant**



**Photo 7. View of housing complex construction**



There is a creek flowing along the east boundary of the Project area. The distance between the creek and the Project boundary differs between 15 to 130 meters along the boundary from north to south direction. There is a parking area of IMM located between the east boundary of the Project area and the creek. As it is observed during the site visits, garbage trucks of IMM and cars of Turkish Post Office Department park here.

At the other side of the creek, there are residential areas of Basaksehir district. The closest houses on this side are located at a distance of approximately 210 m to the east of the Project area. The types of these residents on this side include shanty houses, apartments and housing complexes. There is Nurettin Topcu Elementary School located at a distance of 600 m to east of the northern part of the Project boundary. The settlements, IMM parking area and the creek are shown in Photo 8.

**Photo 8. The view of the east of the Project Area**



There is a drinking water treatment plant (Ikitelli Drinking Water Treatment Plant) belonging to Istanbul Water and Sewage Administration (ISKI) and the Atatürk Olympic Stadium (the largest-capacity stadium of Turkey) to the south of the Project area at approximate distances of 990 m and 2,100 m, respectively.

There is an excavated material disposal area located approximately at a distance of 500 m to the north boundary of the Project area (Photo 9). This area was previously a quarry and is presently

being rehabilitated by filling excavated materials. This area will also be used by the Project for disposal of excavated materials during the construction phase.

**Photo 9. The view of excavated material disposal area**



### **5.2.3 Regional Plans and Zoning**

The project area is composed of two parcels (Plot number: 1356, parcel no: 1 and 2). The areas of parcel 1 and parcel 2 are 675,453.13 m<sup>2</sup> and 113,577.87 m<sup>2</sup>, respectively according to the title deeds (issue date: 09.10.2013). Both parcels are under the ownership of the Treasury. According to the information given in the official letter issued by the Treasury (dated 11.06.2013 and numbered 23674) to the MoH, 9 m<sup>2</sup> of Parcel 1 is allocated to Turkish Electricity Distribution Corporation (TEDAŞ) under a right of easement for construction of a substation.

There are several provincial and local plans that are related with the Project area. One of them is the 1/100,000 scaled Istanbul Environmental Plan approved by the IMM Department of Housing and Urban Development (Approval Date/Number: 13.02.2009/103). A section from this plan is extracted to show the land classification at and around the Project area as shown in Figure 5-3. As can be seen in Figure 5-3, the Project area and southwest part of the Project area is classified as "Health Park". The west of the Project Area is classified as "Development area" and the east is classified as "Residential Area". "National and International Sport Area" is marked at the north and south of the Project area. There is an area at approximately 3.5 km west of the Project area classified as "Area with critical importance in terms of environmental sustainability". There is "Organized Industrial Zone" at approximately 1 km southeast of the Project area. In addition, the current and planned metro line is marked in the environmental plan as "Mass transport rail route".

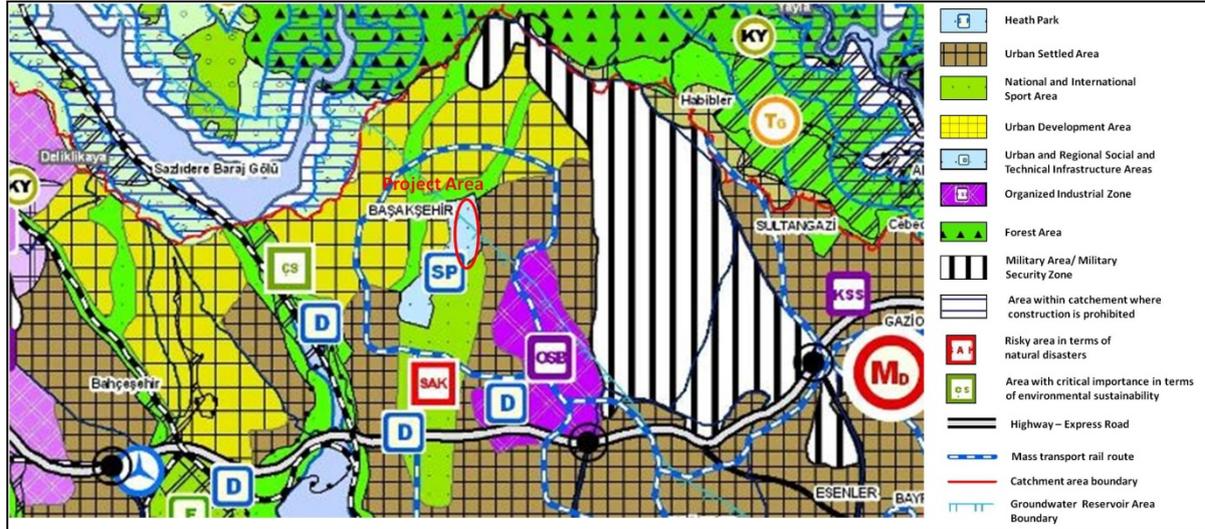


Figure 5-3: Section of 1/100,000 scaled Istanbul Environmental Plan (Project area schematically shown by red line and not part of the plan)

With regard to local zoning plans, the Project area is included in the 1/5,000 scaled Partial Revision Zoning Plan of North Ayazma Slum Prevention Area approved by IMM. As it is shown in Figure 5-4, the Project area is classified as “Health Facility Area (Health Complex)”. 1/5,000 scaled zoning plan also includes roads that are planned by IMM (roads on the east and west side of the Project area) and General Directorate of Highways (cloverleaf junction), as shown in Figure 5-4. The sides of these roads are classified as “park and green areas”. There are commercial areas on the southeast and southwest of the Project area. The flood plain of the creek is also indicated in the 1/5,000 scaled zoning plan. It is understood that the Project area is not within the flood plain of the creek. To the southwest of the Project area, there is an area classified as “High Density Residential Area”. The Project area is also included in the 1/1,000 scaled Partial Revision Zoning Plan of North Ayazma Slum Prevention Area approved by IMM.

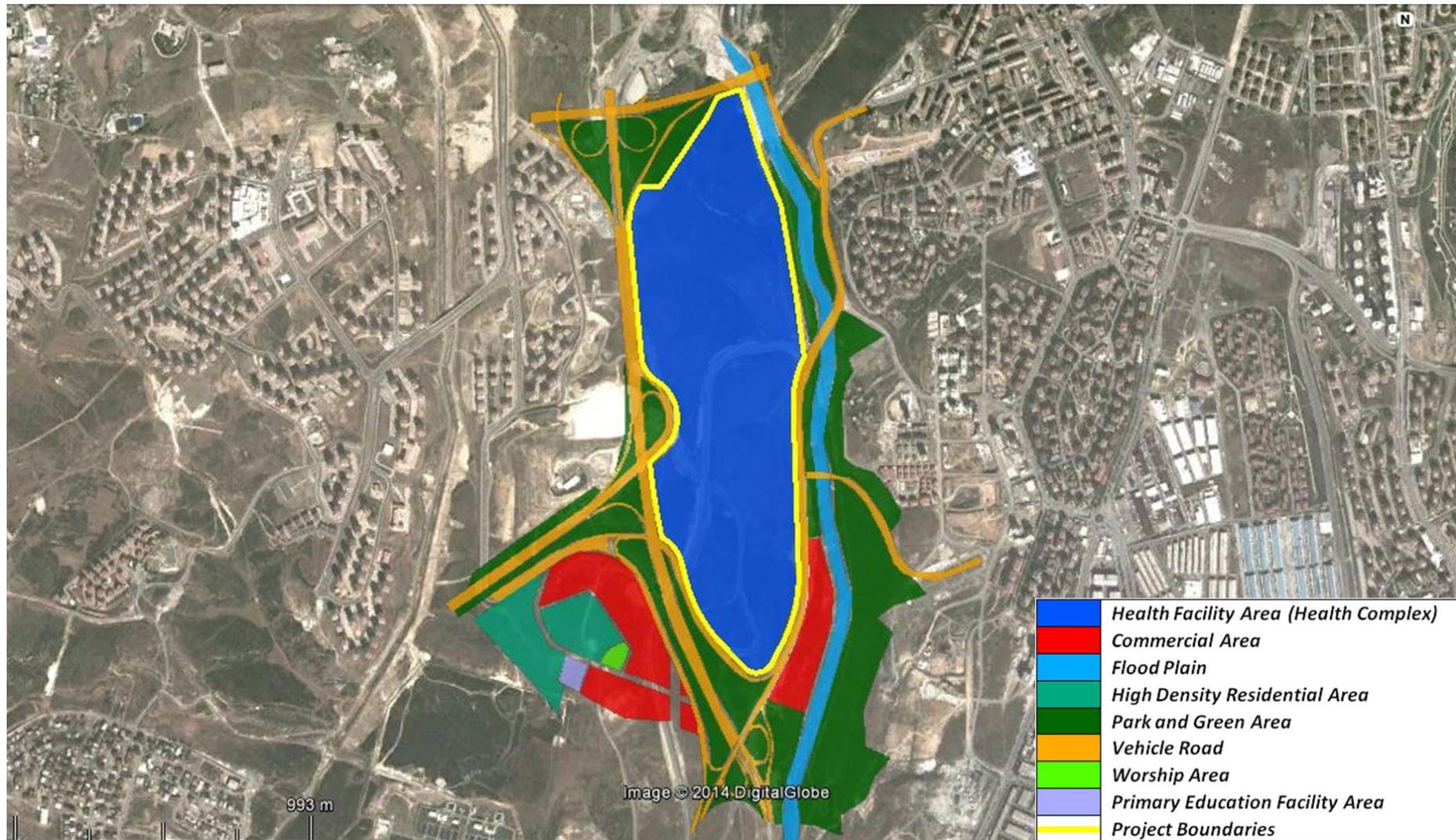


Figure 5-4: Section of 1/5,000 scaled Istanbul Zoning Plan (Project boundary schematically shown by yellow line and not part of the plan)

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#### **5.2.4 Assessment**

The Project comprises development of an Integrated Health Campus within an area that is owned by the Treasury. No land take, expropriation, resettlement and/or economic displacement have occurred related to the Project. As reported, the construction activities will be undertaken within the defined Project area and no additional land will be used.

As explained in above sections, there is a natural gas pipeline buried under the road that is passing through the Project area which will not be relocated. IHIC has made an application to İGDAŞ to confirm any specific requirements that should be met during the construction and operation of the Project. Official response letter of İGDAS is provided in Annex E-1 which provides information on the minimum clear distance required between any structure and the pipeline infrastructure, and requires developing a protocol with the Basaksehir Network Directorate prior to start of the excavation works. IHIC will follow the requirements of İGDAS. No impacts are expected related with this issue and the natural gas pipeline will be able to continue its operation. In addition, 9 m<sup>2</sup> of the Project needs to be used for a substation to be installed by TEDAS. No negative impacts are expected related with this issue as well on condition that necessary communication is made with TEDAS to identify a suitable location that will not interfere with the Project design.

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## 6.0 GEOLOGY, SOILS AND CONTAMINATED LAND

### 6.1 Scope

This chapter presents an evaluation of the predicted impacts of the Project related to geology and soils. The following issues are addressed:

- Seismic activity risks
- Soil impact risk
- Contaminated land risks

A description of the significance criteria to complete the impact assessment is provided followed by a description of the baseline situation. The potential impacts for the issues noted above are discussed and the proposed mitigation measures are presented together with the residual impacts.

The results from the following desktop study and site-specific investigations were used to establish the baseline information:

- Istanbul Province Environmental Status Report, 2010-2011
- Literature survey
- The findings of two geotechnical investigations conducted at the site. A “Master Plan Based Geological and Geotechnical Investigation” study was conducted in December 2008 for a parcel which occupies an area of 1,415,320 m<sup>2</sup> (the ‘investigation area’). A more recent and comprehensive site investigation was finalized in January 2014. These investigation included site observations, drilling of 30 boreholes in the 2008 study and 118 boreholes in the 2014 study, collection of disturbed and undisturbed soil samples and laboratory analysis to assess subsurface soil profile and parameters necessary for geotechnical design. The purpose of these investigations was to determine the geological-geotechnical characteristics and seismicity situation as well as the suitability for building construction on the investigated area.
- The results of a soil quality investigation conducted by ELC at the Project site in January 2014. The study was conducted as part of the 2014 geotechnical site investigation program. Soil samples were collected to assess the soil quality across the study area as well as to identify potential soil contamination from former construction debris and excavated earth material disposed on portions of the site. The soil quality investigation included collecting samples from 10 boreholes having depths varying between 4 m and 30 m below ground level (bgl). Groundwater was not encountered to a depth of 20 m bgl. As reported, groundwater was not encountered to a depth of 30 m bgl in other boreholes that were drilled.

The necessary criteria (e.g. appropriate standards, regulations, etc.) will need to be taken into account in the design of the facilities to address the seismic risks. This will be conducted for satisfying the design of structures located in the 2<sup>nd</sup> degree earthquake zone where the Project site is located. The geotechnical site investigations have identified the geotechnical parameters for seismic and foundation design.

The following significance criteria are suggested related to the contamination of soils and potential presence of contaminated land.

Impact Significance	Description
Negligible	- Temporary use of land (with soil surface) for the storage of excavated materials and construction equipment
Minor	- Temporary small-scale oil spills during construction activities on soils that lead to contamination below generic contamination levels stated in the Turkish Regulation on Soil Pollution Control and Point Source Contaminated Sites (Soil Pollution Regulations) - In case of disturbance of potentially identified contaminated soils: increase contamination in nearby non contaminated soils to above the background level but below the generic contamination levels stated in the Soil Pollution Control Regulations
Moderate	- Continuous/long-term oil spills during construction activities on soils and during operation (e.g. accidents) (concentrations of pollutants in the soil defined in the Soil Pollution Control Regulations are exceeded above the generic contamination levels but below the long term cancer and hazard risk) - In case of disturbance of potentially identified contaminated soils: increase contamination in nearby non contaminated soils to above the background level that are above the generic risk levels stated in the Soil Pollution Control Regulations but below long term cancer and hazard
Major	- Continuous/long-term oil spills during construction activities on soils and during operation (e.g. accidents) (concentrations of pollutants in the soil defined in the Soil Pollution Control Regulations are exceeded to cause long term cancer and hazard risk) - In case of disturbance of potentially identified contaminated soils, increase contamination in nearby non contaminated soils to above the background level that will be hazard to human health

## 6.2 Existing Environment

### 6.2.1 Geology

#### *Regional Geology*

Palaeozoic, Mesozoic and Cenozoic formations are present in Istanbul. The oldest rocks are Palaeozoic rocks that consist of quartz, quartz arenite and arkose. From the Ordovician to the middle of the Carboniferous that are several thousand meters thick, concordant rock sequence outcrops in the area. This sequence mainly consists of variable facies of clastic and carbonate rocks. Some of the main characteristics of the Palaeozoic sequence are horizontal and vertical transitions, alternations of different rocks and lenticular structures (Eroskay, 1985). The Palaeozoic aged rocks cover large areas of Istanbul. Rocks of Ordovician, Silurian and Devonian age outcrop mostly on the Asian side, and Carboniferous rocks are located mostly on the European side (Figure 6-1 and Figure 6-2). Granitic rocks have intruded into these rocks (Oztunali and Satir, 1973) and andesitic and diabasic dykes are also present. Palaeozoic rocks are overlain unconformably by Mesozoic units. These units outcrop in the northern parts of Istanbul, both on the Asian and European side. Triassic formations are represented by conglomerate, sandstone, dolomite, dolomitic limestone, lump limestone and clayey limestone. Cretaceous units are represented by sandstone, shale, and limestone interbedded with lavas and pyroclastic rocks. The Mesozoic rocks, in turn, are covered by Tertiary units. These units are generally fossiliferous limestone, clayey limestone or marl, and uncemented or loosely cemented sand, silt and clay. The various geological units are shown in Figure 6-1.

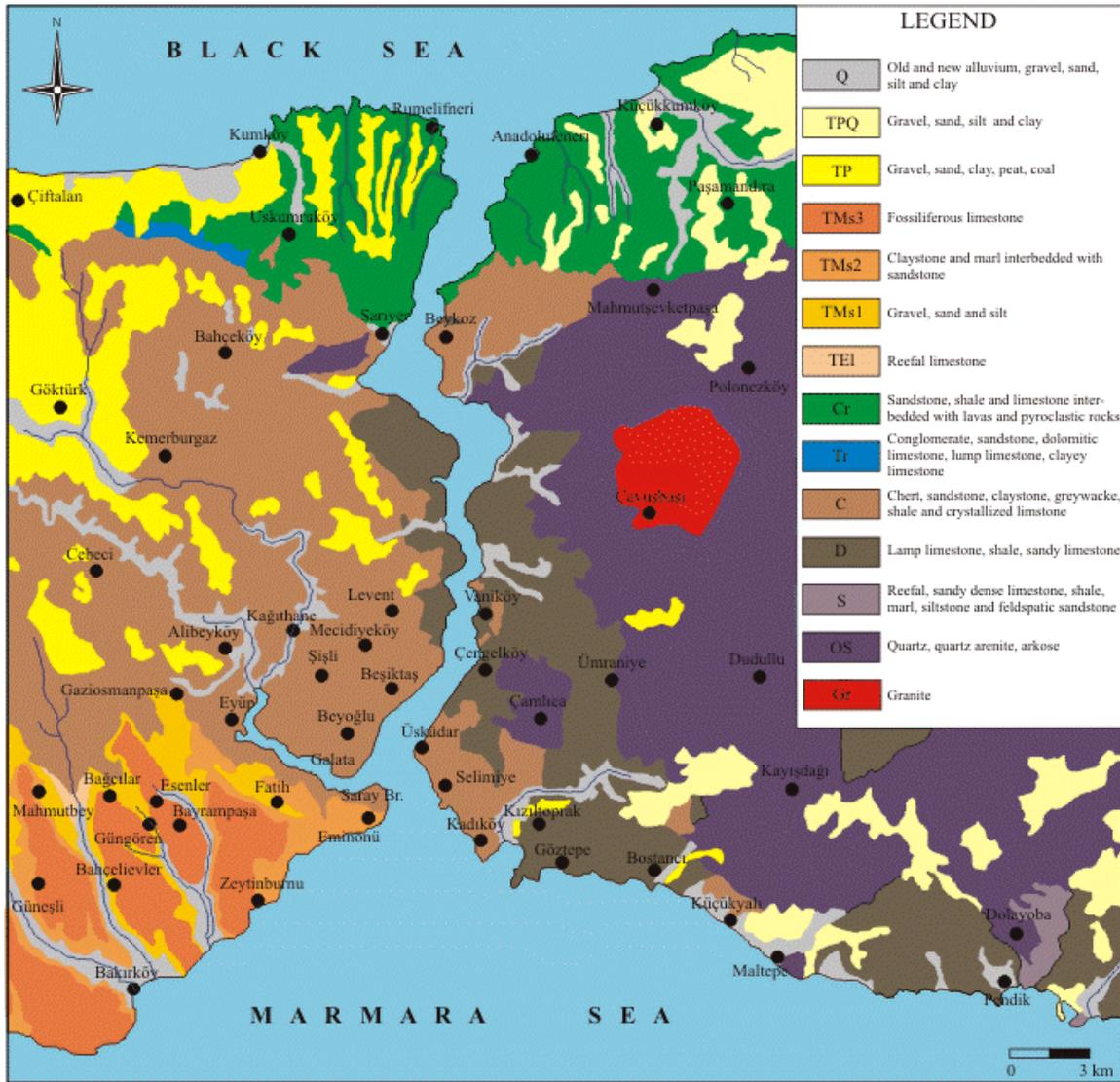


Figure 6-1: Map showing geological map of Istanbul (Undul and Tugrul (2006))

The Project area is located in the southeastern part of Istanbul Province, Kucukcekmece District east of the Trans European Motorway (TEM). The site boundaries are located within the drainage basin of the Kucukcekmece Lake. The geological map within the drainage basin in Figure 6-2. The oldest litho-stratigraphic unit found in the drainage basin of the Kucukcekmece Lake is the Trakya Formation of Lower Carboniferous age. It is composed of turbidites containing sandstone, siltstone, and shale with different grain sizes. As a result of the Caledonian and Alpine Orogenesis, the Trakya Formation was strongly folded, overturned, and scrunched; it was crushed, shredded, and sliced with the large numbers of cracked surfaces and sliding planes; and multidirectional fracture-shear systems have been developed in the formation. The overlying succession is represented by the Kirklareli Formation and the Sazlidere Formation of Eocene. The Kirklareli Formation is represented by folded reefal limestone. This unit covers a large area, and its typical outcrops are located near Arnavutkoy, and in the vicinity of the dam across the Sazlidere Stream. It is followed by the Sazlidere Formation containing clay-bearing limestone. The younger succession of Oligocene–Miocene age is represented by the Gurpinar, Cukurcesme, and Bakirkoy formations, respectively, from bottom to top. The Gurpinar Formation is composed of sandstone and limestone extending to 1 km south of Esenyurt with outcrops across the western parts of the Kucukcekmece Lake. The

Cukurcesme Formation is made up of silt, sand, and gravel exposed at the eastern and western parts of the Kucukcekmece Lake. The Bakirkoy Formation is a clay-bearing limestone unit.

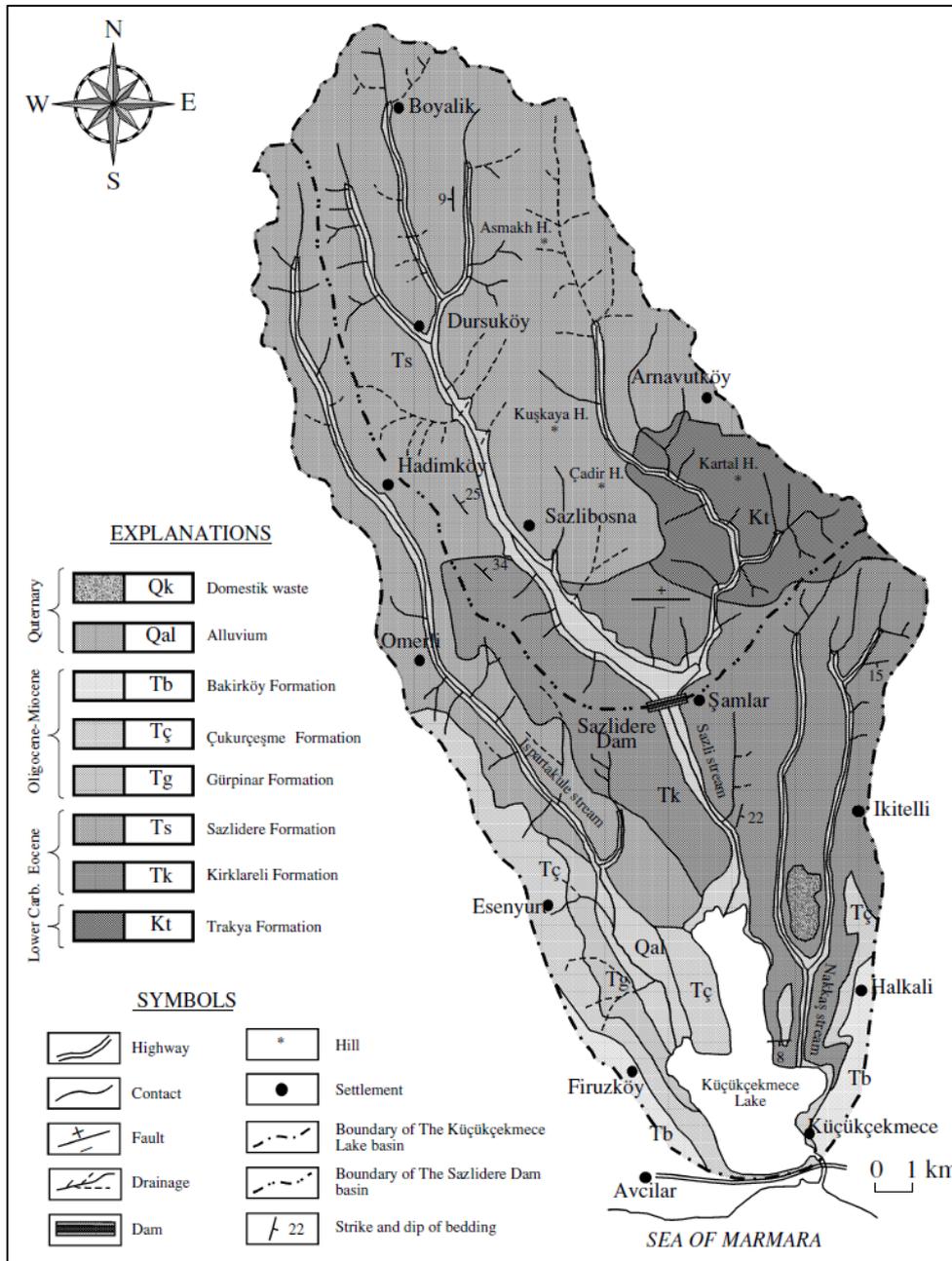


Figure 6-2: Geologic formation distribution near the Project area (Yildirim et al. 2010)

### Site Geology

Thirty boreholes were drilled at the locations shown in Figure 6-3 within the scope of the “Master Plan Based Geological and Geotechnical Investigation”. The borehole depths varied between 3.5 m to 25 m below ground level (bgl). Eight numbers of vertical electrical sounding measurements were also conducted to determine geology of the investigation area. 10 boreholes for soil quality investigation were drilled at the locations shown in Figure 6-4 within the scope of the new geotechnical study conducted in 2014 where the boreholes varied between 4 m and 30 m bgl. The borehole logs are given in Annex F-1.

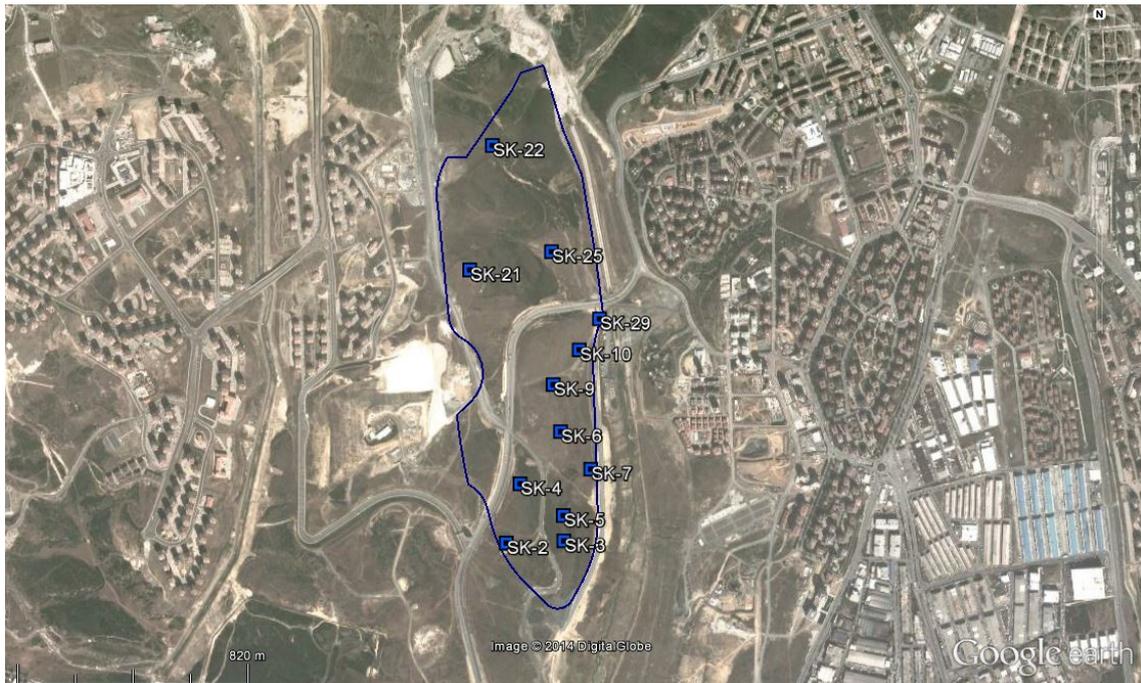


Figure 6-3: The borehole locations for 2008 site study

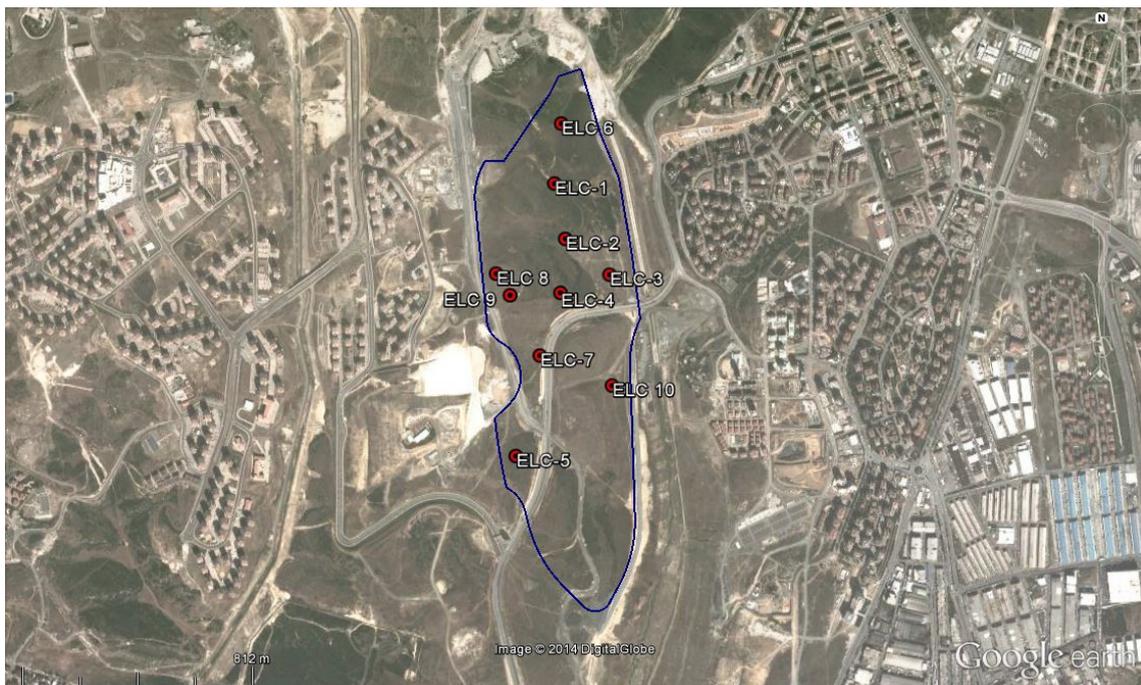


Figure 6-4: The borehole locations for soil quality investigation conducted by ELC (2014)

According to the site observations and borehole drillings conducted within the scope of the investigation, the investigation area and its vicinity are composed of artificial fill in the east and west ends of the site area. Greywacke strata which belongs to Trakya Formation was detected in the east part of the site area and limestone strata towards the west part of the investigation area. The artificial fill was composed mostly of construction debris, asphalt, waste and excavation waste in the east and west ends and southeastern part of the investigation area. The fill layer thicknesses

were noted to reach up to 20 m at the west end, 18 m at the east end and 21 m at the southeast part. The lithology obtained from borehole logs from the 2008 study are shown in Table 6-1.

Table 6-1: Lithology of the investigation area and its vicinity based on 2008 site study

Drilling No.	Borehole Depth (m)	Elevation (m)	Depths (m)	Formation- Lithology
SK-1	6.00	121.00	0.00-1.50 1.50-6.00	Top Soil LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl inter-bedded
SK-2	8.00	129.95	0.00-1.00 1.00-8.00	CLAY white color, gravelly, sandy, carbonated LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-3	10.00	134.00	0.00-0.50 0.50-10.00	CLAY white color, gravelly, sandy, carbonated LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl inter-bedded
SK-4	10.00	137.00	0.00-0.50 0.50-2.50 2.50-10.00	Top Soil CLAY brown color, gravelly, silty, sandy, very hard consistency LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl inter-bedded
SK-5	10.00	138.50	0.00-0.50 0.50-1.80 1.80-10.00	Top Soil CLAY brown color, gravelly, silty, sandy, very hard consistency LIMESTONE white-cream color, medium strength, low-medium weathered, porous thin clay-marl inter-bedded
SK-6	10.00	101.00	0.00-2.00 2.00-10.00	Artificial Fill LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-7	12.00	95.50	0.00-5.50 5.50-12.00	Artificial Fill construction debris, gravelly, sandy heterogeneous material LIMESTONE white-cream color medium strength, low-medium weathered porous thin clay-marl interbedded
SK-8	12.00	82.00	0.00-5.50 5.50-12.00	Artificial Fill construction debris, gravelly, sandy heterogeneous material LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-9	15.00	107.50	0.00-10.50 10.50-15.00	Artificial Fill construction debris, gravelly, sandy heterogeneous material LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-10	10.00	92.50	0.00-1.00 1.00-2.00 2.00-10.00	Top Soil GRAYWACKE weathered, gravelly, sandy, silty unit GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, low-medium strength sandstone-siltstone alteration
SK-11	15.00	97.00	0.00-0.50 0.50-10.00 10.00-15.00	Top Soil CLAY brown greywacke, gravelly, silty, sandy, hard consistency (completely weathered Graywacke) GRAYWACKE brown-dark grey low weathered, low faulted, crackle, low-medium strength, sandstone-claystone alteration
SK-12	10.00	85.00	0.00-2.80 2.80-10.00	Vegetative Soil and Artificial Fill GRAYWACKE brown-dark grey low weathered, low faulted, crackle, medium strength, limestone interbedded sandstone-shale alteration
SK-13	10.00	80.00	0.00-0.50 0.50-10.00	Top Soil GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, low-medium strength sandstone-shale alteration
SK-14	17.00	131.00	0.00-1.50 1.50-17.00	Top Soil LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-15	15.00	130.00	0.00-0.50 0.50-11.00 11.00-15.00	Top Soil CLAY reddish brown color, gravel, silty, sandy, hard consistency LIMESTONE white-cream, medium strength, low-medium weathered, porous, thin clay-marl interbedded

Drilling No.	Borehole Depth (m)	Elevation (m)	Depths (m)	Formation- Lithology
SK-16	25.00	128.00	0.00-20.00	Artificial Fill, construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			20.00-25.00	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-17	20.00	124.00	0.00-16.50	Artificial Fill construction debris ,asphalt, iron, brick, wood pieces containing heterogeneous material
			16.50-20.00	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-18	6.00	127.00	0.00-2.00	Vegetative Soil
			2.00-6.00	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-19	23.00	127.00	0.00-19.00	Artificial Fill, construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			19.00-23.00	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-20	18.50	129.00	0.00-16.50	Artificial Fill, construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			16.5-18.50	LIMESTONE white-cream, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-21	15.00	142.00	0.00-9.50	Artificial Fill construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			9.5-15.00	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-22	3.50	123.00	0.00-3.50	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-23	19.00	110.00	0.00-16.00	Artificial Fill construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			16.00-19.00	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-24	24.00	109.63	0.00-21.00	Artificial Fill construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			21.00-24.00	LIMESTONE white-cream color, medium strength, low-medium weathered, porous, thin clay-marl interbedded
SK-25	15.00	89.00	0.00-8.00	Artificial Fill Construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			8.00-10.00	CLAY brown color, gravelly, silty, sandy, hard consistency
			10.00-15.00	GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, medium strength, sandstone-claystone-shale alteration
SK-26	10.00	74.50	0.00-2.00	Artificial Fill construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			2.00-4.00	CLAY brown color, gravelly, silty, sandy, hard consistency
			4.00-10.00	GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, medium strength, sandstone-claystone-shale alteration
SK-27	15.00	76.00	0.00-12.00	Artificial Fill Construction debris, brick containing heterogeneous material
			12.00-15.00	GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, medium strength, sandstone-claystone-shale alteration
SK-28	22.00	80.00	0.00-18.00	Artificial Fill construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			18.00-22.00	GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, medium strength, sandstone-claystone-shale alteration
SK-29	10.00	78.50	0.00-5.00	Artificial Fill Construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			5.00-6.00	CLAY brown color, gravelly, silty, sandy, hard consistency
			6.00-10.00	GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, medium strength, sandstone-claystone-shale alteration
SK-30	10.00	83.50	0.00-6.50	Artificial Fill Construction debris, asphalt, iron, brick, wood pieces containing heterogeneous material
			6.50-10.00	GRAYWACKE brown-dark gray color, low weathered, low faulted, crackle, medium strength, sandstone-claystone-shale alteration

The following conclusions and suggestions were made in the 2008 site investigation report based on the borehole drilling, soil sampling collection and laboratory assessment results:

- The site has steep elevation differences and a large amount of excavation is expected to be performed prior to installation of the building foundations. The greywacke layers in the Trakya formation on which the foundations are expected to be placed were reported to have adequate bearing capacity for supporting the building loads. However, it was recommended that more detailed studies be conducted to further quantify the bearing capacity of the load bearing units.
- Ground water levels were not identified in any of the boreholes drilled at the site.
- The clay minerals identified at the site through laboratory testing did not show the potential for swelling and the lack of ground water levels at the site indicated that there is no risk of soil swelling.
- There are no natural disasters expected at the site such as landslide, rock fall, flood, avalanche that would fall within the jurisdiction of Law 7269 of the General Directorate of Natural Disaster Affairs.
- The investigation area is a rock environment and there is no risk of liquefaction.

### 6.2.2 Seismic Risks

Istanbul lies on an active seismic zone ranging through Java, Myanmar, Himalaya, Iran, Turkey and Greece, where many large earthquakes have occurred in the past as shown in Figure 6-5 and Figure 6-6. The tectonic framework of the Anatolian peninsula is characterized by the collision of the Arabian and African plates with the Eurasian plate. The Arabian plate is moving northward relative to Eurasia at a rate of about 25 mm/year, and the African plate at a rate of about 10 mm/year. The Arabian plate collides into the southeast margin of the Anatolian micro plate, forcing anti-clockwise rotation of the Anatolian micro plate, accommodated by right lateral slip on the North Anatolian Fault (NAF).

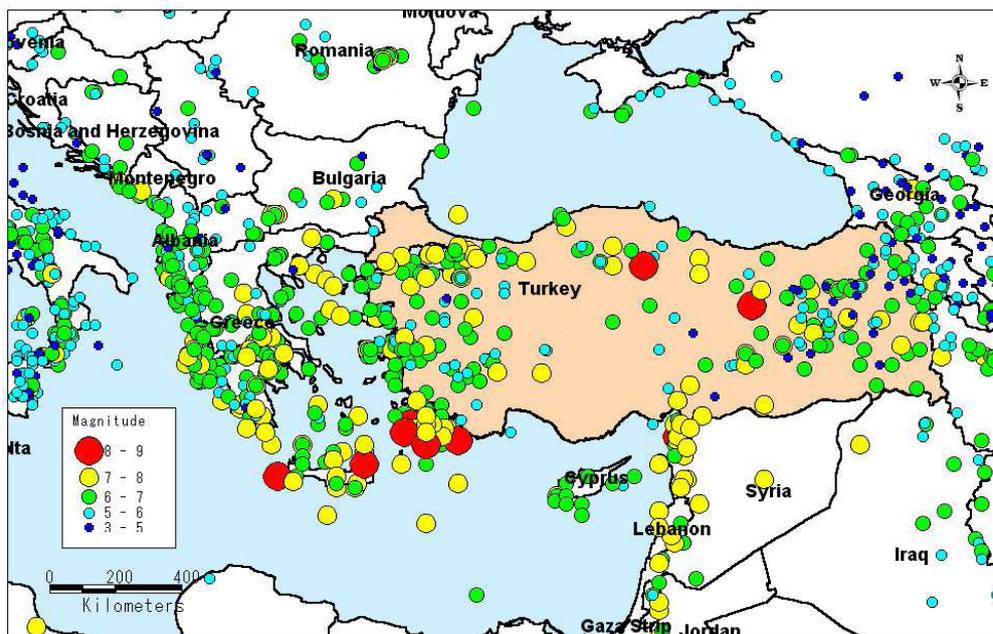


Figure 6-5: Distribution of earthquakes by magnitude (Turkey and vicinity)

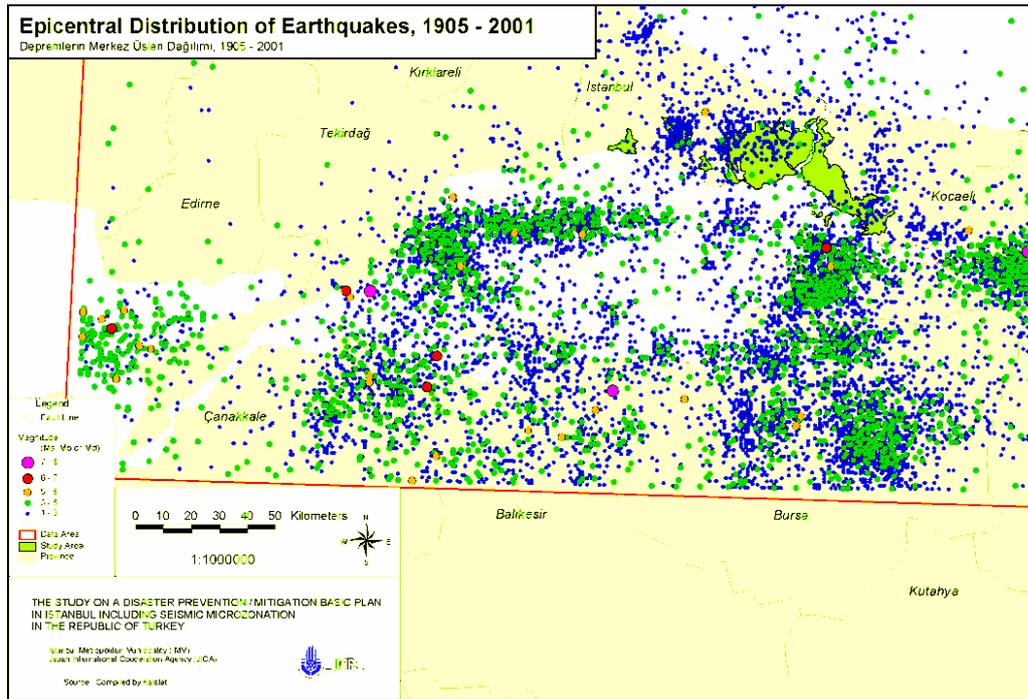


Figure 6-6: Distribution of earthquakes by magnitude (Marmara and Istanbul Region)

Based on worldwide historical catalogues, such as that of Utsu (1990), Istanbul has repeatedly suffered damage due to earthquakes. Table 6-2 shows a summary of damaging earthquakes occurred in Istanbul before the 20<sup>th</sup> century. According to these records, Istanbul has experienced earthquakes equal to or greater than intensity 9 at least 14 times in historical years. This means that Istanbul has suffered damage due to earthquakes every 100 years on average.

Table 6-2: Historical earthquakes affecting Istanbul

Year	Month	Day	Latitude	Longitude	Magnitude	Mercalli Intensity at Istanbul	Tsunami Observed	Damaged area	Damage extent
427			40.5	28.5		10		Turkey: Istanbul	severe
438			40.8	29	6.6	9		Turkey: Istanbul	
440	10	26	41	29		7		Turkey: Istanbul	severe
441								Turkey: Istanbul	severe
447	11	8	40.2	28	7.3	9	Yes	Turkey: Marmara Sea, Istanbul	severe
477	9	25	41	29	7.0	10		Turkey: Istanbul	severe
533	11	29	36.1	37.1				Syria: Aleppo (Halab)/ Turkey: Istanbul	extreme
541	8	16	40.7	39	6.6	9		Turkey: Istanbul	
553	8	15	40.7	29.3	7.0	10		Turkey: Istanbul	severe
555	8	16	41	29	7.6		Yes	Turkey: Izmit (Nicomedia), Istanbul	some
557	10	6	41	29				Turkey: Istanbul	
557	12	14	41.8	29	7.2	10	Yes	Turkey: Istanbul	severe
732			41	29				Turkey: Istanbul	
740	10	26	40.7	29.3	7.3		Yes	Turkey: Marmara Sea, Istanbul, Izmit	severe
815	8		41	29				Turkey: Istanbul	
865	5	16	40.8	28	6.7	9		Turkey: Istanbul	
957	10	26					Yes	Turkey: Istanbul	
975	10	26					Yes	Turkey: Istanbul, Thracian coast	some
989	10	26	40.9	29.3	7.3			Turkey: Istanbul/ Greece	some
1037	12	18	41	29.5				Turkey: Buccellariis, Istanbul	some
1063	9	23	40.8	28.3	7.0	9		Turkey: Istanbul	
1082	12	6	40.5	28.5		10		Turkey: Istanbul (1083?)	some

Year	Month	Day	Latitude	Longitude	Magnitude	Mercalli Intensity at Istanbul	Tsunami Observed	Damaged area	Damage extent
1087	12	6	40.9	28.9	6.5	9		Turkey: Istanbul	
1346								Turkey: Istanbul	some
1419	5	11	41	28.6		9		Turkey: Istanbul	considerable
1490			41	29				Turkey: Istanbul	
1509	9	14	40.8	28.1	7.7	10-11	Yes	Turkey: Tsurlu, Istanbul	severe
1556	3	10	41	29				Turkey: Istanbul	
1556	5	10	41	29				Turkey: Rosanna near Istanbul	moderate
1646	4	5					Yes	Turkey: Istanbul	some
1659			41	29				Turkey: Istanbul	
1719	3	6						Turkey: Istanbul, Villanova	some
1719	5	25	40.8	29.5	7.0			Turkey: Istanbul, Izmit	severe
1754	9	2						Turkey: Istanbul, Izmit/ Egypt: Cario	some
1766	5	22	40.8	29	6.5	9-10	Yes	Turkey: Istanbul	some
1856	2	22	41.3	36.3	6.1			Turkey: Karpan, Korgo, Istanbul	limited
1894	7	10	40.6	28.7	6.7		Yes	Turkey: Geiwe, Istanbul, Adapazari	limited

The earthquake occurred in Kocaeli on 17 August 1999 with an intensity  $M_w=7.4$ , killed 18,000 people, destroyed 17,000 buildings, and caused USD 25 billion in damage. Approximately 1,000 people in Istanbul were killed and there were serious damages to buildings even though the epicenter of the 1999 earthquake on NAF zone was more than 110 km away.

The potential earthquake risks for Istanbul were evaluated for the Greater Municipality of Istanbul by a study funded by Japan International Cooperation Agency (JICA) and the final report entitled “A Study on A Disaster Prevention / Mitigation Basic Plan in Istanbul including Seismic Microzonation in the Republic of Turkey” (JICA study) was published in 2002. The JICA study (2002) estimated that a major earthquake of  $M_w=7.4$  near Istanbul might cost more than 50,000 lives and cause economic losses of more than USD 60-70 billion. Although the estimated number of injuries requiring hospitalization would be around 150,000, 30% of the hospitals (in total of 635) are located in risky areas of southwest part of the city. Earthquake damage scenario results indicate on the basis of two independent approaches (intensity-based and spectral displacement-based approaches) that approximately 35,000–40,000 buildings (approximately 5% of the total building stock) will be damaged beyond repair (complete damage). Results also indicate that approximately 70,000 buildings will receive extensive damage and approximately 200,000 buildings will be moderately damaged.

Provisions of “Regulation on the Buildings that will be established in the Earthquake Zones” published in 2007 by the Ministry of Public Works and Settlement are by law to be applied in all calculations for newly constructed buildings in Turkey. The earthquake loads to be taken during the design of the buildings are obtained based on the earthquake classification of the zone in which the structures are to be built. According to the “Map of Turkey Earthquake Zones” published by the Ministry of Public Works and Settlement, General Directorate of Disaster Affairs, Earthquake Research Department (dated 18.04.1996), the Seismic Zoning Map of Istanbul is given in Figure 6-7. It should be noted that 1<sup>st</sup> degree seismic zone covers areas with highest risk, while 5<sup>th</sup> degree seismic zone covers the areas having minimum seismic risk. The Project area is within the 2<sup>nd</sup> degree seismic zone in the Seismic Zones Map of Istanbul.



For unconsolidated soils group:

- Soil type: C
- Local soil class: Z2
- Effective ground acceleration coefficient:  $A_0 = 0.30$
- Ground spectrum periods:  $T_A = 0.15$ ,  $T_B = 0.40$

For consolidated soils group:

- Soil type: B
- Local soil class: Z1
- Effective ground acceleration coefficient:  $A_0 = 0.30$
- Ground spectrum periods:  $T_A = 0.10$ ,  $T_B = 0.30$

### 6.2.3 Site Soils and Contaminated Land

Site walkthrough and the site investigations have shown that the site was an undeveloped land with no previous industrial or commercial activities undertaken in the area. However, boreholes drilled during the site investigations revealed that part of the Project area consists of artificial fill material that reaches up to 20 m in thickness. The soil quality across the site was investigated through a soil sampling and analysis investigation program undertaken by ELC in January 2014. ELC personnel collected soil samples from selected boreholes drilled during the on-going geotechnical site investigation performed to supplement the findings of the 2008 site study. The soil sampling locations where soil quality samples were collected by ELC are shown in Figure 6-8. The soil sampling depth and analysis conducted are given in Table 6-3.



Figure 6-8: Soil sampling locations (ELC-1 through ELC-5 and ELC-7 are deep boreholes, ELC-8 through ELC-10 and ELC-6 shallow boreholes (max dept. 4 m))

Table 6-3: The soil sampling depth and analysis conducted

Drilling No.	Borehole Depth (m)	Soil Sample Depths (m)	Analyzed Parameters
ELC-1	25	0-3 23-25	
ELC-2	15	0-1.5 13-15	
ELC-3	15	0-1.5 13-15	
ELC-4	15	0-3 12-15	Total Organic Halogens (TOXs), Total Petroleum Hydrocarbons (TPHs),
ELC-5	24	0-1.5 22-24	Volatile Organic Compounds (VOCs),
ELC-6	4	0-2 2-4	Poly Aromatic Hydrocarbons (PAHs),
ELC-7	25	0-3 20-25	Heavy Metals, PCBs
ELC-8	4	0-1.2 1.5-4	
ELC-9	4	0-1.5 1.5-4	
ELC-10	4	0-1.5 1.5-4	

The soil samples were collected and analyzed for Total Petroleum Hydrocarbons (TPH), Poly Aromatic Hydrocarbons (PAHs), Volatile halogenated hydrocarbons, BTEX compounds, PCBs, EOX and heavy metals suite (Antimony (Sb), Arsenic (As), Barium (Ba), Lead (Pb), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Molybdenum (Mo), Nickel (Ni), Mercury (Hg), Vanadium (V) and Zinc (Zn)). The laboratory results are shown in Annex F-2.1. The sample analysis results were compared with the limit values specified in the Regulation on Soil Pollution Control and Point Source Contaminated Sites (Official Gazette date/no: 08.06.2010/27605) and Dutch soil quality standards. The reason for using Dutch standards is that the relevant articles of the Regulation on Soil Pollution Control and Point Source Contaminated Sites have not been enacted yet, and Dutch standards represent the numerical guidelines that were considered in the past by the Turkish Ministry of Environment and Urban Planning. The results from the site survey were evaluated in detail. The summary of the results are given in Annex F-2.2.

The major findings can be summarized as follows:

- PAHs, PCBs, BTEX, Volatile halogenated hydrocarbons were below detection limits in all of the tested samples.
- Low levels of TPH (aliphatic C 16-35) were detected in ELC-3, ELC-5 and ELC-7 sampling locations at 28 mg/kg, 22 mg/kg and 19 mg/kg, respectively. These values are below the allowable generic values given in the Regulation on Soil Pollution Control and Point Source Contaminated Sites.
- Levels of Arsenic identified in all of the soil samples exceed the generic values of the soil and ingestion-soil and dermal exposure and the inhalation of dust in outdoor air exposure scenarios (Regulation on Soil Pollution Control and Point Source Contaminated Sites). These values, however, are below the Dutch intervention guidelines except for the sample ELC-5 which measures 260 mg/kg. Except for the sample collected from ELC-5 location, the Arsenic levels detected in soil samples are similar in range indicating these levels represent

natural conditions in the site soils rather than any contamination. The sample measured at ELC-5 represents a contaminated sample where arsenic levels are above the Turkish and Dutch intervention guidelines for soil pollution.

- Chromium levels for all number of samples except for ELC-6 and ELC-8 sampling locations were above the Turkish generic values for inhalation of dust in outdoor (Regulation on Soil Pollution Control and Point Source Contaminated Sites). These values detected in the soil samples are similar in range and are below the Dutch intervention guidelines except for the sample ELC-5 which measures 120 mg/kg. These results indicate that except for ELC-5 sampling location, the Chromium values are at a natural level in the site soils with no signs of contamination. The analytical results at ELC-5 represents a contaminated sample where Chromium levels are above the Turkish and Dutch intervention guidelines for soil pollution.
- The Nickel values were below the Turkish generic values of the soil and ingestion-soil and dermal exposure and the inhalation of dust in outdoor air exposure scenarios. However, the Nickel values at ELC-1 and ELC-9 were above the Dutch intervention guidelines.
- Cobalt levels were noted to exceed the generic values of the soil and ingestion-soil and dermal exposure scenario at ELC-1, ELC-2 ELC-5 ELC-7 and ELC-10 sampling locations. These values are below the Dutch intervention guidelines. The Cobalt levels detected in the soil samples are similar in range except for ELC-1 and ELC-9 sampling locations indicating that these levels are likely to be naturally present in the site soils with no traces of contamination.

### 6.3 Impacts

#### 6.3.1 Impacts related to Geology and Seismic Risk

In the event of an earthquake during construction and operation, significant impacts on the environment as well as on the community and workers' health and safety and on patients may arise following accidents, spills, fire, etc. related to the seismic incident. During all construction works within the Project area, the Regulation on the Buildings that will be established in the Earthquake Zones" published in 2007 must be complied with. The Project area lies within a 2<sup>nd</sup> degree seismic zone and the geotechnical site investigations performed in the area indicated the following parameter values:

For unconsolidated soils group:

- Soil type: C
- Local soil class: Z2
- Effective ground acceleration coefficient:  $A_0 = 0.30$
- Ground spectrum periods:  $T_A = 0.15$ ,  $T_B = 0.40$

For consolidated soils group:

- Soil type: B
- Local soil class: Z1
- Effective ground acceleration coefficient:  $A_0 = 0.30$
- Ground spectrum periods:  $T_A = 0.10$ ,  $T_B = 0.30$

The Project design will take into account the Turkish regulatory requirements related to seismic design and risk assessment. This will ensure that residual risks are as low as possible.

### 6.3.2 Impacts on Soils

#### *Impacts during Construction*

If any construction was to take place on soils used for productive purposes (e.g. agriculture), this could result in physical damage through compaction. However, the site is predominantly made of fill material overlying alluvial material. No major natural surface soils are present in the Project area. Therefore, the Project will not adversely impact potential agricultural land areas.

Temporary use of land for construction can, if not properly managed and operated, lead to impacts on soil quality by events such as compaction and accidental spills of liquid cement (excluding hazardous material spills). All these events may be expected to have a minor-moderate impact. Construction activities on soils and storage of construction equipment and materials on soils have the potential to affect soil through spills of hazardous material such as oils, fuel or other materials (i.e. fuel loading for machinery operating at the site). The vulnerability of the groundwater should be considered as low due to a lack of groundwater beneath the site to a depth of 30 m bgl. The vulnerability of soil is considered high in case of any spills. If good construction practices are not applied to provide protection against soil, potential impacts are expected to range between minor to major significance depending on the duration of the spills that may range from temporary small-scale spills to continuous/long-term spills.

#### *Impacts during Operation*

During operation, soils may become contaminated from spills of hazardous materials (i.e. fuel leakage from underground storage tanks), poor management of hazardous wastes generated at the site, leakage from underground pipes used for sanitary wastewater discharges. These spills and leakages may lead to impacts that are considered to range between minor to major depending on the spill size, nature of contaminants and impacted areas.

The following conditions were set out in the Environmental Health and Safety based design criteria and infrastructure requirements (extracted from Technical Specifications provided by the MoH) as stated in Annex E-3 for the IHC facility:

- The building underground sanitary drainage system will be sized to serve the loads of the proposed facility. A system of sanitary waste and vent piping will be routed throughout the building to vent and collect the discharge from all of the plumbing fixtures and drains.
- Multiple double wall underground fuel oil tanks or above ground tanks with dikes will be provided near the central energy plant to serve the emergency generators and the boilers. Individual remote fill points will be provided. A leak detection and level monitoring control system will be provided in the central energy plant to monitor the piping system and fuel oil tanks.

The Project will therefore be designed with the necessary protection systems against spills from hazardous materials and wastewater generated at the site. Therefore, the risks of soil pollution during operations are deemed to be negligible if these protections are in place and appropriately operated.

## 6.4 Mitigation Measures

Mitigation measures to avoid and/or mitigate the predicted impacts will include the following:

- All contractors will be required to adopt good construction site practices for protection of soils and to follow the General IFC EHS Guidelines.
- The Project will be designed, constructed and operated in accordance with the Turkish regulations and standards for protection against seismic activity and therefore, risks will be as low as technically and financially feasible.

Specific measures for protection of soil and groundwater media during the construction and operation phases will include the following:

- Provisions will be taken for the protection of newly exposed soil surfaces from rainfall and wind erosion such as silt fences.
- Procedures will be set up for identifying and dealing with contaminated materials when encountered during construction, including treatment and disposal of contaminated soils. Contaminated soils will be disposed of in an appropriately licensed disposal site.
- The use of cement and wet concrete in or close to any exposed areas will be carefully controlled.
- Hazardous and non-hazardous materials and waste during construction and operation will be handled according to the Integrated Quality, Environment, Health and Safety Management System to be prepared and where needed, further site-specific management plans will be developed. Details of waste generation and management methods are provided in *Chapter 8: Material Resources and Waste Management*.
- Fuels, oils and chemicals will be stored on an impervious base protected by bunds to 110% of capacity. Drip trays will be used for fuelling mobile equipment. Any spillages from handling fuel and liquids will be immediately contained on site and the contaminated soil removed from the site for suitable treatment and disposal.
- Spoil and other surplus material arising from the works which is classified as “acceptable fill” shall, wherever practicable, be recovered and used in the construction works. Relevant authorities shall be consulted regarding this on a site by site basis to ensure the re-use of waste materials is acceptable.
- Surplus construction material will be made available to third parties for reuse on local development projects if it cannot be utilized on site.
- Operation of a closed drainage system and implementation of emergency response plans in the event of spills, fire etc. will prevent significant impacts on soils during construction and operation.

## 6.5 Residual Impacts

With the implementation of mitigation measures mentioned above, the residual impact on soil and groundwater is estimated to be insignificant.

## 7.0 HYDROLOGY AND HYDROGEOLOGY

### 7.1 Scope

The potential Project impacts on surface water and groundwater resources are presented in this chapter. The concerns that were identified include potential impacts on the quality of the surface water and groundwater reserve area environment during construction and operation.

A description of the baseline conditions is provided followed by an impact assessment and identification of potential mitigation measures. The main information sources for the baseline conditions were as follows:

- Istanbul Province Environmental Status Report, 2010-2011
- Watershed Protection Action Plan-Marmara Watershed, Tubitak Project (2010)
- State Water Works (DSI) information on groundwater and surface water on Istanbul Province
- Istanbul Water and Sewerage Administration Activity Report (2012)
- 1/100,000 scaled Istanbul Environmental Plan approved by the IMM Department of Housing and Urban Development (Approval Date/Number: 13.02.2009/103)

The significance criteria that are used related to impacts on inland surface water and groundwater are presented below.

Impact Significance	Description
Negligible	The construction or operation will not impact the existing quality of water resources/supplies near or within the Project site. This includes potential temporary contamination of nearby surface water bodies site run-off and run-off from excavated soils/stockpiles during construction and run-off from wastes and material storage during operation that does not degrade the existing water quality.
Minor	The construction or operation will impact water resources/supplies near or within the Project site in the following fashion: <ul style="list-style-type: none"> <li>• Temporary small-scale oil spills and release of construction materials (such as liquid cement, lime) to nearby surface water bodies</li> <li>• Dissolved contamination in potential groundwater resources above the background level that will be below the generic risk levels for all sites (levels provided in Turkish Regulation on Soil Pollution Control and Point Source Contaminated Sites)</li> </ul>
Moderate	The construction or operation will impact water resources/supplies near or within the Project site in the following fashion: <ul style="list-style-type: none"> <li>• Contamination of nearby surface water bodies through site run-off including oil spills during construction and operation activities resulting in change in original water quality by 50% (according to criteria defined in Turkish Water Pollution Control Regulation)</li> <li>• Dissolved contamination in potential groundwater resources above the background level that will not cause long-term cancer and hazard risk based on risk assessment approach given in Turkish Regulation on Soil Pollution Control and Point Source Contaminated Sites</li> </ul>
Major	The construction or operation will impact water resources/supplies near or within the Project site in the following fashion: <ul style="list-style-type: none"> <li>• Contamination of nearby surface water bodies through site run-off including oil spills during construction and operation activities resulting in change in original water quality by 100 % (according to criteria defined in Turkish Water Pollution Control Regulation)</li> <li>• Dissolved contamination in potential groundwater resources above the background level that will cause long-term cancer and hazard risk and presence of free phase in groundwater</li> </ul>

## 7.2 Existing Environment

### 7.2.1 Surface Water Resources

There are two main watersheds in the Province of Istanbul: the Marmara Sea Watershed and the Black Sea Watershed. Furthermore, there are a large number of sub-basins within these two large watersheds. Within the boundaries of the Province, there exists a number of large streams which feed dams, lakes and ponds that are ultimately used as sources of drinking and utilization water. The locations of the streams, basins, sub-basins, dams, lakes and ponds are shown in Figure 7-1 and Figure 7-2.

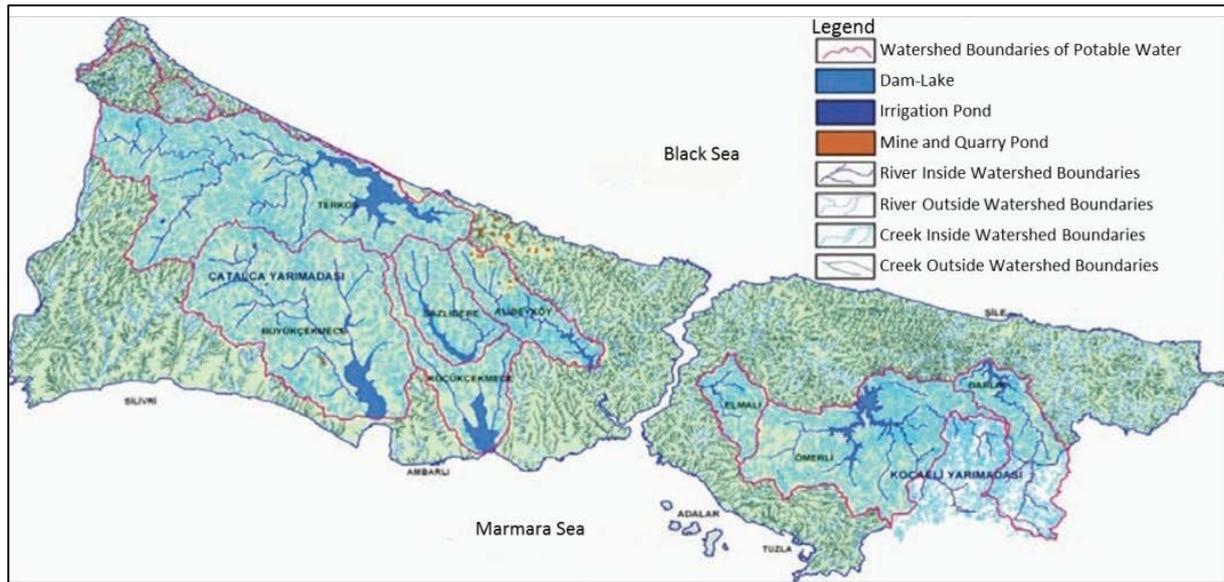


Figure 7-1: Watersheds and sub-basins within the Istanbul Province (Istanbul Province Environmental Status Report (2010-2011))

The Project site lies within the Kucukcekmece sub-basin which is positioned in the European side of Istanbul. The sub-basin is adjacent to the Marmara Sea on the southern side and two important highways, D-100 and the Trans European Motorway (E-80) crossing the sub-basin area. A unique feature of the sub-basin is the presence of the water body named Kucukcekmece Lake which is connected to the Marmara Sea through a narrow channel which is 1 km in length and 1.5 m in depth. The surface area of the Lake is approximately 15.22 km<sup>2</sup> and its volume is reported to be of 145x10<sup>6</sup> m<sup>3</sup>; the Lake's length and width are 7.5 km and 4 km, respectively. The average depth of the Lake is about 8.3 m and maximum depth is 20 m near its southern section. The total drainage area of the Lake is 340 km<sup>2</sup> (Ustun et al., 2005). There are three freshwater streams flowing to the Kucukcekmece Lake: the Eskinoz, Sazlidere and Nakkas streams which have long term average flow rates of 0.24 m<sup>3</sup>/s, 0.86 m<sup>3</sup>/s and 0.29 m<sup>3</sup>/s, respectively (Bagdatlioglu, 1996). The sub-basin features are shown in Figure 7-3.

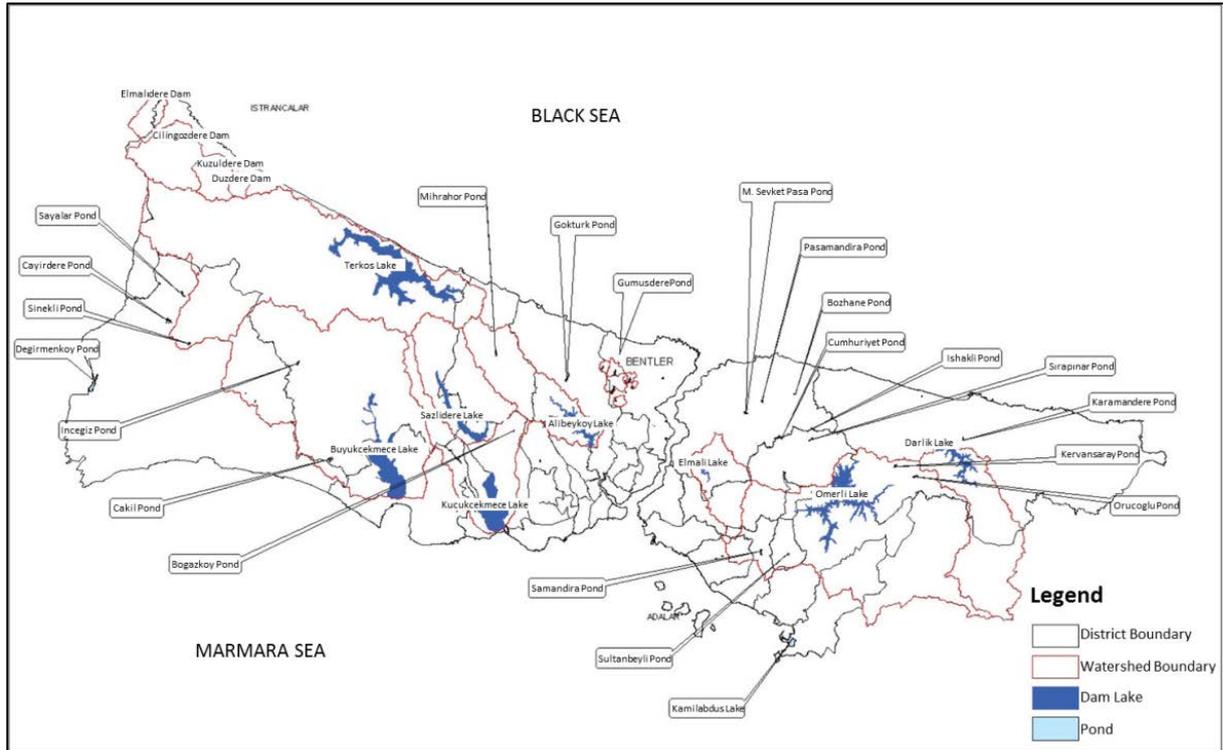


Figure 7-2: Lakes and ponds within the Province of Istanbul (Istanbul Province Environmental Status Report (2010 - 2011))

The freshwater flow to the Lake was notably reduced after 1998 upon the construction of the Sazlidere Dam on the Lake's most important stream (Taner et al., 2007). The Sazlidere Dam is one of the primary drinking water resources of Istanbul. Its drainage area covers around 165 km<sup>2</sup> and has a reported storage volume of 88 x 10<sup>6</sup> m<sup>3</sup>. Its water supply capacity is 55 x 10<sup>6</sup> m<sup>3</sup>/year. The Dam supplies approximately 15% of the city water. The reservoir's surface area is about 11.8 km<sup>2</sup>, with a maximum depth of about 21.6 m, and a mean depth of about 10.8 m. The major streams which drain into the Dam are the Dursunkoy, Boyalik, Baklali, Derbent and Turkose. The streams are shown in Figure 7-3.

The Project site is located within two creeks which ultimately discharges directly to the Kucukcekmece Lake as shown in Figure 7-4. These streams are the Kasap creek and Balikli creek which are located to the east and the west of the Project site, respectively. The distance between the Kasap creek and the Project boundary varies between 15 to 130 meters along the boundary from north to south direction. The Project area is included in the 1/5,000 scaled Partial Revision Zoning Plan of North Ayazma Slum Prevention Area as shown in Figure 7-5 which also shows the flood plain of the Kasap creek.

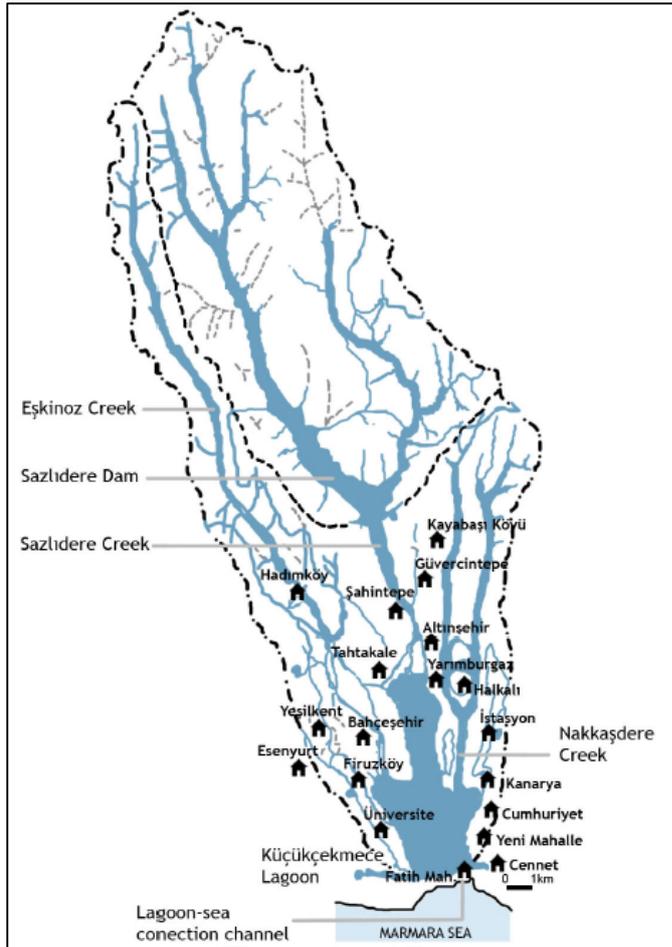


Figure 7-3: Features of the Kucukcekmece sub-basin

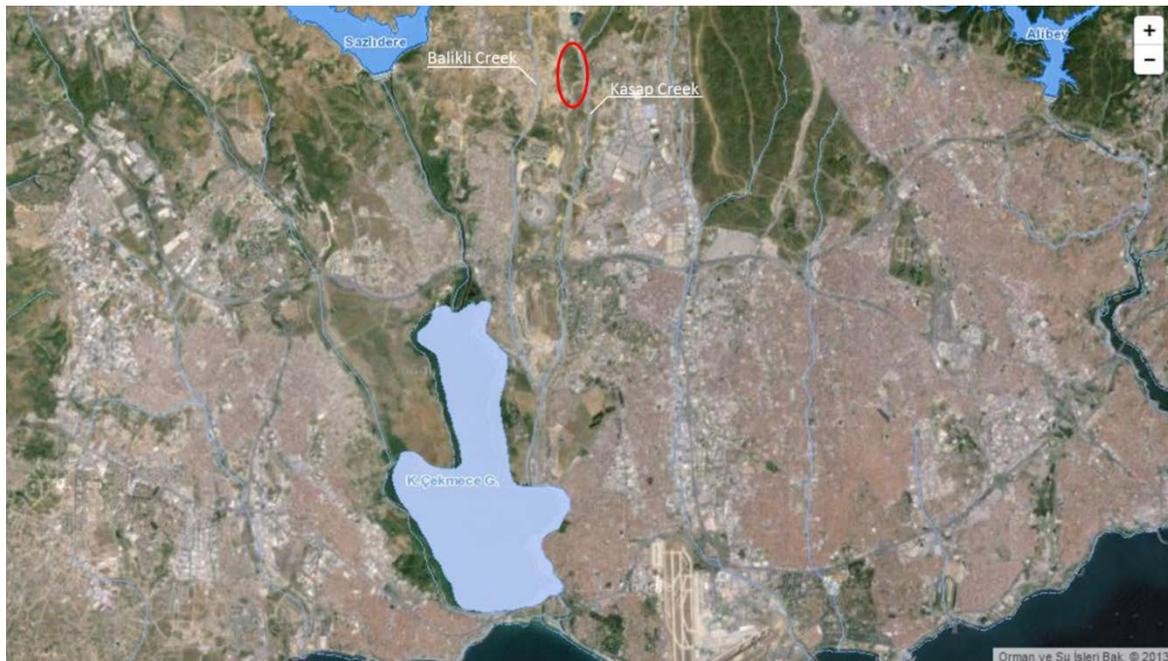


Figure 7-4: Site location with the neighboring Kasap and Balikli creeks (Project boundary schematically shown by red circle)

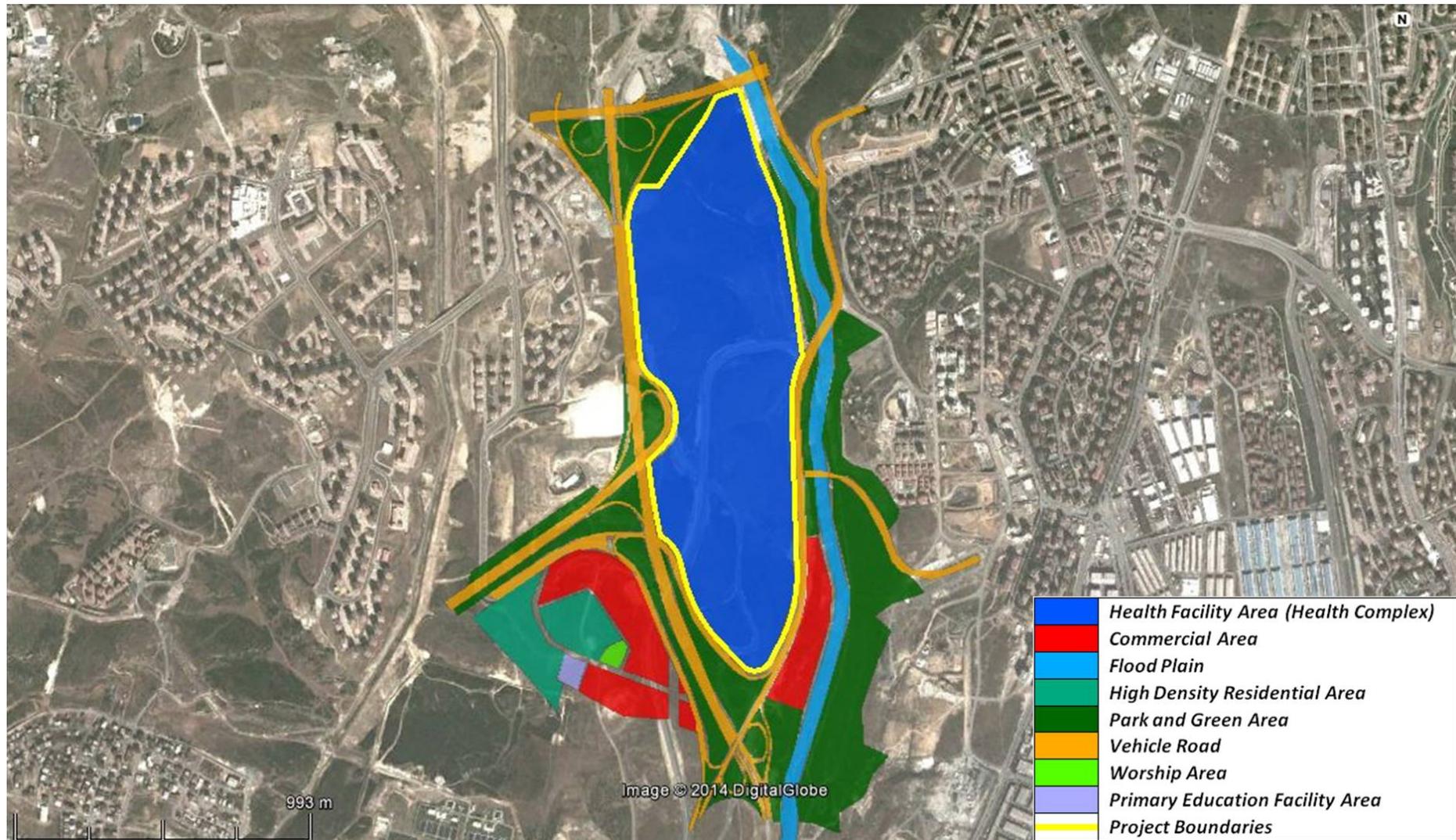


Figure 7-5: Section of 1/5,000 scaled Istanbul zoning plan showing the boundaries of the flood plain near the Project site (Project boundary schematically shown by yellow line)

### 7.2.2 Groundwater Resources

The Istanbul Province area can be classified into two main aquifer types: granular media (unconsolidated formation) aquifers and rock (consolidated formation) media aquifers. The unconsolidated formation aquifers are generally located in the Catalca Peninsula and comprise of Quaternary Alluviums and Neogene – Paleogene aged sands or gravels. These aquifers are observed to be under unconfined as well as confined conditions depending on the location. The aquifers can be tapped with shallow to mid depth extraction wells and used as a source of groundwater supply. The unconsolidated formation aquifers are exposed to potential pollution sources according to the General Directorate of State Hydraulic Works (DSI) studies; the groundwater well water yields and quality of extracted groundwater from these formations range between low to medium.

The consolidated formation aquifers are located mostly in the Kocaeli Peninsula on the Asian side. These aquifers have developed within the weathering zones (cracks and voids) of the Paleozoic and Mesozoic aged rock formations. Siliceous rock materials such as quartzite, granite, greywacke are reported to form the recharge area sources for various springs throughout the region. The common features of siliceous rocks are low hardness and low flow rate yields. The general yield areal extent of these aquifers are given in Table 7-1 and shown in Figure 7-6. The information obtained from the Istanbul Province Environmental Status Report (2010-2011) indicates that the Kocaeli Peninsula has a lower degree of groundwater yield than the Catalca Peninsula.

Table 7-1: Aquifer types, yields and extents

Hydrogeological Groups	Features	Area (km <sup>2</sup> )	Area (%)
Widespread and High Yield Aquifers in Unconsolidated Formations	Groundwater yield is high. (specific flow > 2 lt/s/m)	672.2	2.8
Localized Aquifers in Unconsolidated Formations	Groundwater yield is medium. (0.5 lt/s/m specific flow > 2 lt/s/m)	156	2.9
Localized Aquifers in Consolidated Formations	Contains numerous springs, groundwater yield is medium. (0.5 lt/s/m specific flow > 2 lt/s/m)	24.8	0.5
Widespread and High Yield Aquifers in Consolidated Formations	Generally deep groundwater levels, groundwater yield is efficient. (specific flow > 2 lt/s/m)	43.3	0.8
Impermeable Formations	Groundwater yield is insufficient. (specific flow < 0,1 lt/s/m)	2,752.9	52.3
Permeable Formations	Groundwater yield is insufficient. (0,1 lt/s/m < specific flow < 0,5 lt/s/m)	1,615.9	30.7
Total		5,265	100

Source: Istanbul Province Environmental Status Report, 2010-2011.

Silivri, Catalca and Bakirkoy district areas are reported to have abundant groundwater resources. However, unplanned and rapid urbanization of these districts has generated significant deficiencies in the water supply network and this inadequacy has created severe burdens on groundwater resources due to excessive groundwater extraction. Excessive utilization of groundwater sources has lead to irreversible loss of capacity where the groundwater levels have been lowered up to 350 to 400 m. For example, the Bakirkoy aquifer has lost its artesian water supply characteristic in the last 50 years. The water levels have dropped to 250 m due to excessive consumption, so that it is no longer a viable source of groundwater.

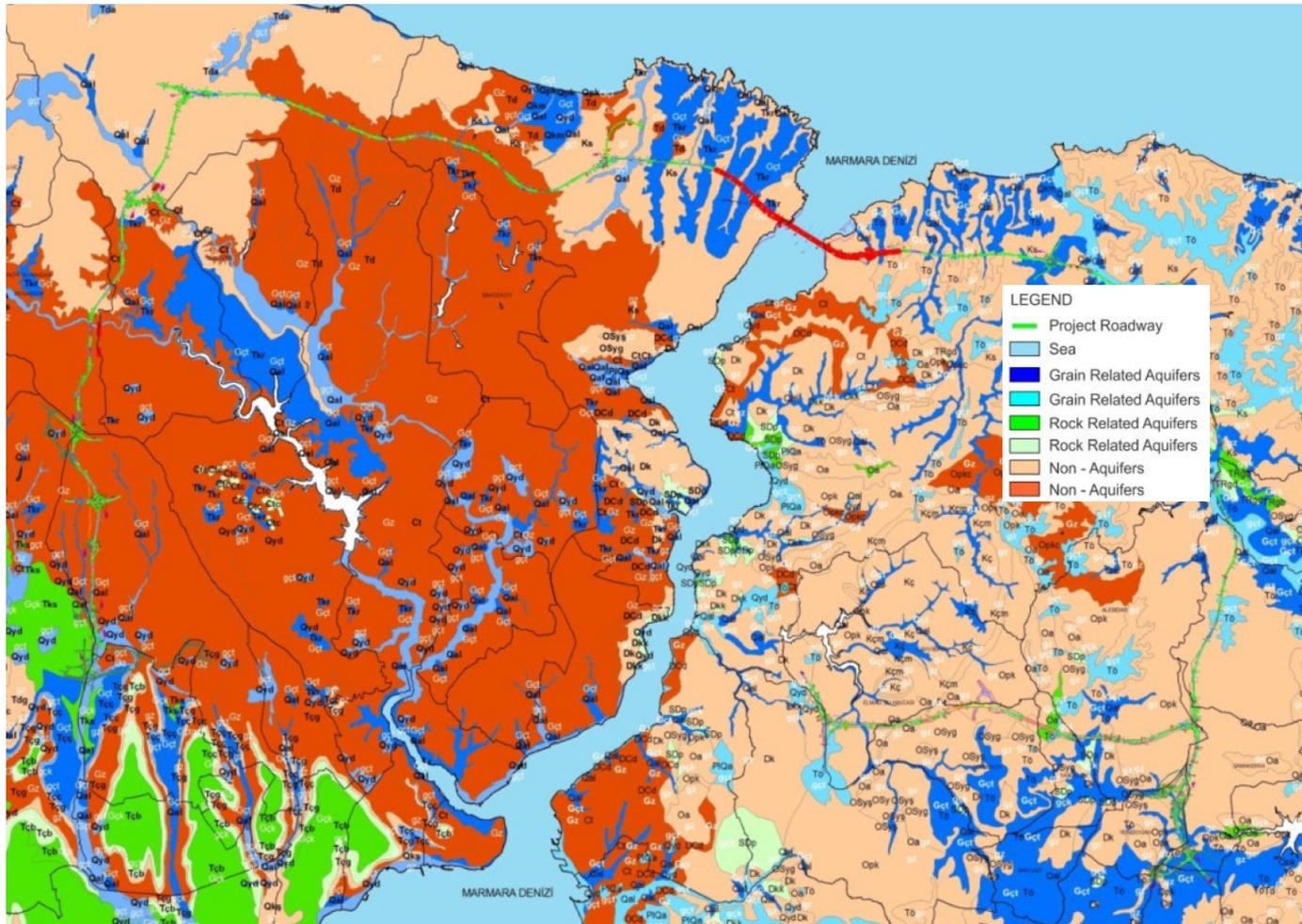


Figure 7-6: Areal extent of water bearing formations in the Istanbul Province

There are ten groundwater reserve fields designated by DSI in Istanbul Province. The operational fields have 37.19 million m<sup>3</sup> reserves per year. There are 315 permits with a total annual water allocation amount of 6,820,027 tonnes (DSI, 2008). However, groundwater consumption through unlicensed wells is quite common in both metropolitan and rural area. The 14<sup>th</sup> DSI Regional Office has the authority to distribute exploration and usage certificates in the Istanbul Province in the licensed areas shown in Table 7-2.

Table 7-2: Groundwater licensed areas

Licensed Area	Groundwater Reserve (10 <sup>6</sup> m <sup>3</sup> /year)	Allocation (10 <sup>6</sup> m <sup>3</sup> /year)	Operating Status
Catalca – Yalikavak	0.50	-	Open (Since Jul 25 1970)
Karacakoy - Terkos Plains	4.00	0.90	Open (Since Jul 25 1970)
Kagithane Valley	7.00	7.20	Closed (Since Nov 28 1972)
Riva Village-Alacali Coastal Plain	2.00	-	Open (Since Oct 24 1970)
Topkapi - Kucukcekmece Plain	13.50	65	Closed (Since Mar 10 1966)
Kucukkoy - Pasacayiri Plain	0.66	0.90	Closed (Since Feb 15 1967)
Coastal Plain of Kartal District	1.50	-	Open (Since Mar 16 1972)
Tavsanlı River Coastal Plain	5.50	6.85	Open (Since Jul 19 1968)
Buyukdere Coastal Plain	1.5	-	Open (Since Sep 25 1972)
Tuzla Plain	1.50	-	Open (Since Feb 29 1972)
<b>TOTAL</b>	<b>37.16</b>	<b>80.85</b>	

Source: Istanbul Environmental Status Report, 2010-2011.

Springs also represent a widely used water resource for more than 100 years. The list of springs used in the European Side are shown in Table 7-3.

Table 7-3: List of operating water springs in the European side of Istanbul Province

Spring Name	District	Location
Altinpinar Spring	Catalca	Gumuspinar Village
Akcapinar Spring	Catalca	Karamandere Village
Gumuspinar Spring	Catalca	Gumuspinar Village
Mispak Spring	Catalca	Karamandere Village
Yali Spring	Catalca	Yali Village
Mimella Spring	Catalca	Ciftlik Village
Ayazma Spring	Catalca	Akalan Village
Imren Spring	Catalca	Ihsaniye Village
Ulupinar Spring	Catalca	Karaca Village
Mega Icme	Catalca	Cakil Village
Guzelpinar Spring	Gaziosmanpasa	Cebeci Village
Ozpinar	Gaziosmanpasa	Ogaz Village
Mercan Spring	Eyup	Princci Village
Kum Spring	Eyup	Kemerburgaz
Kemer Spring	Eyup	Kemerburgaz
Hamidiye Spring	Eyup	Kemerburgaz
HamidiyeBurgaz Spring	Eyup	Kemerburgaz
Findik Spring	Eyup	Kemerburgaz
Hisar Spring	Eyup	Kemerburgaz
Cobanpinar Spring	Eyup	Gokturk Village
Binbasilcme	Eyup	Kemerburgaz
Baspinar Spring	Eyup	Kemerburgaz
Guvenpinar	Eyup	Kemerburgaz
Kestane Spring	Sariyer	EskiSular Yolu

Source: Istanbul Environmental Status Report, 2010-2011.

The groundwater resources in the Project area are based on the hydrogeological properties of the consolidated and unconsolidated formations near the Project area. The Project area is located within the drainage basin of the Kucukcekmece Lake with the geological setting described in Chapter 6 and shown in Figure 6-2. The oldest litho-stratigraphic unit found in the drainage basin of the Kucukcekmece Lake is the Trakya Formation of Lower Carboniferous age. It is composed of turbidites containing sandstone, siltstone, and shale with different grain sizes. The overlying succession is represented by the Kirklareli Formation and the Sazlidere Formation of Eocene. The Kirklareli Formation is represented by folded reefal limestone while the Sazlidere Formation contains clay-bearing limestone. The younger succession of Oligocene–Miocene age is represented by the Gurpinar, Cukurcesme, and Bakirkoy formations, respectively, from bottom to top. The Gurpinar Formation is composed of sandstone and limestone extending to 1 km south of Esenyurt with outcrops across the western parts of the Kucukcekmece Lake. The Cukurcesme Formation is made up of silt, sand, and gravel exposed at the eastern and western parts of the Kucukcekmece Lake. The Bakirkoy Formation is a clay-bearing limestone unit.

Yildirim and Uzaydin (1993) investigated the Land Use Suitability of Ikitelli Organized Industrial Region and its vicinity including the hydrogeology of the area. The Ikitelli Organized Industrial Zone is approximately 4 km from the nearest site boundary. The following information was obtained from their study:

- Low yielding groundwater flow rates from fractures were noted in boreholes drilled to depths of 150 m at areas with elevation of 120 m (Trakya Formation).
- The Kirklareli formation is made up of limestone which are karstic in nature. It is likely that high groundwater yields may be obtained from wells drilled in this formation.
- The Cukurcesme formation has good aquifer characteristics, however the formation does not extend to the site area.
- The dominant unit in the Gungoren formation is clay and therefore this formation can be considered to be impermeable.
- The Bakirkoy formation was noted to be devoid of groundwater in the region of investigation.

The geotechnical site investigations conducted at the site in 2008 and 2014 included the drilling of boreholes which extended to 30 m below ground level. Groundwater levels were not recorded in the boreholes.

The groundwater related information in the 1/100,000 scaled Istanbul Environmental Plan approved by the IMM Department of Housing and Urban Development (Approval Date/Number: 13.02.2009/103) is shown in Figure 7-7. Part of the site falls within the groundwater reservoir area boundary designated by the Istanbul Environmental Plan. Groundwater reserve areas are areas that represent potential areas for groundwater resources. The environmental plan indicates that settlements and developments within these areas should not prevent water collection and groundwater infiltration process.



Figure 7-7: Section of 1/100,000 scaled Istanbul Environmental Plan (Project area schematically shown by red line and not part of the plan)

### 7.3 Impacts

A number of construction activities may adversely impact the nearby surface water course and subsurface media designated as groundwater reserve area. These activities include soil and concrete movement due to excavations and the presence of stockpiles of exposed soil and concrete which may lead to suspended sediment in runoff waters from the work sites. Exposed soils that are dampened to reduce dust emissions may also produce surface runoff leaving the site boundaries. If not mitigated, impacts could range between minor to major significance depending on the amount and quality of surface runoff leaving the site. It should be noted that the distance to nearby surface water bodies is very close to the site boundaries.

Impacts may occur as a result of accidental spills from the use of hazardous materials (fuel oils and lubricants) as well as construction materials (liquid cement, lime) during construction which may migrate off and also infiltrate to the subsurface resulting in the degradation of groundwater bearing zones within the groundwater reserve area. Spills may also occur from the refueling of equipment during construction. Associated impacts could range from minor to major significance depending on the amount of spill and the timely response to the incident.

If the hazardous materials (i.e. fuels stored in underground storage tanks) are not handled appropriately, potential spills and leakages may result in impacts ranging from minor to major significance and may become permanent during operation. Accidental discharges and spills of hazardous materials and wastes have the potential to contaminate the subsurface and related impacts are considered to be of minor to major significance depending on the amount of spill and timely response to the incident.

Inappropriate storm water drainage conditions for the İkitelli IHC facilities may result in flooding of the site area. Flooding may result in impacts ranging from minor to major significance in terms of health and safety conditions. The flooding assessment from the nearby surface water body is deemed to be low since the Project site will be developed outside of the flood plain of the Kasap creek.

Some specific mitigation measures were already requested by MoH to be part of the EHS design. The following conditions were set in the EHS based design criteria and infrastructure requirements (extracted from Technical Specifications provided by the MoH) as stated in Annex E-3 for the IHC facility:

- The building underground sanitary drainage system will be sized to serve the loads of the proposed facility. A system of sanitary waste and vent piping will be routed throughout the building to vent and collect the discharge from all of the plumbing fixtures and drains.
- The storm water piping from the roofs will be collected within the building and routed outside the building for connection to the site storm sewer system. Storm water from the upper levels will be discharged to the site storm sewer system by gravity flow or by a siphonic drainage system where gravity flow would not be suitable. The stormwater from the loading dock and from the parking structures (parking garages) will be routed through an oil interceptor. In the unlikely event that any of the outlets are below the site storm main, interior storm sump pump systems with duplex pumps will be provided. The duplex stormwater pumps will be provided with emergency power from the building. The building automation system will monitor the stormwater sump pump system with a high water alarm. The stormwater collected by the foundation drainage system will be collected in multiple separate sumps within the building and pumped to the exterior of the building for extension by the site utility contractor to the site storm sewer system.
- Multiple double wall underground fuel oil tanks or above ground tanks which are banded will be provided near the central energy plant to serve the emergency generators and the boilers. Individual remote fill points will be provided. A leak detection and level monitoring control system will be provided in the central energy plant to monitor the piping system and fuel oil tanks.

The EHS based design criteria and infrastructure requirements will cause the potential impacts of storm water flood occurrence, sanitary water leakage from pipes and hazardous material spills from underground storage tanks to be considered as negligible.

#### 7.4 Mitigation Measures

Specific additional mitigation measures to avoid and/or mitigate the potential impacts to surface water and subsurface media designated as groundwater reserve area will need to include the following:

- The mitigation measures discussed in *Chapter 8: Material Resources and Waste Management* will be implemented. The mitigation measures are specific to the management of wastes including storage, transport and disposal of waste materials generated during construction and operation.
- Good construction site practices (i.e. measures as described below such as using designated areas for storing materials, regular inspections at construction sites, training of construction workers, placement of sediment traps and/or oil/water separators, etc.) will be adopted to minimize risks of water pollution.
- Stockpiles of soil will be stored as needed at designated areas.
- Construction workers and relevant staff will be trained related to the implementation of good construction site practices and on spill response and prevention measures.

- No fuelling of vehicles or equipment will take place within excavated areas; and no hazardous materials will be stored in excavated areas and all handling of hazardous materials will be under special supervision. Fuelling shall only be carried out in designated areas away from surface drainage pathways exiting the site. Suitably sized impervious bunds or other containment will be installed where hazardous materials are handled (such as fuel stores and loading areas, concrete mixing, hazardous material stores) to prevent hazardous materials entering the site drainage.
- All staff and subcontractors will be required to report any incidents and these will be subject to investigation, and remedial and preventive actions will be taken as needed.
- Spill response kits including absorbent materials suitable for the materials will be present on site. These will be kept at designated areas with specific instructions for their use. Site staff will be trained on the use of spill kits.
- Regular periodic integrity testing for hazardous material storage equipment (i.e. underground storage tanks and lines) will need to be conducted and appropriate leak detection systems will be in place.
- A Hazardous Material Management Plan should be developed to ensure proper handling of hazardous materials during construction and operation of the IHC.
- An Emergency Preparedness and Response Plan should be developed to ensure mitigation of spills from hazardous materials during construction and operation of the IHC.

## 7.5 Residual Impacts

Assuming that mitigation measures mentioned above and those mentioned in relevant chapters (i.e. *Chapter 6: Geology, Soils and Contaminated Land* and *Chapter 8: Material Resources and Waste Management*) are implemented and good site practices are adopted, the residual impacts on the surface water and groundwater is estimated to be negligible.

## 8.0 MATERIAL RESOURCES AND WASTE MANAGEMENT

### 8.1 Scope

The potential impacts from the use of material resources and generated wastes during construction and operation of the Project are discussed in this chapter. A description of the material resources that will be required for the construction and operation of the Project is provided. The waste management baseline conditions have been identified and the types of wastes that will be generated by the Project during construction and operation phases have been identified. The assessment indicates that energy efficiency will be an important consideration in terms of the use of material resources during the operation phase. Furthermore, the following potential concerns related to waste management were identified:

- Potential impacts to the environment related to inadequate solid and liquid waste management (excluding medical waste) during construction and operation phases
- Potential health and safety impacts to the patients, workers and employees at the Integrated Health Campus (IHC) related to inadequate medical waste management during operation.
- Potential environmental, health and safety impacts to the community related to inadequate waste disposal practices specifically from medical waste.

### 8.2 Material Resources

The construction material required for the Project will include ready-mixed concrete, structural steel, and formworks. It is anticipated that approximately 560,000 m<sup>3</sup> concrete, 61,000 tons of steel bar reinforcement and 1,300,000 m<sup>2</sup> of formwork will be used for the Project. Concrete will be supplied from 120 m<sup>3</sup>/hour capacity “Bogazici Concrete Plant” located almost adjacent to the west boundary of the Project area. It is also planned to establish two concrete plants in the scope of the Project with 65 m<sup>3</sup>/hour and 30 m<sup>3</sup>/hour capacities to meet additional concrete needs.

As necessary, onsite temporary laydown areas for imported materials will be appropriately selected and implemented to avoid potential disturbance and run-off. Construction laydown area will be cleared for the temporary storage of equipment and supplies and covered with rock and/or gravel base to ensure accessibility and safe maneuverability for transport and off-loading of vehicles.

During the detailed design and procurement stage, the contractor will be responsible for identifying sources for all materials and equipment and will be required to consider environmental impacts in selecting materials to be used for the Project. This will include using less harmful materials where possible, considering the carbon footprint of alternative materials and considering the impacts of extraction, processing and transport. In particular the contractor will be required to:

- use recycled materials and materials certified as being from “green” or lower carbon sources where practicable,
- source aggregates and materials from quarries, borrow pits, crushing plants and asphalt plants operating with valid environmental and other permits and licenses and where the sites are managed in full compliance with all applicable environmental standards and specifications.

There will be drinking and potable water usage by construction workers and during construction activities. A 150 litres/day/capita was selected for water usage resulting in a daily water requirement of construction workers (Ministry of Environment and Urban Planning (MoEU) based consumption data). Approximately 1,000 workers will work during regular construction phase; however, work force will increase up to 3,000 workers during the finishing works of the construction phase. Thus, the average daily water consumption will be 150 m<sup>3</sup> during regular construction and 450 m<sup>3</sup> during the finishing works. In addition to this, water will be used for dust suppression activities, spraying concrete, adding water to backfill material, equipment cleaning and site clean-up. The construction activity water requirement can be taken as 60-70% of the construction worker requirement based on case studies (Wrap UK, 2011). This would mean an extra 97 m<sup>3</sup>/day to 290 m<sup>3</sup>/day during the regular construction phase and finishing works phase, respectively. Consequently, the total daily water requirement for the regular construction activities would be approximately 247 m<sup>3</sup>/day and for the finishing works would be maximum 740 m<sup>3</sup>/day. The water will be supplied from both groundwater wells which will be installed near the stream located at east side of the project site and municipality water network during construction phase of the Project. The well water which will be tapping the stream will be used for construction material preparation if the chemical analyses are suitable for its purpose and the necessary well installation and extraction permits are obtained from the authorities. Network water will be used for drinking water and potable water demand of the personnel and a water tank will be placed at the project site.

During operation, there will be water usage related to general domestic and sanitary use (including laundry), food preparation processes, sterilizers and autoclaves, X-ray equipment (water used in the processing of prints) and water used for gardens. A daily water consumption value per capita per bed was identified to vary between 1.13 m<sup>3</sup>/day (Altin *et al.*, 1999) and 1.60 m<sup>3</sup>/day (data for large hospitals in the United States (U.S. Energy Information Administration, 2007)). Water consumption of the Istanbul İkitelli IHC is predicted to vary between 3,030 and 4,290 m<sup>3</sup>/day.

The water supply to the Project site will be provided from the Sazlidere Dam which is treated at the İkitelli Drinking Water Treatment Plant prior to distribution. The total water supply to the İkitelli water treatment plant from Sazlidere Dam was 47,510,230 m<sup>3</sup>/year in 2012 according to the Istanbul Water and Sewage Administration Activity (ISKI) Report (2012). Based on this information, the water supply increase during the construction and operation of the IHC Project can be considered negligible on the water supply requirements for the region.

The electricity, heating and cooling needs of the facility will be provided from the co-generation system that will be located to the west of the project area. The system will have estimated capacity of 16.745 MW that will consist of five gas turbines using natural gas with an installed capacity of 3.349 MW each.

Data for large hospitals in the U.S. (U.S. Energy Information Administration, 2007) indicates that the yearly electricity consumption is 250 kWh/m<sup>2</sup>. This would indicate that the yearly electricity consumption of the IHC would be 204,344,250 kWh.

The Project design will consider energy conservation systems to include solar energy panels that will be used to illuminate internal roads.

### 8.3 Existing Waste Management Conditions

The existing waste generation and management in Istanbul including the medical wastes generated in the existing health care service, on-going disposal practices and review of the waste disposal facilities in the Istanbul Province are presented in this section. The information was gathered to review whether the wastes that will be generated in the construction and operation phase of the Project can be managed in line with the Turkish regulatory requirements and lenders waste management guidelines.

Information on baseline conditions has been identified using the following sources:

- Istanbul Environmental Status Report (2010 - 2011),
- Istanbul Water and Sewage Administration Activity (ISKI) Report (2012),
- Ministry of Environment and Urban Planning web site- Licensed Facilities,
- ISTAC (Istanbul Environment Management Inc.) web site.

#### 8.3.1 Overview of Waste Generation in Istanbul Province

Wastes that are generated include domestic waste (solid waste and domestic wastewater), packaging waste, excavation waste, hazardous waste, medical waste and special wastes. Waste management activities undertaken in the Istanbul Province are discussed in this section. The waste management facilities are operated by ISTAC; the list of these facilities are given in Table 8-1.

Table 8-1: ISTAC Waste Management Facilities

WASTE MANAGEMENT FACILITIES OPERATED BY ISTAC		
WASTE	FACILITY	
Domestic Waste	Class II Landfill - Komurcuoda (European)	
	Class II Landfill - Odayeri (Asian)	
	Composting - Kemerburgaz	
Medical Waste	Incineration Plant- Kemerburgaz	
Domestic Waste Transfer Stations	Halkalı	
	Yenibosna	
	Baruthane	
	Silivri	
	Hekimbaşı	
	Kucukbakkalkoy	
	Aydınlı	
Excavation Waste Storage Areas	Silivri/Seymenkoyu	Maltepe
	Silivri/Buyuksemizkum	Bolluca
	Şile/Kurna	Yenikapi
	Tayakadin	AkfiratTepeoren
	Agacli	Sile Sahilkoy
	Omerli	Fenerkoy
	Ayazaga	Muratbey
	Hazardous Waste	Class I Landfill- Komurcuoda
Temporary Storage Facility-Komurcuoda		
RDF (Refuse Drived Fuel) Plant - Kemerburgaz		

#### Domestic Waste

According to the 2012 MoEU Environmental Status Report summaries for cities, a total of 15,556 tons of domestic waste is collected daily for landfilling and composting in Istanbul. The collected domestic waste is landfilled at the Komurcuoda Class II Landfill Facility (233 ha area) located at the

Asian Side of Istanbul and the Odayeri Class II Landfill Facility (114 ha area) located at the European Side. Both facilities were constructed and started operating in 1995. The domestic waste is transferred to the landfill facilities from four transfer stations operating on the European side and three stations on the Asian side. Domestic waste which is collected from Sisli, Eyup, Basiktas and Beyoglu districts is composted at the tunnel type composting facility at Kemberburgaz. The produced compost material is sold in the market.

#### Packaging Waste:

The task of collecting packaging waste separately in Istanbul have been given to ISTAC according to the Packaging Waste Control Regulation. Within this scope, “Packaging Waste Separate Collection Project” has been initiated and the protocols have been signed between the district municipalities and ISTAC and the packaging waste recycling (collection from site and recycling on the plant) facilities. A total twenty-six municipalities have signed a protocol by the end of 2010 and 91,090 tons of packaging waste have been collected in these municipalities. The recycling activities are managed by the district Municipalities and are regularly reported to MoEU. Packaging waste recycling and packaging waste recovery facilities in Istanbul are given in Table 8-1.

#### Medical Wastes:

There are 229 health care facilities with a total 32,999 bed capacity in Istanbul. 151 of these facilities are located on the European side and 78 are operating on the Asian side. The medical waste collection system in Istanbul is divided into 26 main districts and 6 intermediate districts. According to this system, the medical wastes are collected from 229 health care facilities within these 32 districts and transported to the ISTAC incineration plant. There are 34 licensed companies and 49 licensed vehicles that carry medical waste in Istanbul. ISTAC collects approximately 25,000 tons of medical waste annually with its own 18 medical waste transportation vehicles. During the collection of wastes, radioactivity measurements are conducted by hand-held type devices in order to avoid radioactive waste mixing with medical waste.

According to the ISTAC database, the daily medical waste generation rate in Istanbul is approximately 2-2.5 kg/day/bed (above 20 beds capacity health care services). Health Care Facility Numbers in Istanbul and Medical Waste Collected by ISTAC from medical facilities with more than 20 Bed Capacity are provided in Figure 8-1 and Figure 8-2 respectively.

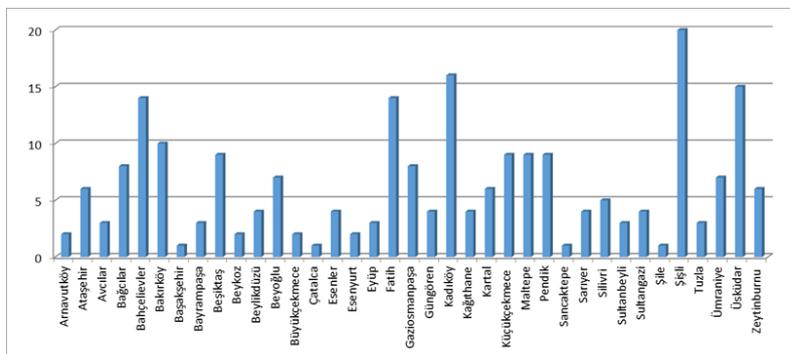


Figure 8-1: Health care facility numbers in Istanbul, 2010

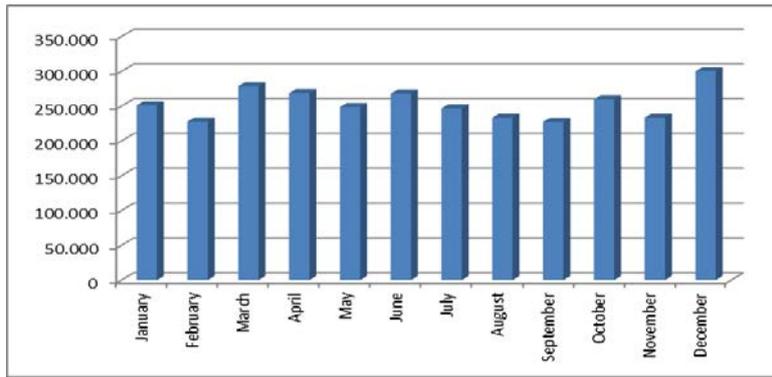


Figure 8-2: Medical waste collected by ISTAC from medical facilities with more than 20 bed capacity (2010)

### Hazardous Wastes

More than 51,698 tons of hazardous waste are generated in Istanbul (Taskan and Calli, 2013). Chemical wastes, industrial wastewater treatment sludge, paint sludge, paint residue, contaminated packaging materials, contaminated fabrics and filters are the primary hazardous waste types that are generated in Istanbul. Hazardous wastes are required to be managed according to the Hazardous Waste Control Regulation. Thus, the hazardous wastes have to be transported via licensed hazardous waste transporters to the licensed waste management facilities using the National Waste Transportation Form (NWTF). The waste should be sent by the waste producer to the licensed hazardous waste recycling / disposal facilities. The facilities also have to use the NWTF. According to the Istanbul Environment Province Directorate, there are 54 firms and 100 vehicles which have licenses to transport hazardous waste. There are 23 licensed hazardous waste recycling/disposal facilities in Istanbul. Additionally, the waste producer who produces hazardous waste more than 1,000 kg per month has to obtain hazardous waste temporary permit for the storage on-site. ISTAC hazardous waste management facilities and third party hazardous waste management facilities for recycling and/or disposal are given in Table 8-1 and Table 8-4, respectively.

### Special Wastes

**Waste Mineral Oils:** Waste vehicle oils and industrial lubricating oils are classified as waste mineral oil and the manufacture, temporary storage, transport, recycling, disposal of these wastes are regulated by the Waste Oil Control Regulation. Waste oils which are generally generated from the maintenance and repair works are classified into three categories. First category waste oils can be recycled, second category can be used as fuel supplement, and the third category cannot be recycled and/or used but should be disposed.

Waste vehicle oils are collected by the authorized company/transporter, PETDER, to waste oils recyclers, cement plants for energy recovery, and IZAYDAS for disposal by incineration. PETDER collected 4,203,667 kg waste oil from 775 oil manufacturer in Istanbul in 2010. The lubricating oils are given either to the oil suppliers or sent to the licensed facilities by waste producers. The licensed facilities can be seen in Table 8-4.

**Waste Vegetable Oils (Special Waste):** There are 4 companies who collect waste vegetable oils in Istanbul. Waste vegetable oil recycling and collection companies have 16 licensed vehicle operating

in Istanbul. Even though 350,000 tons waste vegetable oil should be collected annually, the total collected amount just reached 3,000 tons in the last two years in Istanbul. Waste vegetable oils should be collected separately and given to the licensed collectors and/or recycling facilities.

*Waste Batteries and Accumulators (Special Waste):* Used batteries are delivered to specified locations such as supermarkets, schools, and malls by the consumers. Some Municipalities support the waste battery collection via the use of their vehicles; moreover, 15 chain stores, 15 organized industrial zones, 12 universities, 256 hotel, banks, public institutions and some other institutions are involved in the collection activities. The collected waste batteries are delivered to the temporary waste battery storage cells at ISTAC Odayeri and Komurcuoda landfill facilities. According to the signed protocols between TAP (Portable Battery Manufacturers and Importers Association – authorized by the MoEU) and 37 district municipalities, the stored waste batteries are sent to recycling / disposal facilities by TAP in order to recycle and/or dispose the waste.

Waste accumulators are collected by retailers which sell these products and by car care services as a deposit in return for a new accumulator. Additionally, there are 8 permitted temporary storage areas for storing and 6 licensed vehicles for transporting the waste accumulators. However, there is no recycling facility for waste accumulator.

*Waste Electronic and Electrical Equipment (WEEE) (Special Waste):* WEEE should be sent to the licensed processing facilities by the waste producer.

#### Excavation Wastes:

Management of the construction and excavation wastes generated within the Istanbul Province is within the responsibility of ISTAC. Presently, these wastes are being used as fill material in recreation areas and road construction sites. The amount of excavation waste was 342,733 tons in 2008-2012 and the recycled quantity of amount was 196,218 tons. Istanbul has over 100 million m<sup>3</sup> excavation waste storage capacity at the dedicated storage areas. The excavation waste storage areas and the storage capacities are given in the Table 8-2 below:

Table 8-2: Excavation Waste Storage areas in Istanbul

Storage Area	Total Storage Volume, m <sup>3</sup>
Silivri/Seymenkoyu	4,250,000
Silivri/Buyuksemizkum	1,226,000
Şile/Kurna	1,432,000
Tayakadin	35,000,000
Ağaçlı	7,450,000
Omerli	8,650,106
Ayazağa	4,405,563
Maltepe	7,800,000
Bolluca	28,232,009
Yenikapı	5,800,000
AkfiratTepeoren	807,151
Şile Sahilkoy	1,415,804
Fenerkoy	-
Muratbey	-

Source: ISTAC Web Site

### Non-hazardous Waste:

Common non-hazardous wastes managed by ISKI are the non-hazardous treatment sludge which are landfilled at a dedicated location at Komurcuoda Landfill Facility. Other non-hazardous waste should be sent to licensed Non-hazardous waste Recycling Facilities according to the related Communiqué on Recycling of Certain Non-hazardous Waste.

### **8.3.2 Waste Disposal and Treatment**

ISTAC was founded as an affiliate of Istanbul Metropolitan Municipality in 1994 in order to manage Istanbul waste according to the Regulations. Within the scope of EU Waste Management Norms, ISTAC has been carrying out the following activities: disposal of domestic and medical waste, recycling of packaging wastes, management of construction and excavation wastes, building and operation of sanitary landfill areas, treatment of landfill water leakage, production of electricity from landfill gas, collection and disposal of wastes from ships and sea surface, cleaning of seacoast lines, beaches, stream mouths, public squares, streets and main arteries, compost production and recycling from organic wastes, disposal and recovery of industrial wastes. ISTAC waste management facilities are listed in Table 8-1.

#### Class II Landfill Facilities

The Komurcuoda Class II Solid Waste Landfill Facility on the Asian side was developed on 233 ha area at the Komurcuoda location of Karakiraz Village in Sile County. The Odayeri Class II Sanitary Landfill Facility in European side was developed on 114 ha area at the Odayeri location which is 5 km northwest of Gokturk town. The Odayeri and Komurcuoda Class II Sanitary Landfill Facilities were commissioned and started operations in 1995.

Domestic wastes coming from four transfer stations on the European side and three stations on the Asian side are disposed in these Class II sanitary landfill facilities. Approximately 14,000 tons of domestic waste is collected throughout Istanbul. Of this amount 9,000 tons are collected on the European side whereas 5,000 tons is collected on the Asian side. In Class II Sanitary Landfill Facilities, there are units such as;

- Leachate Treatment Facility, Leachate Collection Pools:
- Scale, Administrative Building,
- Vehicle Maintenance Workshop:



Figure 8-3: ISTAC Class II Landfill Facilities

### Waste Material Recovery and Compost Facility

The mixed domestic waste that is generated daily has on average a 50% organic content. A compost and recovery facility was established and started operating in 2001 for using the organic content wastes in mixed municipality wastes.

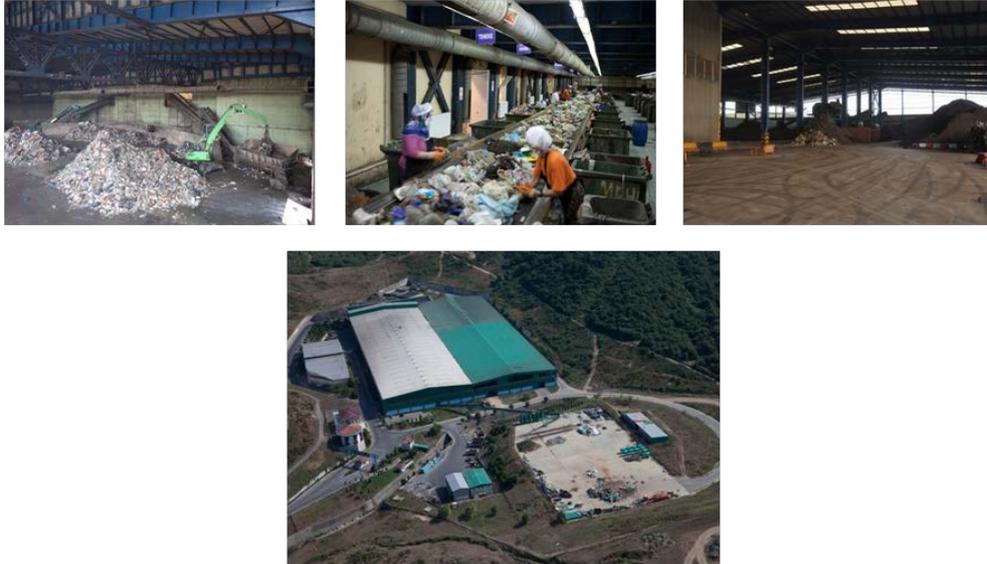


Figure 8-4: ISTAC Waste Material Recovery and Compost Facility

The compost and recovery facility is comprised of four units;

1. Compost Unit
2. Recovery Unit
3. Granule Unit
4. Refuse Derived Fuel (RDF) Unit

Waste water formed in the processes is sent to the leachate treatment facility in Odayeri Sanitary Landfill Area. Domestic waste waters are discharged into ISKI canal before treatment. Ambient air with foul odors formed because of fermentation is passed through the bio filter and discharged to the air.

### Medical Waste Incineration Plant

The medical waste incineration plant is a 24 ton capacity rotary kiln type incinerator. The plant was established in 1995 and is located in Kemberburgaz, Odayeri. Operation temperature is 1000°C in rotary kiln and 1200°C in the post-combustion chamber. The flue gas is discharged to the atmosphere after gas treatment which contains dioxin-furan control via activated carbon injection. The heat from waste incineration is used to produce steam which is used to produce electricity in turbine-generator. The generated electricity has 0.5 MWh capacity and is used to illuminate offices, workshop etc. Animal carcasses are also incinerated at the Kemberburgaz incineration plant.



Figure 8-5: ISTAC Medical Waste Incineration Facilities

Hazardous Waste Sanitary Landfill Facility

A 4 ha hazardous waste landfill area (to reach 12 ha in total), was built in Sile Komurcuoda location. Wastes appropriate for the Annex-2 analysis given in the Regulation for Sanitary Landfill of the Wastes are disposed in the Hazardous Waste Sanitary Landfill Area.

Refuse Derived Fuel (RDF) Manufacturing Facility

ISTAC RDF Facility which manufactures additional fuel for cement factories from mixed municipal wastes and wastes resulting from industry is located in Kemberburgaz Compost and Recovery Facility. Wastes resulting from the industry, which has a high calorific value, are directed to this facility and processed and contribute to economy by being used as additional fuel in cement kiln.



Figure 8-6: ISTAC RDF Manufacturing Facility

Excavation Waste Storage Areas

The collected excavation and demolition waste are recycled and reused at necessary location for the site rehabilitations.



Figure 8-7: ISTAC Excavation Waste Storage Areas

### Domestic Waste Transfer Stations

The collected domestic wastes are delivered to the seven waste transfer stations both in European and Asian sides of Istanbul and are compressed by motion compactors and then stored in 32 cubic meters silos. Dumper trucks leave stations within 10 minutes after arrival, and an online registration system is fed with data by the station gate checkpoints concerning dumper trucks arriving and leaving. The data are processed by the ISTAC main computer system. The compressed waste is transferred to Class II landfills by big trucks making 400 trips daily.



Figure 8-8: ISTAC Domestic Waste Transfer Stations

### ISKI Domestic Wastewater Treatment Plants

The domestic wastewater generated in Istanbul Province is being treated in the wastewater treatment plants (WWTPs) operated by Istanbul Water and Sewage Administration (ISKI). ISKI domestic wastewater treatment plant names, start-up years, and the capacities of the plants can be seen in Table 8-3.

Table 8-3: Wastewater Treatment Plants in Istanbul Operated by ISKI

	WASTEWATER TREATMENT PLANT (WWTP)	Start-up Year	Capacity (m <sup>3</sup> /day)	
1	Yenikapi wastewater pre-treatment plant (WWTP)	1988	864,000	
2	Baltalimani WWTP	1997	625,000	
3	Uskudar WWTP	1992	77,760	
4	Buyukcekmece WWTP	1998	155,120	
5	Tuzla WWTPs	Tuzla Biological WWTP	1998	150,000
		Tuzla Advanced Biological WWTP	2009	100,000
6	Paşakoy WWTPs	Pasakoy Advanced Biological WWTP	2000	125,000
		Pasakoy Advanced Biological WWTP	2009	100,000
7	Terkos Advanced Biological WWTP	2000	1,730	
8	Kucukcekmece WWTP	2003	354,000	
9	Kadıkoy WWTP	2003	833,000	
10	Kuçuksu WWTP	2004	640,000	
11	Bahcesehir Biological WWTP	2004	7,400	
12	Canta Biological WWTP	2006	1,600	
13	Gumusyaka Biological WWTP	2007	1,700	
14	Omerli Biological WWTP	2008	500	
15	Kumbaba WWTP	2008	46,000	
16	Pasabahce WWTP	2009	575,000	
17	Atakoy Advanced Biological WWTP	2010	400,000	
18	Agva Biological WWTP	2010	2,000	
19	Izzettinkoy Biological WWTP	2010	500	

	WASTEWATER TREATMENT PLANTS in VILLAGES	Start-up Year	Capacity (m <sup>3</sup> /day)
1	Akalan Village Package Biological WWTP	2008	200
2	Belgrat Village Package Biological WWTP	2008	50
3	Orencik Village Package Biological WWTP	2008	250
4	Komurluk Biological WWTP	2008	125
5	Sahilkoy Biological WWTP	2008	200
6	Orcunlu Village Biological WWTP	2010	250
7	Kestanelik Village Biological WWTP	2010	500
8	Canakca Village Biological WWTP	2010	500
9	Oklalı Village Biological WWTP	2010	500
10	Yazlik Village Biological WWTP	2010	250
11	Basakkoy Biological WWTP	2010	250
12	Orucoglu Village Natural WWTP	2010	125
13	Ogumce Village Biological WWTP	2010	200
14	Yenikoy Biological WWTP	2008	200
	<b>TOTAL</b>		<b>5,063,910</b>

#### Licensed Third Party Waste Management Facilities

Other than the ISTAC facilities there are numerous third party waste management facilities in Istanbul licensed from the MoEU.

The licensed third party waste management facilities in Istanbul Province have been reviewed from the MoEU website and are listed in Table 8-4.

Wastes during the construction and operation of the Project can be managed at the appropriate facility according to the waste type and the facility permit type and content.

Table 8-4: Licensed waste management (recycling / disposal) facilities located in Istanbul province

No	Name of the Facility	Contact Details	License Subject	License Due Date
1	MERSAN PLASTİK VE BAHÇE MOBİLYALARI SAN. TİC. LTD. ŞTİ.	UZUNDERE MEVKİİ TURGUT REİS MAH. SELÇUK CAD. NO:68 SULTANBEYLİ/İSTANBUL tel:02163986521 fax:02163981043	Non-hazardous Waste Recovery Packaging Waste Recovery	11.01.2014
2	GOKSU PLASTİK AMBALAJ SAN.VE TİC.LTD ŞTİ.	TERAZİDERE M. FUNDA SOKAK. NO:17 (BODRUM KAT) tel:2126139224 fax:2126139228	Non-hazardous Waste Recovery Packaging Waste Recovery	05.02.2014
3	EMEK ATIK DONUŞUM VE NAKLİYAT SANAYİ VE DIŞ TİCARET LİMİTED ŞİRKETİ	S.ÇEŞME MAH. HALKALI CAD. 243 KUÇUKÇEKMECE tel:2126705026 fax:2126705027	Non-hazardous Waste Recovery Packaging Waste Recovery	06.02.2014
4	BOLİŞ PLASTİK VE KİMYA SANAYİ TİCARET LİMİTED ŞİRKETİ	TOPSELVİ MAH. ESKİ YAKACIK YOLU CAD. NO:6 tel:2163068866 fax:2163068828	Non-hazardous Waste Recovery Packaging Waste Recovery	14.02.2014
5	CESUR AMBALAJ SAN.VE TİC.A.Ş.	YAKACIK YAN YOL SENEM SOK.NO:11 KARTAL İSTANBUL tel:2163772855 fax:2163097891	Non-hazardous Waste Recovery Packaging Waste Recovery	14.02.2014
6	KAZANÇ PLASTİK SAN.VE TİC.A.Ş.	ORHANLI ORTA MH. 30 AĞUSTOS CAD. NO:5 TUZLA tel:2163042216 fax:2163042257	Non-hazardous Waste Recovery Packaging Waste Recovery	01.04.2014
7	ATILIM PET LEVHA AMBALAJ PLASTİK SANAYİ VE TİCARET LİMİTED ŞİRKETİ	UNİVERSİTE M. SARIGUL SOK. 6 B AVCILAR tel:2125764915 fax:2125766325	Packaging Waste Recovery	03.04.2014
8	ŞAHİNLER METAL SANAYİ VE TİCARET A.Ş İSTANBUL ŞUBESİ	ORTA MAH. BULENT ECEVİT CAD. NO:4 34959 ORHANLI tel:02163040506 fax:02163040505	Hazardous Waste Recovery Packaging Waste Recycling Scrap Metal Processing Non-hazardous Waste Recovery Packaging Waste Recovery	24.05.2014
9	KILIÇ PLASTİK PETROL NAKLİYAT SAN.VE TİC.LTD.ŞTİ.	MURAT MAH İŞKENT SAN.SİT.D.BLK 13,15,16,17,18,19,20,80,81 BAYRAMPAŞA tel:2126146727 fax:2125782501	Non-hazardous Waste Recovery Packaging Waste Recovery	29.05.2014
10	DOĞUŞ PALET VE AMBALAJ SAN.TİC.LTD.Ş Tİ.	AKÇABURGAZ MH 2.CAD. 6 ESENYURT tel:2128869977 fax:2128869777	Packaging Waste Recovery	25.07.2014
11	HALKALI KAĞIT KARTON SANAYİ VE TİCARET ANONİM ŞİRKETİ	HALKALI MERKEZ MAH. DEREBOYU CAD. 72/1 KUÇUKÇEKMECE tel:2126939334 fax:2125483221	Packaging Waste Recycling Packaging Waste Recovery	30.07.2014
12	EREN PLASTİK TEKSTİLİTH.İHR.SAN.VE T İC.LTD.ŞTİ.	İKİTELLİ OSB MAH. OTO SANAT. SAN. SİT. SOK. NO:119-120 tel:212 2757545 fax:212 2757881	Packaging Waste Recovery	23.09.2014
13	TUTLUOĞLU AHSAP PALET SAN.VE TİC.LTD ŞTİ.	ESENKENT MAH. BAYSAL SK. NO:1/1 UMRANIYE İSTANBUL tel:02165275094 fax:02163640480	Packaging Waste Recovery	10.10.2014
14	ONER PLASTİK GERİ DONUŞUM - KENAN ONER	RAMAZANOĞLU MH. SULTAN SK. NO:15 PENDİK tel:2163783501 fax:2163783501	Non-hazardous Waste Recovery Packaging Waste Recovery	24.10.2014
15	UZEYİR DEMİR	TEPEOREN YOLU AKTEPE SAN.ST. 10 TUZLA tel:5327448365 fax:216 5963558	Packaging Waste Recovery	27.10.2014

No	Name of the Facility	Contact Details	License Subject	License Due Date
16	YLC İÇ VE DİŐ TİCARET LİMİTED ŐRKETİ	BUYUKBAKKALKOY BUYUK BAKKALKOY YOLU S. 31 2 MALTEPE tel:2164279529 fax:2164279529	Packaging Waste Recovery	07.11.2014
17	POLYE PLASTİK VE ÇEVRE TEKNOLOJİLERİ SANAYİ TİCARET LİMİTED ŐRKETİ	ESENKENT M./ORG.SAN. BOLG./2. CD 20 2 UMRANIYE tel:2165406903 fax:2165406906	Packaging Waste Recovery	21.11.2014
18	GURBETÇİLER PLASTİKSAN.VE TİC.A.Ő.	HIZIR REİS CAD. NO:9 KURTKOY-PENDİK/İSTANBUL tel:2165950171 fax:2165950176	Non-hazardous Waste Recovery Packaging Waste Recovery	04.12.2014
19	ÇİĞDEMLER HURDA METAL İNŐ.NAK.OTOM.S AN.TİC.LTD.ŐTİ.	ALIPAŐA MAH. ERKOÇ SK. NO:28 tel:2127165294 fax:2127165294	Packaging Waste Recycling	23.05.2014
20	YON TEMİZLİK PEYZAJİNŐAAT SAN.VE TİC.LT D.ŐTİ.	YENİ MAHALLE CD.NO:28 ORNEKKOY BEYKOZ tel:2164257338 fax:2164011518	Packaging Waste Recycling	11.07.2014
21	GULTEM ÇOP NAKLIYAT VETEMİZLİK AMBALAJ ATIĐI TOPLAMA AYIKLAMA	Y.KOY A.H.L. KARGO TERMİNALİ BOL. YOK BAKIRKOY tel:2124654601 fax:2124656412	Packaging Waste Recycling	30.07.2014
22	TUZLA DERİ OSB GERİ DONUŐUM ANONİM ŐRKETİ	AYDINLIK OY ORGANİZE DERİ SANAYİ BOLGESİ ÇEVRE SOKAK NO: 3tel:2163948068 fax:2163948069	Hazardous Waste Recovery Hazardous Waste Temporary Storage Non-hazardous Waste Recovery Packaging Waste Recycling	11.11.2014
23	AKADEMİ ÇEVRE DANIŐMANLIK HİZ. İNŐ. SAN. VE TİC. LTD. ŐTİ.	TEPEOREN ORTA MAH. DEMOKRASİ CADDESİ N:92/1 tel:2163042515 fax:2163041975	Hazardous Waste Recovery Hazardous Waste Temporary Storage Non-hazardous Waste Recovery Waste Electronic and Electrical Equipment (WEEE) Processing Scrap Metal Processing	15.02.2014
24	ALTAŐ YAPI SAN. VE TEM. HİZM. TİC. A.Ő. (ELEKTRONİK ATIK TESİŐİ)	MERDIVENKOYMAH. YUMURTACIABDİBEY CAD. NO:8934732 KADIKOY / İSTANBUL tel:2165640604 fax:2165640604	WEEE Processing	29.07.2014
25	EAG GERİ DONUŐUM SAN. VE TİC. A.Ő- SULTANGAZİ ŐUBESİ	KUÇUK SANAYİ SİTESİ ESENTEPE MAH. 2951. SOK. NO:28/A SULTANGAZİ/İSTANBUL tel:2126060324 fax:2122945577	WEEE Processing	19.08.2014
26	KARAMAN KARDEŐLER METAL SANAYİ VE TİCARET LTD. ŐTİ.	SELİMPAŐA MAHALLESİ, 6205. SOKAK, NO:25, SİLİVRİ/İSTANBUL tel:2125561622 fax:2125050447	WEEE Processing	02.09.2014
27	EMRE METAL DİŐ TİCARET LTD.ŐTİ.	İŐTİKLAL MAH. BARIŐ MANÇO CAD. NO:9, KIRAÇ tel:2126898444 fax:2126893299	Hazardous Waste Recovery WEEE Processing	25.11.2014
28	AKÇANSA ÇİMENTO SANAYİ VE TİC.A.Ő. BUYUKÇEKMECE FABRİKA	MIMAR SINAN MERKEZMAH. MARMARA CAD. 13/1 AKA SOK. NO:6 34900 BUYUKÇEKMECE İSTANBUL tel:0212866100 fax:02128661200	Non-hazardous Waste Recovery Waste Incineration and Co-incineration	29.03.2014
29	İŐTAÇ İSTANBUL ÇEVRE YONETİMİ SANAYİ VE TİCARET ANONİM ŐRKETİ - KOMURCUODA TESİŐLERİ	KOMURCUODA DUZENLİ DEPOLAMA ALANI- KOMURCUODA MEVKİİ, KARAKİRAZ KOYU/ŐİLE /İSTANBUL tel:02167328705 fax:02167328713	Class I Landfill Hazardous Waste Temporary Storage	28.06.2014
30	KOÇA METAL PASLANMAZ ÇELİK GERİ DON.SAN.V E TİC.LTD.ŐTİ.	İKİTELLİ O.S.B. DEPO VE ARDİYE KOOP. 784 ADA PARSEL 8/B BAŐAKŐEHİR/İSTANBUL tel:02126750591 fax:02126750594	Scrap Metal Processing	17.12.2014

No	Name of the Facility	Contact Details	License Subject	License Due Date
31	SAYAN METAL	İKİTELLİ ORGANİZE SANAYİ BOLGESİ İSDOK SANAYİ SİTESİ 3. BLOK NO:26 BAŞAKŞEHİR tel:2124855701	Hazardous Waste Recovery	01.02.2014
32	MISIRLI KUYUMCULUK RAMATÇILIK SAN.VE TİC.LTD.ŞTİ.	İKİTELLİ ORG.SAN.BOL.ÇEVRE SAN.SİT.2. BLOK NO:2-4-6-8 tel:2124853092 fax:2124853093	Hazardous Waste Recovery Non-hazardous Waste Recovery	01.04.2014
33	AKADEMİ GERİ DONUŞUM SANAYİ VE TİCARET LİMİTED ŞİRKETİ	İSTANBUL DERİ ORGANİZE SANAYİ BOLGESİ 9. YOL D-1 PARSEL TUZLA/İSTANBUL tel:02163941873 fax:02163942166	Hazardous Waste Recovery Non-hazardous Waste Recovery	15.05.2014
34	ONSA MUCEVHERAT İMALATI VE DIŞ TİCARET ANONİM ŞİRKETİ	AKÇABURGAZ MAH. 122 SK. 003 ESENYURT tel:02128867100 fax:02128868562	Hazardous Waste Recovery Non-hazardous Waste Recovery	29.05.2014
35	ONDER VARİL VE GERİ KAZANIM TİCARET LİMİTED ŞİRKETİ.	ORHANLI ORTA MAH.T.OREN KOYU MU.AKU YA.İS.BO.VE VER.SAN.SİT. 59 TUZLA tel:2163114194 fax:2163114194	Hazardous Waste Recovery	11.12.2014
36	YILDIRIMLAR PLASTİK SANAYİ VE TİCARET LTD.ŞTİ.	KARAYOLLARI MH K.AKDOĞAN CD 29 GAZİOSMANPAŞA tel:2124798684 fax:2124798490	Non-hazardous Waste Recovery	22.01.2014
37	ONCA PLASTİK SANAYİ VE TİCARET LİMİTED ŞİRKETİ	BEYCİLER KOYU İSTASYON CD. NO:32 SİLİVRİ/İSTANBUL tel:2127453571 fax:2127453574	Non-hazardous Waste Recovery	14.02.2014
38	ŞAHİN RAMAT VE KUYUMCULUK SANAYİ TİC .LTD.ŞTİ.	ORG.SAN.BOLG.ÇEVRE SAN.SİT. 2. BLOK 24 tel:2124862298 fax:2124862599	Non-hazardous Waste Recovery	26.02.2014
39	HAKAN AYDIN AYDIN RAMAT	İSDOK SANAYİ SİTESİ 7 BLOK NO: 2 İKİTELLİ BAŞAKŞEHİR tel:2124852093 fax:2124852093	Non-hazardous Waste Recovery	28.02.2014
40	KILSAN KİL SANAYİ VETİC.A.Ş.	KEMERBURGAZ IŞIKLAR KOYU YOK EYUP tel:2122065206 fax:2122065211	Non-hazardous Waste Recovery	29.03.2014
41	BİRLİK METAL	İKİTELLİ ORGANİZE SANAYİ BOLGESİ İSDOK SANAYİ SİTESİ 4.BLOK NO:13 BAŞAKŞEHİR tel:02124858183 fax:02124858183	Non-hazardous Waste Recovery	01.04.2014
42	KENAN METAL DOKUM SANAYİ VE TİCARET LTD. ŞTİ.	İKİTELLİ OSB İSDOK SANAYİ SİTESİ 4. BLOK NO:14 tel:02124856035 fax:02124856046	Non-hazardous Waste Recovery	29.04.2014
43	ÇELİK GRANUL SANAYİ A.Ş.	HASTANEMAH. İSTANBUL CAD. NO: 58 HADIMKOY - ARNAVUTKOY / İSTANBUL tel:02127714555 fax:02127712057	Non-hazardous Waste Recovery	07.05.2014
44	UZEL KUYUMCULUK SANAYİ VE TİCARET LİMİTED ŞİRKETİ	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 3. BLOK NO:15tel:02124855124 fax:02126385055	Non-hazardous Waste Recovery	14.05.2014
45	VOLKAN RAMATÇILIK	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 3.BLOK NO:16 tel:02124856552 fax:02124856552	Non-hazardous Waste Recovery	14.05.2014
46	SİMGE RAMATÇILIK İMALAT SANAYİ VE TİCARET LİMİTED ŞİRKETİ	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 3. BLOK NO:1 tel:02124853860 fax:02126030536	Non-hazardous Waste Recovery	10.06.2014
47	NEZİR PLASTİK GRANUL SANAYİ ve TİC. (MEHMET ENGİN)	SANAYİ MAH. GURBUZ SK. No: 13-15 GUNGOREN tel:2125556611 fax:2125077429	Non-hazardous Waste Recovery	10.06.2014

No	Name of the Facility	Contact Details	License Subject	License Due Date
48	ENES KUYUMCULUK DEĞERLİ MADENCİLİK DAYANIKLI TÜKETİM MALLARI İNŞAAT GIDA TEKSTİL SANAYİ VE TİCARET LİMİTED ŞİRKETİ	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 3.BLOK NO:14 tel:2124853094 fax:2124855061	Non-hazardous Waste Recovery	08.07.2014
49	EFSUN PLASTİK GRANÜR HAMMADDE VE KASA İMALATI SANAYİ TİCARET LİMİTED ŞİRKETİ	PİK DOKUMCULAR SAN B-3 BLK 13 BAŞAKŞEHİR tel:2124854718 fax:2124854719	Non-hazardous Waste Recovery	21.10.2014
50	NADİR METAL RAFİNERİ SANAYİ VE TİCARET ANONİM ŞİRKETİ	AKÇABURGAZMAHALLESİ 119.SOKAK NO 6 ESENYURT İSTANBUL tel:2128866728 fax:2128866731	Non-hazardous Waste Recovery	11.11.2014
51	CEM METAL TİCARET VE SANAYİ LTD.ŞTİ.	İSTANBUL TUZLA ORGANİZE SANAYİ BOLGESİ 6059 ADA, 4 NOLU PARSEL TUZLA/İSTANBUL tel:2165931200 fax:2165931201	Non-hazardous Waste Recovery	13.12.2014
52	İRGİ HURDA TİCARETİ SONER İRGİ	Z.GOKALP MH. İSDOK SAN.SİT.4.BLK 11 BAŞAKŞEHİR tel:2124856071 fax:2124856071	Non-hazardous Waste Recovery	16.12.2014
53	UZUNOĞLU PLASTİK SANVE TİC.LTD.ŞTİ.	OSMANGAZİ M. ALSANCAK C. 24 SANCAKTEPE tel:2163112064 fax:2163111023	Non-hazardous Waste Recovery	18.12.2014
54	MAVİ PLASTİK GIDA SAN.TİC.LTD.ŞTİ.	İKİTELLİ O.S.B. ATATURK OTO SANAYİ SİTESİ 22.BLOK NO:628-629-630 İKİTELLİ BAŞAKŞEHİR tel:02124859095 fax:02124857557	Packaging Waste Recovery	24.06.2016
55	OBALILAR KAĞIT METALPLAS CA TO AY İN SA V TİC LTD ŞTİ	AKÇABURGAZ MAH. 1632. SOK NO:38 ESENYURT İST tel:2128866161 fax:02128866763	Packaging Waste Recycling Packaging Waste Recovery	22.09.2016
56	HUR PLASTİK GERİ DONUŞUM VE GRANUL İMALATI SAN. TİC. LTD. ŞTİ.	RAMAZANOĞLU MAH. MİMAR SİNAN CAD. NO:2 tel:02163782500 fax:02163785531	Non-hazardous Waste Recovery Packaging Waste Recovery	04.11.2016
57	YENİHUZUR PLASTİK SAN.VE TİC.LTD.ŞTİ.	ORG.SAN.BOLG. TURGUT OZAL CD. 137 BAŞAKŞEHİR tel:2125499961 fax:02125499960	Non-hazardous Waste Recovery Packaging Waste Recovery	22.12.2016
58	ASTS PROFİL MUHENDİSLİK VE PLAST.SAN VE TİC.A.Ş.	TUZLA KİMYA SANAYİCİLERİ ORGANİZE SANAYİ BOLGESİ MELEK ARAS BLV.TUNA CD. NO: 10 tel:2165930862 fax:2165930863	Non-hazardous Waste Recovery Packaging Waste Recovery	01.03.2017
59	TURANSAN STRAFOR GERİ DONUŞUMU TUNCAY TECER	BATTALGAZİ MH SULTAN SANAYİ SİT. B BLOK NO.42 SULTANBEYLİ / İSTANBUL tel:02165923845 fax:02165923847	Non-hazardous Waste Recovery Packaging Waste Recovery	02.05.2017
60	VATAN PLASTİK SAN.VE TİC.A.Ş.	SOĞANLIK ORTA MAH.E-5 YANYOL NO:14 KARTAL İSTANBUL tel:0216 377 22 80 fax:0216 377 11 96	Packaging Waste Recovery	14.05.2017
61	BERRA OYUNCAK HEDİYELİK EŞYA SAN VE DİŞ TİC LTD ŞTİ	FİRUZKOY M. BAĞLARIÇI C. 77 AVCILAR tel:02124234615 fax:02124234615	Non-hazardous Waste Recovery Packaging Waste Recovery	24.05.2017
62	ADEMOĞLU PLASTİK İTHALAT VE İHRACAT SANAYİ TİCARET LTD.ŞTİ	İOSB İPKAS SANAYİ SİTESİ B BLOK N:1 İKİTELLİ BAŞAKŞEHİR İSTANBUL tel:02126710385 fax:02126711235	Non-hazardous Waste Recovery Packaging Waste Recovery	04.06.2017
63	ŞİMŞEK PLASTİK(HAYRETTİN YILMAZ)	VATAN MAH ELMAS SOK NO:19-21/1 BAYRAMPAŞA-İST tel:0212 6125476 fax:02126744950	Non-hazardous Waste Recovery Packaging Waste Recovery	13.07.2017

No	Name of the Facility	Contact Details	License Subject	License Due Date
64	UÇAL KAĞIT SANAYİ VE TİCARET ANONİM ŞİRKETİ	SIRAPINAR KOYU BEYKOZ CAD. NO:89 ÇEKMEKÖY İSTANBUL tel:02164357374 fax:02164357139	Packaging Waste Recovery	13.07.2017
65	POLİREN PLASTİK SAN. VE TİC. LTD. ŞTİ.	SANAYİ MAH. AVCILAR CAD. FUGE İŞ MERKEZİ NO:3 GUNGÖREN/İSTANBUL tel:02125063505 fax:02125063515	Non-hazardous Waste Recovery Packaging Waste Recovery	16.08.2017
66	ERGÜLLER PLASTİK KALIP İNŞAAT SAN.VE TİC.L TD.ŞTİ.	VATAN MAH ESENLER CAD. SERAP SOK. NO:9\A BAYRAMPAŞA-İST tel:2126133061 fax:02125771417	Non-hazardous Waste Recovery Packaging Waste Recovery	14.09.2017
67	HARPUT PLASTİK SAN. VE TİC. LTD.ŞTİ.	HAVUZBAŞI MAH. ÇEŞME SOK. ZAFER SAN. SİTESİ D BLOK NO: 58 tel:212 615 79 26 fax:02126169233	Non-hazardous Waste Recovery Packaging Waste Recovery	17.09.2017
68	METROPLAST AMBALAJ TEKSTİL SAN.VE TİC. LTD. ŞTİ.	MERKEZEFENDİ MAH. GUMUŞSUYU CAD.FATİH ŞEHİTLERİ CAD.NO:13 MALTEPE-TOPKAPI-ZEYTİNBURNU /İSTANBULtel:02125019309 fax:02126128352	Packaging Waste Recovery	05.12.2017
69	ÇILTAŞ NAKLİYAT TİC.LTD. ŞTİ.	ESKİ SİLİVRİ CADDESİ NO:34 MİMARŞINAN BUYUKÇEKMECE-İST tel:2128614437-38 fax:02128614440	Packaging Waste Recycling Packaging Waste Recovery	10.12.2017
70	LİFLİ RULO VE LEVHA SANAYİ A. Ş.	İST.DERİ ORG.SAN.BOL TABAK S.N7-1 OZ.PAR. 2 TUZLA tel:2163941818 fax:2163941816	Non-hazardous Waste Recovery Packaging Waste Recovery	11.12.2017
71	AKSAN PLASTİK SANAYİ VE TİCARET LİMİT ED ŞİRKETİ	RAMAZANOĞLU M M.SİNAN C SULTAN S 17 1 PENDİK tel:02165951357 fax:02163786542	Packaging Waste Recovery	14.12.2017
72	YASİN METAL VE PLASTİK SAN. TİC.(YASİN KUŞOĞLU)	İKİTELLİ ORG. SAN. BOL. ZİYA GOKALP MAH. DERSAN KOOP.S6 C BLOK NO:101-103 İKİTELLİ tel:2125497719 fax:2125497768	Packaging Waste Recycling Packaging Waste Recovery	31.12.2017
73	DOA GERİ DONUŞUM AMB PLASTİK VE KAĞIT SAN TİC.LTD.ŞTİ.	MERMERCİLER SAN.SİT.5.CAD.NO:8 tel:02128792874 fax:02128792875	Non-hazardous Waste Recovery Packaging Waste Recovery	22.01.2018
74	APEKS AMBALAJ SANAYİ VE TİC LTD ŞTİ	UNİVERSİTE M. FIRUZKOY BULVARI 45/1 AVCILAR tel:2124211800 fax:2124211802	Packaging Waste Recovery	24.01.2018
75	SULEYMAN KILINÇ	AYDINLI KOYU AYDINLI MAH. İST. DERİ SAN. BOLG. Y. G. A. XXVI-6 TUZLA/İSTANBUL tel:02165910470 fax:02642913777	Non-hazardous Waste Recovery Packaging Waste Recovery	29.01.2018
76	OZARPACI PLASTİK GERİ DONUŞUM GRANUL İMALATI - HEDİYE OZARPACI	İKİTELLİ O.S.B TURGUTOZALCAD.PIKDOKUM KOOP.A3 BLOK NO:14 tel:02124850730 fax:02124850731	Non-hazardous Waste Recovery Packaging Waste Recovery	08.02.2018
77	PLAZEN PLASTİK DANIŞMANLIK HİZMETLERİ SANAYİ VE DIŞ TİCARET LİMİTED ŞİRKETİ	İSTANBUL DERİ ORGANİZE SANAYİ BOLGESİ, KAZLIÇEŞME CADDESİ, 1. YOL, H-15 PARSEL, TUZLA/İSTANBUL tel:2163942569 fax:2163941671	Packaging Waste Recovery	27.02.2018
78	PET ŞİŞE GERİ DONUŞUM TURAN ATEŞ	Y.DUDULLU/ŞERİFALİ CD. DERGAH SK. NO:37 UMRANIYE tel:2163642245 fax:2163651002	Packaging Waste Recovery	16.04.2018
79	BAYRAK DONUŞUM PLASTİK TİCARET VE SANAYİ LTD. ŞTİ.	HADIMKOY MAH. BİNNUR SOK. NO:3 ARNAVUTKOY / İST tel:2127716181 fax:02127716184	Non-hazardous Waste Recovery Packaging Waste Recovery	30.04.2018

No	Name of the Facility	Contact Details	License Subject	License Due Date
80	OZDEN OZ PLASTİK SAN. VE TİC. LTD. ŞTİ.	MALTEPEGUMUŞSUYU CAD. LITROSYOLU SITE SK. NO:21 tel:0212 577 72 74 fax:02125675213	Non-hazardous Waste Recovery Packaging Waste Recovery	15.05.2018
81	OZDEMİRBAĞLAR METALİNŞ.AMB.PLAS.İM.GERİ DON.SAN.TİC.LTD.ŞTİ.	TAHTAKALE M. İSTANBUL C. 32 AVCILAR tel:02126870626 fax:02126878142	Non-hazardous Waste Recovery Packaging Waste Recovery	21.05.2018
82	GUNDOĞDU PLASTİK - MUHAMMET GUNDOĞDU	ŞEYHLİ MAH. SİNE SOK. NO:18 PENDİK tel:2163784822 fax:2163784822	Non-hazardous Waste Recovery Packaging Waste Recovery	09.07.2018
83	ORHAN PLASTİK VE KAĞIT AMB. SAN. VE TİC. LTD. ŞTİ	ÇİFTE HAVUZLAR CAD. EMEL SK. NO:9 K:1 BAYRAMPAŞA tel:2125672728 fax:02125760135	Non-hazardous Waste Recovery Packaging Waste Recovery	01.08.2018
84	ORUÇOĞULLARI ALUMİNYUM KULÇE SAN. VE TİC. LTD. ŞTİ.	GAZİTEPE MAHALLESİ, FABRİKALAR CADDESİ, NO:16, SİLİVRİ/İSTANBUL tel:02127388489 fax:2127388497	Non-hazardous Waste Recovery Packaging Waste Recovery Hazardous Waste Recovery	13.08.2018
85	AKIN YILDIZ PLASTİK AMBALAJ SAN VE TİC A.Ş.	TERAZİDEREMAH. HAKAN SK. NO:18-20-22 tel:02125776210 fax:02125760149	Non-hazardous Waste Recovery Packaging Waste Recovery	23.08.2018
86	ERYURT PLASTİK İNŞAATURİZM GIDA OTOM.SAN VE DİŞ TİC.LTD.Ş	SANAYİ MAH AVCILAR C 7/1 ZEM GUNGOREN tel:2125572995 fax:2125572900	Non-hazardous Waste Recovery Packaging Waste Recovery	11.09.2018
87	DEMİRTAŞ PLASTİK-İSMET DEMİRTAŞ	ÇEKMEKOY HUSEYİNLİ KOYU BEYKOZ CAD.NO:147 tel:02164345953 fax:02125760660	Non-hazardous Waste Recovery Packaging Waste Recovery	11.09.2018
88	SAĞLAM GERİ DONUŞUMPLS.PVC GRANUL SAN.V E TİC.LTD.ŞTİ.	VATAN M. Ç.HAVUZLAR C.GİRİŞ K 16 BAYRAMPAŞA tel:2124800495 fax:2124800498	Non-hazardous Waste Recovery Packaging Waste Recovery	22.10.2018
89	OZKARDEŞLER PLASTİK TEKSTİL SAN.TİC.LTD.ŞTİ.	VATAN MAH.CUMHURİYET CAD.NO:1 tel:02125766096 fax:02125766096	Non-hazardous Waste Recovery Packaging Waste Recovery	26.10.2018
90	GEMA POLİMER PLASTİK URUNL.SAN. VE TİC A.Ş.	YEŞİLCEMAH. DALGIÇ SOKAK NO: 31 tel:2122706644 fax:2122843574	Non-hazardous Waste Recovery Packaging Waste Recovery	26.10.2018
91	OZEN CAM GERİ DONUŞUM KAZANIM VE İNŞ SAN LTD ŞTİ.	KAYABAŞI KOYU FABRİKALAR MEVKİ NO:62 KUÇUKÇEKMECE tel:2126685877 fax:2126685878	Non-hazardous Waste RecoveryPackaging Waste RecoveryPackaging Waste Recycling	04.12.2018
92	AKDOĞAN KAĞITÇILIK AMBALAJ ATIĞI TOPLAMA VE AYIRMA TESİSİ	HASANPAŞA MAH.DEVELİ SOK.NO:4 SULTANBEYLİ/İSTANBUL tel:02163980972 fax:02163989476	Packaging Waste Recycling	19.01.2016
93	KADIKOY BEL. AMBALAJ ATIKLARINI TOPLAMA VE AYRIŞTIRMA TESİSİ(İŞLT.ALTAŞ YAPI SAN.VE TEM.HİZ.TİC.A.Ş.	MERDİVENKOY MAH. ŞAİR ARŞİ CAD.DEVAMI E-5 KENARI GOZTEPE/KADIKOY/İST. tel:02164780915 fax:02164784735	Packaging Waste Recycling	09.02.2016
94	DONKASAN DONUŞEN KAĞIT HAMMADDELERİ SANAYİ VE TİCARET A.Ş.	CUMHURİYET MH. FERMAN CD. NO: 3 34876 tel:2163770090 fax:2163770012	Packaging Waste Recycling	18.03.2016

No	Name of the Facility	Contact Details	License Subject	License Due Date
95	DONKASAN DONUŞEN KAĞIT HAMMADDELERİ SAN.VE TİC.A.Ş.	İSTİKLAL MAH. ÇEVRE SK. NO: 4 34904 tel:02126890481 fax:02126890159	Packaging Waste Recycling	31.03.2016
96	TEKNİK KAĞIT AMB.PLAS.TEK.SAN. VE TİC.LTD.ŞTİ	NAMIK KEMAL MAH. EKŞN CAD.NO: 1 tel:02124284850 fax:02124284853	Packaging Waste Recycling	16.09.2016
97	HURSAN GERİ DONUŞUM VE ÇEVRE TEKNOLOJİLERİ SAN.VE TİC. A.Ş.ZEYTİNBURNU ŞUBESİ	TOPKAPI MALTEPE MAH. LİTROS YOLU NO:17 ZEYTİNBURNU İSTANBUL tel:02125448685 fax:02125447257	Packaging Waste Recycling	19.12.2016
98	EREN KAĞIT SAN. ve TİC. AŞ.(TOPKAPI SB.)	MALTEPEMAH. GUMUŞSUYU CAD. NO:7/1 TOPKAPI/İSTANBUL tel:02124814991 fax:02124814987	Packaging Waste Recycling	10.01.2017
99	EREN KAĞIT SAN. ve TİC. AŞ. (MERKEZ TESİS)	MAHMUTBEYMERKEZMAH. TAŞOCAĞIYOLU NO:10 BAĞCILAR/İSTANBUL tel:02124463847 fax:02124463851	Packaging Waste Recycling	10.01.2017
100	TARHAN GERİ DONUŞUM CUMALİ TARHAN	RAMİ KIŞLA CAD. TOPÇULAR MAH. BAHÇEYOLU SOK. NU:3 tel:02125775701 fax:02125763251	Packaging Waste Recycling	16.01.2017
101	GHS ULUS.TAŞIMACILIKVETURİZİM DIŞ Tİ C.LTD.ŞTİ	MERKEZ MAH CEMAL ULUSOYCAD ŞEHİT YUNUS ÇAÇA SOK.NO:6/1 YENİBOSNA-BAHÇELİEVLER tel:02126979642 fax:02126976149	Packaging Waste Recycling	20.01.2017
102	OZ KARTALLAR İNŞAAT SANAYİ VE TİCARET LİMİTED ŞİRKETİ	ESENKENT MAH. ATATURK CAD. BATALALP SOK. NO:30 UMRANIYE İSTANBUL tel:02164660953 fax:02164660953	Packaging Waste Recycling	13.02.2017
103	EREN KAĞIT A.Ş. (ESKİŞEHİR)	OSB. 8.CAD.NO:29 ODUNPAZARI/ESKİŞEHİR tel:2124230004 fax:02222362303	Packaging Waste Recycling	15.02.2017
104	ÇAMLİBEL KAĞIT HURDACILIK NAKLİYAT S AN.VE TİC.LTD.ŞT	CEBECİ MAH. 2602 SOK NO:33 SULTANGAZİ-İST tel:02126689446 fax:02126686948	Packaging Waste Recycling	12.03.2017
105	ANDIÇ TEKSTİL GIDA TEMİZLİK TURİZM VE İNŞ.SAN.TİC.LTD.ŞTİ.	BEYCİLER KOYU GİRİŞİ HASAN AĞANIN SAPLIĞI MEVKİİ 13. PAFTA tel:02127453113 fax:02127453113	Non-hazardous Waste Recovery Packaging Waste Recycling	01.11.2017
106	EROĞLU SAC VE DEMİRSAN.TİC.LTD.ŞTİ.	ORHANLI BELDESİ ANADOLU MAH. KUZEY YAN YOL CAD. NO:06 TUZLA/İSTANBUL tel:02643042927 fax:02163040088	Packaging Waste Recycling	08.11.2017
107	ŞALLILAR KAĞIT AMBALAJ NAKLİYE İNŞAAT MADENCİLİK SAN.VE TİC. LTD. ŞTİ.	GULLUBAĞLAR M. HURRİYET C. 40 B PENDİK tel:02163079236 fax:02163079181	Packaging Waste Recycling	30.11.2017
108	İSTANBUL GERİ KAZANIM VE YAPI ENDÜSTRİLERİ LİMİTED ŞİRKETİ	KARAYOLLARI MAH. K.AKDOĞAN CAD.547/1 4C GAZİOSMANPAŞA tel:2124771727 fax:2124777659	Packaging Waste Recycling	14.12.2017
109	AKSU ÇEVRE DANIŞMANLIK VE GERİ DONUŞUM A.Ş.	YENİ MAHALLE, YAKACIK YOLU ATOLYELER SOKAK NO:7 (HABAŞ KARŞISI) KARTAL/İSTANBUL tel:02164738946 fax:02164738947	Packaging Waste Recycling	24.12.2017

No	Name of the Facility	Contact Details	License Subject	License Due Date
110	AZİM GERİ DONUŞUM SANAYİ VE DIŞ TİCARET LİMİTED ŞİRKETİ	EMEK MH ZİRVE SK 3 SANCAKTEPE tel:5323243361 fax:2124700380	Packaging Waste Recycling	01.01.2018
111	TOPCU KAĞIT ERİM TOPCU	FİRUZKOY M. ULKER C. 52 AVCILAR tel:2126903465 fax:2126904695	Packaging Waste Recycling	31.01.2018
112	ATLAS İNŞ. SAN. VE TİC. LTD. ŞTİ.	PAŞA MAH. PİYALEPAŞA BULVARI NO:76/1 FERİKOY/ŞİŞLİ/İSTANBUL tel:02122475290 fax:02122479922	Packaging Waste Recycling	16.04.2018
113	TAŞLAR KAĞIT İNŞAAT METAL PLASTİK URUNLERİ SANAYİ VE TİCARET LİMİTED ŞİRKETİ	ESENKENT MH. BARAJYOLU CD. ŞEHİT OSMAN ERGUR SK. NO:1 tel:02163130250 fax:02163130293	Packaging Waste Recycling	14.05.2018
114	BAYFA GERİ DONUŞUM TURİZM TAŞIMACILIK SAN.TİC.LTD.ŞTİ	MERKEZMAH. AYAZMA CAD. NO:1 KAĞITHANE/İSTANBUL tel:2122945286 fax:2122945286	Packaging Waste Recycling	18.06.2018
115	OZ SEKİZLER KAĞIT METAL PLASTİK NAKLIYE GERİ DONUŞUM SAN.TİC.LTD.ŞTİ.	AKÇABURGAZ MAH.95 SK.NO:7 ESENYURT/İSTANBUL tel:02128868637 fax:02128869970	Packaging Waste Recycling	06.09.2018
116	TAŞSAN TEMİZLİK MADEN SAN VE DIŞ TİC LTD ŞTİ	MERKEZ MAH. ATATURK CAD. NO:111 ALİBEYKOY-EYUP-İST tel:02126270101 fax:02126250649	Packaging Waste Recycling	01.10.2018
117	D TAŞLAR METAL KAĞIT PLASTİK İNŞAAT SANAYİ VE TİCARET LİMİTED ŞİRKETİ	FERHATPAŞA MAH. GAZİPAŞA CAD. 49 SOK. NO: 46A ATAŞEHİR tel:2166615976 fax:2166615978	Packaging Waste Recycling	22.12.2018
118	İSSAN KİMYA SAN TİC LTD ŞTİ	TUZLA KİMYACILAR ORGANİZE SANAYİ BOL.MELEK ARAS BULVAR ORGANİK CAD.NO: 32 TEPEOREN-TULZ-İSTANBUL tel:02165930024 fax:02165933346	Waste Mineral Oil Recycling	04.04.2016
119	ORUSAN KİMYA VE AKARYAKIT URUN. SAN. TİC. LTD. ŞTİ.	İSTANBUL TUZLA KİMYA SANAYİCİLERİ ORGANİZE SANAYİ BOLGESİ, MELEK ARAS BULVARI, ANALİTİK CADDESİ, N:86 tel:2165931773 fax:2165931774	Waste Mineral Oil Recycling	22.01.2018
120	KOLZA BİODİZEL A.Ş. BİTKİSEL ATIK YAĞ GERİKAZANIM TESİSİ	KİMYA SANAYİCİLERİ OSB AROMATİK CAD. NO: 31 TUZLA-İSTANBUL tel:02165332490 fax:02165932492	WasteVegetable Oil Recycling	09.05.2016
121	MAYSA YAĞ SANAYİ ANONİM ŞİRKETİ	Z.GOKALP M.E.TURGUT OZAL CADDESİ 14 B BAŞAKŞEHİR/İSTANBUL tel:02125492020 fax:02125492019	WasteVegetable Oil Recycling	17.04.2017
122	HURSAN PASLANMAZ ÇELİK GERİ DONUŞ TES.TİC. VE SAN. A.Ş	YENİBOSNA MERKEZ MH. CEMAL ULUSOY CAD. ŞEHİT YUNUS ÇAÇA SOKAK NO: 4 / 1 tel:2126969761 fax:2126969765	Scrap Metal Processing	08.02.2018
123	TAŞMETAL KİMYA SAN.VE TİC.LTD.ŞTİ.	ORG.SAN.BOLG.GALVANO TEKNİK SAN.SİT. A BL 11 KUÇUKÇEKMECE tel:02125496819 fax:02126715836	Hazardous Waste Recovery	30.03.2016
124	HASTURK GERİ DONUŞUM SANAYİ TİC. LTD. ŞTİ.	KIRAÇ MERKEZ MAH. MAREŞAL FEVZİ ÇAKMAK CAD. NO:42 ESENYURT tel:02126899105 fax:02126899106	Hazardous Waste Recovery Non-hazardous Waste Recovery	22.08.2016

No	Name of the Facility	Contact Details	License Subject	License Due Date
125	AYPE MEDİKAL VE GUMUŞ GERİ KAZANIM MAKİNALARI	İKİTELLİ OSB AYKOSAN SAN SİT 6.BLOKLAR C BLOK NO:15 BAŞAKŞEHİR-İST tel:2124150108 fax:02126577778	Hazardous Waste Recovery	06.03.2017
126	SEYHAN MEDİKAL VE GUMUŞ GERİKAZANIM SAN. TİC. LTD. ŞTİ.	İKİTELLİ OSB. AYKOSAN SAN. SİTESİ 6'LI BLOK E/105 tel:02125490618 fax:02126713785	Hazardous Waste Recovery	07.03.2017
127	KAHYAOĞULLARI HURDACILIK SAN. TİC. LTD. ŞTİ. İSTANBUL TUZLA ŞUBESİ	ORGANİZE DERİ SANAYİ BOLGESİ M1/1A TUZLA İSTANBUL tel:02163940525 fax:02163940528	Hazardous Waste Recovery	03.05.2017
128	KURTYILDIZ KİMYA SANAYİ-ORHAN KURTOĞLU	GALVANOTEKNİK SANAYİ SİTESİ TURGUT OZAL CAD. A BLOK NO: 83 ALT KAT İKİTELLİ-İSTANBUL tel:02126713069 fax:02126713068	Hazardous Waste Recovery	03.07.2017
129	GOZDE KİMYA MEDİKAL GUMUŞ GERİ DONUŞUM - EROL BUYUKGOZ	AYKOSAN SANAYİ SİTESİ E BLOK NO:70 BAŞAKŞEHİR tel:02126716740 fax:02126577778	Hazardous Waste Recovery Non-hazardous Waste Recovery	14.08.2017
130	ERTAŞ METAL SAN.VE TİC.A.Ş.	BAĞCILAR GÜNEŞLİ KOÇMAN C. 15 BAĞCILAR tel:02125504686 fax:02125504699	Hazardous Waste Recovery Non-hazardous Waste Recovery	09.10.2017
131	KESKİNLER ALUMİNYUM METAL MAKİNA VE ENDÜSTRİYEL URUNLERİ TİC. LTD. ŞTİ.	İKİTELLİ O.S.B. İSDOK SANAYİ SİTESİ 2.BLOK NO:26-28 tel:02124851005 fax:02124851005	Hazardous Waste Recovery	20.11.2017
132	NERGİS FOTOĞRAFÇILIK BANYO ATIKSUYU TOPLAMA VE İŞLEME-MUSTAFA KASAP	İKİTELLİ OSB SARAÇLAR SAN. SİTESİ 7.BLOK NO:501 tel:02126174355 fax:02126174340	Hazardous Waste Recovery Non-hazardous Waste Recovery	22.01.2018
133	NCG METAL VE PLASTİK AMBALAJ YENİLEME SAN VE TİC AŞ İSTANBUL ŞUBESİ	İSTANBUL DERİ ORGANİZE SANAYİ BOLGESİ YAN SANAYİ YB-41 PARSEL TUZLA/İSTANBUL tel:2165910627 fax:2165910628	Hazardous Waste Recovery	05.02.2018
134	BİLGİ METAL METALURJİ MAKİNA GIDA MADDELERİ İHRACAT VE İTHALAT SANAYİ TİCARET LİMİTED ŞİRKETİ	RAMAZANOĞLU MAH.SANAYİ CAD. NO: 44/1A-B-C-D-AG PENDİK/İSTANBUL tel:02165951488 fax:02165951489	Hazardous Waste Recovery	05.02.2018
135	YILDIZ METAL İTHALATİHRACAT SAN. VE TİC. LTD. ŞTİ.	RAMAZANOĞLU M. SANAYİ C. 13 PENDİK tel:02163781716 fax:02163787844	Hazardous Waste Recovery Non-hazardous Waste Recovery	08.02.2018
136	EGEMEN KİMYA ENDÜSTRİYEL MALZEMELER SANAYİ VE TİCARET LİMİTED ŞİRKETİ	İKİTELLİ ORGANİZE SANAYİ BOLGESİ İSDOK SANAYİ SİTESİ 2.BLOK NO:25 tel:02124853474 fax:02124853468	Hazardous Waste Recovery Non-hazardous Waste Recovery	01.03.2018
137	BİLGİ GERİ DONUŞUM VE LOJİSTİK SANAYİ DİŞ TİCARET LİMİTED ŞİRKETİ	RAMAZANOĞLU MH. MUHACİR SK. NO:7 PENDİK tel:2165951488 fax:2165951489	Hazardous Waste Recovery	09.07.2018

No	Name of the Facility	Contact Details	License Subject	License Due Date
138	METAL-KİM METALURJİ VE KİMYA TARIM S AN.TİC.LTD.ŞTİ.	VELİBABA M. SANAYİ C.DOLAYOBA 34 1 PENDİK tel:02163070102 fax:02163070104	Hazardous Waste Recovery	07.08.2018
139	REMLE KİMYA MATBAACILIK TURİZM İNŞAAT SANAYİ VE TİCARET LİMİTED ŞİRKETİ	İKİTELLİ ORGANİZE SANAYİBOLGESİAYKOSANSANAYİSİTESİ D BLOK NO:76 BAŞAKŞEHİR/İSTANBUL tel:05072167378 fax:05072167378	Hazardous Waste Recovery Non-hazardous Waste Recovery	21.10.2018
140	PİREKS BAKIR ALAŞIMLARI SANAYİ VE Tİ C.A.Ş.	OMERLİ MAH. MURATHAN SOK. NO:3 tel:2127982246 fax:2127982193	Hazardous Waste Recovery Non-hazardous Waste Recovery	25.11.2018
141	DEDEOĞLU HURDA NAK.VE KİMYASALLARI TİC. LTD. ŞTİ.	EVREN OTO SAN KARŞISI HURDACILAR MEVKİİ NO 18 tel:02128869641 fax:02128869641	Hazardous Waste Recovery	25.12.2018
142	İPEK GERİ DONUŞUM PLASTİK SAN. VE TİC. LTD. ŞTİ.	VATAN MAH. ESENLER CAD. BARUT SOK. NO:15-17 tel:02126124265 fax:02125768787	Non-hazardous Waste Recovery	06.07.2016
143	ZUMRUT SUNİ DERİ SAN VE TİC LTD ŞTİ	CİHANGİR MAHALLESİ GUVERCİN CADDESİ NO:9 AVCILAR İSTANBUL tel:02124228986 fax:02124228985	Non-hazardous Waste Recovery	28.09.2016
144	MAVİ MADEN URUNLERİİÇ VE DIŞ TİCARE T SAN LTD ŞTİ	SANAYİ MAH İSİSO SAN SİT 15 YOL U-1 BLOK NO:3 tel:02126232741 fax:02126232726	Non-hazardous Waste Recovery	24.10.2016
145	MUTLU METAL VE KİMYA SAN.VE TİC.LTD.ŞTİ.	BOYA VE VERNİK ORG.SAN.BOL.TEM YANYOLU 1.CD.1.SK.NO.5 TUZLA İSTANBUL tel:2165931157 fax:2165931159	Non-hazardous Waste Recovery	10.11.2016
146	POLİMET KİMYA VE TARIM URUN.SAN.VE T İC.LTD.ŞTİ.	TUZLA ORGANİZE SANAYİ BOLGESİ (İTOSB) 238Eİ4C PAFTA 6510 ADA 6 PARSEL TUZLA/İSTANBUL tel:2165932014 fax:2165932016	Non-hazardous Waste Recovery	07.02.2017
147	KARABULUT DIŞ TİCARET LTD.ŞTİ.	ORTAKOY MAH. SANAYİ MAH. TUNALI SABRİ CAD. NO:5 tel:02127343754 fax:02127343762	Non-hazardous Waste Recovery	02.04.2017
148	ONER TEKSTİL SANAYİDİŞ TİCARET LTD. ŞTİ.	KADIKOY YOLU UZERİ USTUN SOKAK NO: 20 GAZİTEPE KOYU tel:02127388282 fax:02127388115	Non-hazardous Waste Recovery	11.04.2017
149	GOZ PLASTİK TEKSTİL İNŞAAT SAN. VE DIŞ TİC. LTD. ŞTİ.	VATAN MAH. ELMAS SOK. İLTER İŞHANI NO:7 BODRUM KAT tel:02125445430 fax:02125674226	Non-hazardous Waste Recovery	24.04.2017
150	DAYI PLASTİK SANAYİVE TİCARET LİMİTED ŞİRKETİ	HASTANE MAH. UĞURMUMCU CAD. 221 SK. DEVAMI HADIMKOY ÇATALCA tel:02127711345 fax:02127714961	Non-hazardous Waste Recovery	06.07.2017
151	MERT PLASTİK YAŞAR KUÇUK	VATAN MAH. ENDER SK. NO:6-7 tel:02125448941 fax:02125671409	Non-hazardous Waste Recovery	30.07.2017
152	ARMASAN VAKUM AMBALAJ SAN.VE TİC.LTD ŞTİ.	KIRAÇ NAMI KEMAL MH ATATURK CAD. 16 YO ESENYURT tel:02126899162 fax:02126899167	Non-hazardous Waste Recovery	14.08.2017
153	AKUMSAN PLASTİK URUNLER SAN.VE TİC.A .Ş.	KIRAÇ BELDESİ ATATURK C 19 BUYUKÇEKMECE tel:02126224400 fax:02126897041	Non-hazardous Waste Recovery	06.09.2017
154	ÇAMOLUK PLASTİK KARABULUT ENVER HUSEYİN	VATAN MAH. EMEL SOK NO:1 BAYRAMPAŞA tel:2126745816 fax:2126745816	Non-hazardous Waste Recovery	17.09.2017

No	Name of the Facility	Contact Details	License Subject	License Due Date
155	KABLOSAN PLASTİK METAL SAN. VE DIŞ TİC. LTD. ŞTİ.	DOĞAN ARASLI CAD.FATİH SANAYİ SİTESİ C 10 BLOK NO:30 ESENYURT/İSTANBUL tel:02124236660 fax:02124236660	Non-hazardous Waste Recovery	07.11.2017
156	SAÇLIOĞULLARI TEKSTİL SAN. VE TİC. LTD. ŞTİ.	UĞUR MUMCU MH. 2345 SK. NO:9-11 tel:02126193104 fax:02126680896	Non-hazardous Waste Recovery	16.11.2017
157	OZ-KA VAKUM PLASTİKAMB VE MAK KALIP SAN TİC LTD ŞTİ	İKİTELLİ ORG SAN BOL ÇEVRE SAN SİT 9.BLOK NO:23-25-27 K.ÇEKMECE İKİTELLİ/İST tel:4859611 fax:02124859614	Non-hazardous Waste Recovery	19.12.2017
158	YERÇİZEN TERLİK SAN.VE TİC.LTD.ŞTİ.	BOĞAZKOY İSTİKLAL MAH. İSMET İNONU CAD. NO:38 tel:2126850011 fax:2126850070	Non-hazardous Waste Recovery	02.01.2018
159	OZLEM RAMAT VE KUYUMCULUK-MEHMET KIVRAK	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 2.BLOK NO:16 tel:02124853882 fax:02124851128	Non-hazardous Waste Recovery	18.02.2018
160	FAB PLASTİK VE KİMYA TİC LTD ŞTİ	ORHANLI ORTİM SAN SİTESİ K BLOK No:1 2 3 4 5 6 tel:2163040600 fax:2163040601	Non-hazardous Waste Recovery	10.04.2018
161	DOĞAÇ PLASTİK ALUMİNYUN GERİ DONUŞUM SANAYİ TİCARET LİMİTED ŞİRKETİ	SELİMPAŞA KAVAKLI YOLU UZERİ 1.KM. 44 1 SİLİVRİ tel:02127312266 fax:02126070871	Non-hazardous Waste Recovery	12.04.2018
162	KAYA METAL SADETTİN KAYA	İKİTELLİ O.S.B. BAĞCILAR GUNGOREN SAN. SİT. 11. BLOK NO:46-48-50 tel:02125491259 fax:02125491260	Non-hazardous Waste Recovery	24.04.2018
163	GUÇLU KAUCUK GERİ DONUŞUM İMALAT VE SANAYİ AHMET CAN GUÇLU	SAMANDIRA YOLU CAD. NO:11 tel:02163118380 fax:02163118381	Non-hazardous Waste Recovery	25.04.2018
164	ALİ EROĞLU EROĞLU Plastikve Metal San.İkitelli İstanbul Şb.	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ATATURK SANAYİ SİTESİ 20 SK. NO: 580 BAŞAKŞEHİR / İSTANBUL tel:02124855516 fax:02124855520	Non-hazardous Waste Recovery	29.05.2018
165	BETE BE MOZAİK VE SERAMİK SAN.A.Ş.	DAVUTPAŞA CAD. CEBEALIBEY SOK. NO:11 TOPKAPI ZEYTİNBURNU/İSTANBUL tel: 0212 449 00 00 fax:02124490010	Non-hazardous Waste Recovery	09.07.2018
166	GUNEŞ RAMAT-ZEKİ GUNEŞ	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 4.BLOK NO:13 tel:02124857306 fax:02124857307	Non-hazardous Waste Recovery	09.07.2018
167	TEZ KUYUMCULUK SAN TİC. LTD. ŞTİ.	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SAN SİTESİ 4. BLOK NO:9-11 tel:2124851633 fax:2124851633	Non-hazardous Waste Recovery	10.07.2018
168	İKİLER PLASTİK PROFİL SAN. VE TİC. LTD. ŞTİ.	MALTEPE MAH. LİTROS AYVALIDERE SOK. NO:7/B tel:02124823860 fax:02124813118	Non-hazardous Waste Recovery	12.07.2018
169	AK METAL PLASTİK SAN. VE TİC. LTD. ŞTİ	ORG.SAN.BOLG. İSDOK SAN. SİT.5.BLK 18 KUÇUKÇEKMECE tel:02124852637 fax:02124852637	Non-hazardous Waste Recovery	25.07.2018
170	KALE KAYIŞLARI SANAYİ DIŞ TİCARET LİMİTED ŞİRKETİ	ÇANTA BELDESİ FATİH M.BUYUK SANAYİ C. 9 . SİLİVRİ tel:02127465767 fax:02127465880	Non-hazardous Waste Recovery	25.07.2018

No	Name of the Facility	Contact Details	License Subject	License Due Date
171	AYARCI AYAREVİ VE RAMATEVİ KUYUMCULUK-METİN ALBORA	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 2. BLOK NO:18 tel:02124854726 fax:02125141206	Non-hazardous Waste Recovery	02.08.2018
172	ULUGOL DEĞERLİ MADENLER SANAYİ VE TİCARET LTD. ŞTİ.	İKİTELLİ ORGANİZE SANAYİ BOLGESİ ÇEVRE SANAYİ SİTESİ 4. BLOK NO:21-23 tel:02124862234 fax:02124855694	Non-hazardous Waste Recovery	02.08.2018
173	TİSAN MUHENDİSLİK PLAS.SAN.VE TİC.LTD.ŞTİ.	EKŞİOĞLU MH. YAVUZ SELİM C.86.SOK 4 UMRANIYE tel:2164293665 fax:02163121478	Non-hazardous Waste Recovery	23.08.2018
174	AKYUZ İNOVASYON VE GERİ DONUŞUM TEKNOLOJİLERİ SANAYİ VE TİCARET A.Ş.	AKÇABURGAZ MAH. 4.CAD.ÇAKMAKLI 12 ESENYURT tel:2128861366 fax:2125491511	Non-hazardous Waste Recovery	05.09.2018
175	HAZAR TEKSTİL SANAYİ VE TİCARET A.Ş.	ORTAKOY M SANAYİ BULVARI 011 001 SİLİVRİ tel:02127343720 fax:02127343716	Non-hazardous Waste Recovery	26.10.2018
176	SARI METAL RAMAZAN TURGUT	İKİTELLİ ORGANİZE SANAYİ BOLGESİ İSDOK. SANAYİ SİTESİ 5.BLOK NO:9 tel:2124852629 fax:2124857561	Non-hazardous Waste Recovery	28.10.2018
177	AZİZ METAL GERİ DONUŞUM SANAYİ VE TİCARET LTD.	İOSB ATATURK OTO SAN SİT 1.SOKAK 9 BAŞAKŞEHİR tel:2124852023 fax:2124852016	Non-hazardous Waste Recovery	25.11.2018
178	ÇEVREM İTHALAT İHRACAT MAKİNA GERİ DONUŞUM SANAYİ VE TİCARET LİMİTED ŞİRKETİ	KAYABAŞI KOYU KUYULAR MEVKİİ 1 KUÇUKÇEKMECE tel:2126911066 fax:2126911791	Non-hazardous Waste Recovery	16.12.2018

Source: Ministry of Environment and Urban Planning Website

## 8.4 Waste Generation and Management during the Construction Phase

Waste management operations such as collection, storage, transport and disposal practices during the construction and operation phases of the Project are required to be in full compliance with the Turkish regulatory framework. The Turkish regulations that govern the wastes that will be generated during construction and operation of the Project are as follows:

- Regulation on General Principles of Waste Management (Official Gazette (OG) Date/Number: 05.07.2008/26927)
- Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)
- Solid Waste Control Regulation (OG Date/Number: 14.03.1991/20814)
- Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)
- Packaging Waste Control Regulation (OG Date/Number: 24.07.2007/26562)
- Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)
- Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)
- Regulation on Control of Excavated Soil, Construction and Demolition Wastes (OG Date/Number: 18.03.2004/25406)
- Regulation on Control of Waste Vegetable Oils (OG Date/Number: 19.04.2005/25791)
- Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)
- Regulation on Environmental Permits and Licenses (OG Date/Number: 29.04.2009/27214)
- Communiqué on Road Transportation of Wastes (OG Date/Number: 18.01.2013/28532)
- Regulation on Control of Waste Electrical and Electronic Equipment (OG Date/Number: 22.05.2012/28300)
- Communiqué on Recycling of Certain Non-hazardous Waste (OG Date/Number: 17.06.2011/27967)
- Wastewater Discharge to Sewerage System Regulation (ISKI)

In addition to the Turkish regulations, waste management practices for the Project will also need to abide with the following IFC Guidelines:

- IFC General Environmental, Health, and Safety Guidelines
- IFC Environmental, Health, and Safety Guidelines for Health Care Facilities

The Turkish regulatory framework requirements and the conditions set in the IFC guidance documents provide inherent mitigation measures against the potential impacts resulting from waste generation. These conditions were reviewed and discussed in Section 8.7.

The types of wastes that will be generated during construction phase include domestic waste/wastewater, packaging waste, medical waste, hazardous waste, special waste, excavation waste, and non-hazardous waste. The list of these wastes, proposed management practices and relevant information are given in Table 8-5.

**Domestic Waste and Domestic Wastewater:** Domestic waste will be collected in waste containers and will be collected by the Municipality garbage trucks. Size and the numbers of the containers as well as the locations of the containers should be considered for proper and effective waste collection on-site during construction activities.

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Domestic wastewater will be collected in septic tank during construction phase of the Project. The septic tank will be emptied by vacuum trucks periodically and the wastewater will be sent to the nearest ISKI domestic wastewater treatment plant. Permission for septic tank construction and operation will need to be obtained prior to implementation.

**Packaging Waste:** Packaging waste such as paper and cardboard, metal, plastic and glass materials will be separately collected in dedicated waste bins. The bins will be located at certain points of site and periodically collected by the Municipality authorized packaging waste recycling company. Accordingly, the packaging waste materials will be recycled and recovered.

**Medical Wastes:** Medical waste will be generated at trace amount during construction phase according to the minor cuts and first aid activities from the polyclinic on-site.

**Hazardous Wastes:** Hazardous waste will include contaminated/oily fabrics and filters, contaminated packaging material, paint residue, used chemicals, waste mineral oils etc. The hazardous waste will be separately collected on the dedicated containers on-site and will be stored at dedicated area which will have concrete bases. All hazardous waste containers will be labeled with the waste codes and the waste types. Hazardous wastes will be sent to the licensed hazardous waste recycling and/or disposal facilities according to their waste types and the facility license type.

**Special Wastes:** Each special waste will be managed according to the relevant Regulation such as:

- Waste Mineral Oils will be collected in red colored metal drums and will be delivered to the licensed facilities. Waste vehicle oils will be delivered to PETDER.
- Waste Vegetable Oils will be collected by the licensed waste vegetable oil recycling facility. The necessary containers are provided by the facilities.
- Waste batteries will be separately collected in battery box. The box will be collected by TAP or Surat Kargo (the authorized waste battery collector for TAP) to recycle at the licensed recycling facility.
- Waste accumulators will be delivered to the supplier. No need to store the waste accumulators on-site.

**Excavation Wastes:** It is anticipated that approximately 5,000,000 m<sup>3</sup> of excavated material will be generated and 1,500,000 m<sup>3</sup> will be used as cut and fill material during construction. Remainder of these will require off-site disposal and these materials. Excavation wastes will be transported to the former mining area located approximately 500 m distance to the north border of the Project area as part of the former quarry rehabilitation. This practice is already on going by bringing excavation waste from other parts of the region. Excavation materials will be transported to that site by 25 m<sup>3</sup> capacity trucks. The trucks will work for a total of 14 hours per day between 08:00-18:00 and 22:00-06:00 (as reported by IHIC, the truck transportation is permitted by the Municipality only between these hours).



Figure 8-9: Former Mining Site and Excavation Waste Storage

**Non-hazardous Wastes:** Non-contaminated scrap materials such as metal, wood and plastic from materials delivery, maintenance works etc. during construction phase will be sent to the licensed non-hazardous waste recycling facilities according to their types.

Table 8-5: Waste Types and Proposed Management Practices during Construction Phase of the Project

Waste Class	Waste Type	Waste Code	Governing Regulation	Summary of Storage and treatment prior to disposal options / notes	Waste Transporter / Waste Management Facility	Risks
DOMESTIC WASTE	Solid Wastes: Food waste, general solid waste, toilet papers etc. <i>Source:</i> Accommodation and restaurant	20 03 01	Solid Waste Control Regulation (OG Date/Number: 14.03.1991/20814)	Impermeable and sealed waste containers on-site. (400 lt or 800 lt)	Municipality trucks/ ISTAC Class II Landfill in Kemerburgaz	Low Risk. Facility already in use and has adequate capacity to receive waste.
	Domestic Wastewater <i>Source:</i> Camp activities	20 03 01	Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)	Collection in septic tank and periodically discharge.	n/a ISKI WWTP	Low Risk. Number of workers represent a small increase in the wastewater being generated in the region and for treatment at the WWTP
PACKAGING WASTE	Metal, Glass, Plastic packaging waste <i>Source:</i> packaging of products brought to the site that will include certain plastic, glass and metal.	15 01 04 (metal)	Packaging Waste Control Regulation (24.07.2007/26562)	Impermeable and sealed waste containers	Licensed Packaging Waste Recycling Company	Low Risk. Facilities already in use and has adequate capacity to receive waste
		15 01 07 (glass)				
		15 01 02 (plastic)				
HAZARDOUS WASTE	Chemicals <i>Source:</i> Maintenance and repair		Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	Hazardous wastes will be segregated and stored based on the waste code. Wastes shall be temporarily stored on a designated area and labeled with special signs. These areas will be covered and sealed area separate from other types of waste generated on the Site for a maximum period of six months. The areas will have an impermeable surface and will be designed to contain any spillages or leakage of hazardous wastes.	Licensed hazardous waste transportation company / Licensed waste recycling and disposal facilities	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	Contaminated filters, fabrics <i>Source:</i> Maintenance and repair	15 02 02*				
	Contaminated packaging <i>Source:</i> Maintenance and repair	15 01 10*				
	Contaminated soil <i>Source:</i> Leveling and excavation works	17 05 03*				

Waste Class	Waste Type	Waste Code	Governing Regulation	Summary of Storage and treatment prior to disposal options / notes	Waste Transporter / Waste Management Facility	Risks
SPECIAL WASTE	Waste Mineral Oils <i>Source:</i> Maintenance and repair activities of construction equipment	13 01 ... 13 02 ...	Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)	Waste oils will be collected in red-colored metal drums with "Waste Oil" label. Storage up to 90 days on-site. Recycling of 1st category waste mineral oils; Energy recovery as fuel supplement in cement kilns of 2 <sup>nd</sup> category waste oils; disposal in incineration plants of 3 <sup>rd</sup> category waste oils.	Licensed Transporter / Licensed waste oil recycling facilities, Cement kilns, Incineration Plants	Low Risk. Waste oil collection, transport and disposal recycling are common practice that are well regulated by MEUP.
	Waste Batteries <i>Source:</i> Maintenance and repair activities of construction equipment	20 01 33*	Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)	Separately collect in battery box.	TAP / SuratKargo / Send to TAP for further recycling in licensed facility	Low Risk since this is an established practice and the waste batteries and accumulators will not represent a large increase in the existing waste stream.
	Waste Accumulators <i>Source:</i> Maintenance and repair activities of construction equipment	16 06 01*		Separately store in hazardous waste storage area up to 90 days on-site. Treatment: Recycling of the plastic, lead and acid solutions.	Licensed Transporter / Give back to the supplier / Licensed Recycling Facility	
	Waste Vegetable Oils <i>Source:</i> Food processing	20 01 25	Regulation on Control of Waste Vegetable Oils (OG Date/Number: 19.04.2005/25791)	Collect in dedicated plastic drums provided from the licensed recycler.	Licensed Recycling Company / Licensed Recycling Facility	Low Risk. Recycling companies has an effective collection and processing system.
EXCAVATION WASTE	Natural soil  <i>Source:</i> Levelling and excavation for foundations	17 05 04	Regulation on Control of Excavated Soil, Construction and Demolition Wastes (OG Date/Number: 18.03.2004/25406)	Temporary piling on ground within construction site with care against dust generation and surface runoff.	Former mining area at the north of the project site which is approved by Municipality.	High Risk. Excavated volume is large and there may not be a suitable area to dispose of the material
MEDICAL WASTE	Infectious waste, Sharps waste <i>Source:</i> Generated from infirmary during construction activities	18 01 01* 18 01 03* 18 02 01* 18 02 02*	Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)	Stored in medical waste bags.		Low Risk since the medical waste generation amounts are negligible during construction phase
NON-HAZARDOUS WASTE	Metal Scrap	20 01 40	Communiqué on Recycling of Certain Non-hazardous Waste (OG Date/Number: 17.06.2011/27967)	Stored in dedicated impermeable base area	Licensed non-hazardous waste recycling facility	Low Risk. Recycling is a common practice at the Licensed facilities.
	Wood scrap	17 02 01				
	Plastic scrap	17 02 03				

## 8.5 Waste Generation and Management during the Operation Phase

The waste categories that will be generated during the operation phase include domestic waste/wastewater, packaging waste, medical waste, radioactive waste, hazardous waste, special waste, excavation waste, and non-hazardous waste. Waste types and the waste classes, expected amounts of waste to be generated, relevant waste codes and potential disposal locations have been assessed in this section. Focus has been given to the healthcare waste (including medical waste, some types of hazardous wastes and other types of waste such as radioactive waste).

In order to identify the amount of healthcare waste to be generated during the operation of the IHC, a literature survey was conducted to determine waste generation ratios per bed in Turkey. Daily amount of medical waste per bed in Istanbul and the medical waste generation in Turkey presented in Table 8-6 and Table 8-7 respectively. The medical waste amount during operation phase was calculated based on the private hospital medical waste generation rate in Table 8-6. The literature survey results showed that there are many factors that have an impact on the daily medical waste amount per bed including the economical structure of the provinces, technical infrastructure of medical institutions, bed occupancy rates, hospital's field of activity and bed capacities of the private branch hospitals leading to different amount of wastes among various provinces.

Table 8-6: Medical Waste Generation Rates in Istanbul Hospitals (kg/day/bed)

Hospital Type	Rates, 2007
University Hospital	0.58
Private Hospital	1.85
State Hospital	0.67

Source: Yurtseven *et al.*, 2010.

Table 8-7: Medical Waste Generation in Turkey (kg/day/bed)

Medical waste amount	kg/bed-day
Turkey average (Demiret <i>et al.</i> , 2002)	0.66
Istanbul (Birpınar, 2008)	0.63
Edirne (Uysal and Tinmaz, 2004)	0.28
Kırklareli (Uysal and Tinmaz, 2004)	0.49
Tekirdağ (Uysal and Tinmaz, 2004)	0.82
Konya (Evirgen, 2007)	1.08
Bursa (Varıncaet <i>et al.</i> , 2009)	1.15

Source: Ege and Budak, 2012

In accordance with the IFC EHS Guidelines for Health Care Facilities, the health care wastes are categorized into infectious wastes (including pathological waste), sharps, pharmaceutical waste, genotoxic/ cytotoxic waste, chemical waste, radioactive waste, waste with high content of heavy metals, pressurized containers and general health care waste. Each of these classifications has a separate waste code and suitable disposal method in accordance with the Turkish regulations. Based on the above mentioned information and the information on the distribution percentages of different types of medical waste obtained from World Health Organization, 1999, medical waste and domestic waste generation during IHC operation have been estimated as provided in Table 8-8.

Table 8-8: IHC Project Waste Generation Rates

Waste type	Waste amount per bed (kg/bed/day)	%***	Waste Amount (kg/day)
Medical waste	<b>1.85*</b>	<b>100</b>	<b>4,961</b>
- infectious		37.5	1,860
- pathologic		37.5	1,860
- pharmaceutical		5	248
- sharps		5	248
- Genotoxic/ cytotoxic waste		2	99
- chemical waste		10	496
- high levels of metal content		2	99
- pressurized containers		1	44.5
Domestic Waste	<b>2.35**</b>	<b>100</b>	<b>6,302</b>
- Non-recyclable		95	5,986
- Metal (recyclable)		2.5	158
- Plastics (recyclable)		2.5	158

\*the average value is provided from Table 8.6.

\*\*Literature

\*\*\* Rates are provided from WHO, 1999.

Table 8-9 (developed based on the information provided in IFC EHS Guidelines for Health Care Waste) provides guidelines for the wastes anticipated to be generated during the IHC operation phase. The classification was based on the waste codes, best practice disposal methods as defined in the mentioned IFC guideline and the likely disposal method that will be used for the Project.

Table 8-9: Wastes Anticipated Generation during the Operation of the Istanbul İkitelli IHC Project and the Management Options

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
MEDICAL WASTE	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.	18 01 03* 18 02 02*	Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)	<b>Waste Segregation Strategy:</b> Yellow or red colored bag / container, marked "infectious" with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved. <b>Treatment:</b> Chemical disinfection; Wet thermal treatment; Microwave irradiation; Safe burial on hospital premises; Sanitary landfill; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) Highly infectious waste, such as cultures from lab work, should be sterilized using wet thermal treatment, such as autoclaving.	1860 kg/day	Istanbul Metropolitan Municipality with NWTF (National Waste Transportation Form) / ISTAC Medical Waste Incineration Unit (ISTAC Sterilization Unit-planning phase)	Low Risk. Medical waste management is common practice that is well regulated by the MoEU and the Istanbul Metropolitan Municipality.
	Pathologic waste: 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.	18 01 02*		Anatomical waste should be treated using Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator).	1860 kg/day		
	Sharps: Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	18 01 01* 18 02 01*		<b>Waste Segregation Strategy:</b> Yellow or red color 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 labeled "infectious waste". <b>Treatment:</b> Chemical disinfection; Wet thermal treatment; Microwave irradiation; Encapsulation; Safe burial on hospital premises; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) - Following incineration, residues should be landfilled. -Sharps disinfected with chlorinated solutions should not be incinerated due to risk of generating POPs. -Needles and syringes should undergo mechanical mutilation (e.g. milling or crushing) prior to wet thermal treatment	248 kg/day		

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
HAZARDOUS WASTE	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.).	18 01 06*	Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	Waste Segregation Strategy: Brown bag / container. Leak-proof plastic bag or container. Treatment: Sanitary landfill; Encapsulation; Discharge to sewer; Return expired drugs to supplier; Incineration (Rotary kiln; pyrolytic incinerator); Safe burial on hospital premises as a last resort. <b>Small quantities:</b> Landfill disposal acceptable, however cytotoxic and narcotic drugs should not be landfilled. Discharge to sewer only for mild, liquid pharmaceuticals, not antibiotics or cytotoxic drugs, and into a large water flow. Incineration acceptable in pyrolytic or rotary kiln incinerators, provided pharmaceuticals do not exceed one percent of total waste to avoid hazardous air emissions. Intravenous fluids (e.g. salts, amino acids) should be landfilled or discharged to sewer. Ampoules should be crushed and disposed of with sharps. <b>Large quantities:</b> Incineration at temperatures exceeding 1200 °C. Encapsulation in metal drums. Landfilling not recommended unless encapsulated in metal drums and groundwater contamination risk is minimal	248 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	<b>Genotoxic / cytotoxic waste:</b> Genotoxic waste may have mutagenic, teratogenic, or carcinogenic properties, and typically arises from the feces, urine, and vomit of patients receiving cytostatic drugs, and from treatment with chemicals and radioactive materials. Cytotoxic drugs are commonly used in oncology and radiology departments as part of cancer treatments.	18 01 08*		<b>Waste Segregation Strategy:</b> See above for "infectious waste". Cytotoxic waste should be labeled "Cytotoxic waste". Treatment: Return expired drugs to supplier; Chemical degradation; Encapsulation; Inertization; Incineration (Rotary kiln, pyrolytic incinerator); - Cytotoxic waste should not be landfilled or discharged to sewer systems. - Incineration is preferred disposal option. Waste should be returned to supplier where incineration is not an option. Incineration should be undertaken at specific temperatures and time specifications for particular drugs. Most municipal or single chamber incinerators are not adequate for cytotoxic waste disposal. Open burning of waste is not acceptable. - Chemical degradation may be used for certain cytotoxic drugs - Encapsulation and inertization should be a last resort waste disposal option.	99 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
	<b>Chemical waste:</b> Waste may be hazardous depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Chemical waste may be in solid, liquid, or gaseous form and is generated through use of chemicals during diagnostic / experimental work, cleaning, housekeeping, and disinfection. Chemicals typically include formaldehyde, photographic chemicals, halogenated and non-halogenated solvents, organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).	18 01 06*		<b>Waste Segregation Strategy:</b> Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects.- Facilities should have permits for disposal of general chemical waste (e.g. sugars, amino acids, salts) to sewer systems.- Small hazardous quantities: Pyrolytic incineration, encapsulation, or landfilling.- Large hazardous quantities: Transported to appropriate facilities for disposal, or returned to the original supplier using shipping arrangements that abide by the Basel Convention. Large quantities of chemical waste should not be encapsulated or landfilled.	496 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	<b>Waste with high content of heavy metals:</b> Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).			<b>Waste Segregation Strategy:</b> Waste containing heavy metals should be separated from general health care waste. Treatment: Safe storage site designed for final disposal of hazardous waste. - Waste should not be burned, incinerated, or landfilled. Transport to specialized facilities for metal recovery.	99 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant or Licensed Hazardous waste Recycling Facility	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	<b>Pressurized containers:</b> Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.			<b>Waste Segregation Strategy:</b> Pressurized containers should be separated from general health care waste. Treatment: Recycling and reuse; Crushing followed by landfill - Incineration is not an option due to explosion risks - Halogenated agents in liquid form should be disposed of as chemical waste, as above.	44,5 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant or Licensed Hazardous waste Recycling Facility	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	Fluorescent Lamp	20 01 21*		<b>Waste Segregation Strategy:</b> Separately collect in cardboard boxes to avoid being broken. Disposal: Crushing in dedicated drums		Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS SUREKO	Low Risk. Hazardous waste collection, transport and

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
	Contaminated packaging	15 01 10*		<b>Waste Segregation Strategy:</b> Separately collect in containers. Disposal: RDF production or disposal		Licensed Hazardous Waste Transporter with NWTF/ Licensed Hazardous waste Recycling/disposal Facility	disposal are common practice that is well regulated by MEUP.
RADIOACTIVE WASTE	<b>Radioactive waste:</b> Includes solid, liquid, and gaseous materials that have been contaminated with radionuclides. Radioactive waste originates from activities such as organ imaging, tumor localization, radiotherapy, and research / clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.		TAEK	<b>Waste Segregation Strategy:</b> Lead box, labeled with the radioactive symbol. Treatment: Radioactive waste should be managed according to national requirements and current guidelines from the International Atomic Energy Agency (IAEA (2003), Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research. IAEA Draft Safety Guide DS 160, 7 February 2003).		Inform TAEK immediately	High Risk.
SPECIAL WASTE	Waste mineral oils	13 01 ..* 13 02 ..*	Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)	<b>Waste Segregation Strategy:</b> Red-colored metal drums with "Waste Oil" label. Recycling of 1st category waste mineral oils; Energy recovery as fuel supplement in cement kilns of 2 <sup>nd</sup> category waste oils; disposal in incineration plants of 3 <sup>rd</sup> category waste oils.		Licensed Waste Oil Transporter with NWTF / İssanKimya San Tic Ltd Şti. or OrusanKimyaVeAkaryakitU run. San. Tic. Ltd. Şti.	Low Risk. Special waste collection, transport and recycling /disposal are common practice that is well regulated by MEUP and by the related licensed facilities.
	Waste vegetable oils	20 01 25	Regulation on Control of Waste Vegetable Oils (OG Date/Number: 19.04.2005/25791)	<b>Waste Segregation Strategy:</b> Collect in plastic drums Treatment: Recycling to produce biodiesel fuel.		Kolza Biodizel MaysaYağ	
	Waste accumulators	16 06 01*	Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)	<b>Waste Segregation Strategy:</b> Separately store in hazardous waste storage area up to 90 days on-site. Treatment: Recycling of the plastic, lead and acid solutions.		Licensed Waste Transporter / Give waste accumulators back to the supplier.	
	Waste batteries	20 01 33*		<b>Waste Segregation Strategy:</b> Separately collect in battery box. Treatment: Recycling		Licensed Waste Transporter / Give the waste batteries to TAP.	

Waste Class	Type of waste	Waste Code	Governing Regulation	Summary of storage treatment and disposal options / notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
DOMESTIC WASTE	General health care waste (including food waste)	20 03 01	Solid Waste Control Regulation (OG Date/Number: 14.03.1991/20814)	<b>Waste Segregation Strategy:</b> Black bag / container. Halogenated plastics such as PVC should be separated from general health care facility waste to avoid disposal through incineration and associated hazardous air emissions from exhaust gases (e.g. hydrochloric acids and dioxins). Treatment: Disposal as part of domestic waste. Food waste should be segregated and composted. Component wastes (e.g. paper, cardboard, recyclable plastics [PET, PE, PP], glass) should be segregated and sent for recycling.	5986 kg/day	Istanbul Metropolitan Municipality / ISTAC Class II Landfill Facility	Low Risk. Facility already in use and has adequate capacity to receive waste.
	Domestic wastewater	20 03 01	Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)	Direct discharge into the nearby municipal wastewater collection line via permitted collection to the infrastructure. <b>Should be separately collected, should not be mixed with medical wastewater.</b>		n/a ISKI WWTP	Low Risk. Facility already in use and has adequate capacity to receive waste.
PACKAGING WASTE	Metal, Glass, Plastic packaging waste  <i>Source:</i> Generated from packaging of products brought to the site that will include certain plastic, glass and metal.	15 01 04 (metal)	Packaging Waste Control Regulation (24.07.2007/26562)	Impermeable and sealed waste containers	474 kg/day	Licensed Packaging Waste Recycling Company/ Licensed Packaging Waste Recycling Company	Low Risk. Facilities already in use and has adequate capacity to receive waste
		15 01 07 (glass)					
		15 01 02 (plastic)					
NON-HAZARDOUS WASTE	Metal Scrap	20 01 40	Communiqué on Recycling of Certain Non-hazardous Waste (OG Date/Number: 17.06.2011/27967)	Stored in dedicated impermeable base area		Licensed Non-hazardous waste recycling company / Licensed recycling facility	Low Risk. Non-hazardous waste collection, transport and recycling are common practice that is well regulated by MEUP and by the related licensed facilities.
	Wood scrap	17 02 01					
	Plastic scrap	17 02 03					

During operation, there will be water usage for general domestic and sanitary use including laundry, food preparation processes, sterilizers and autoclaves, X-ray equipment (water used in the processing of prints) and water used for gardens (if they are irrigated). A daily water consumption value per capita per bed was identified to vary between 1.13 m<sup>3</sup>/day (Altin et al., 1999) and 1.60 m<sup>3</sup>/day (data for large hospitals in the U.S. (U.S. Energy Information Administration, 2007)). Water consumption of the Istanbul İkitelli IHC is predicted to vary between 3,030 and 4,290 m<sup>3</sup>/day. All the water consumed is assumed to be converted into wastewater and will be discharged into municipality sewer lines.

IFC Guidelines indicated that often the wastewater quality from hospital care units has a quality similar to urban wastewater. However, contaminated wastewater may result from discharges from medical wards and operating theaters (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, and chemical disinfection. These waste streams will need to be collected separately.

## 8.6 Potential Impacts

Noncompliance with storage, transport and final disposal according to the Turkish regulatory framework was deemed to constitute a major impact. The existing Turkish regulatory framework has been modelled to be parallel to the EU Waste Legislative framework. The previous discussions indicate that the Turkish regulatory framework is in place for assigning specific waste codes to each of the waste stream to be generated in the construction and operation phases. The impacts of the generated wastes can be considered negligible if IHC Project complies with the applicable regulations during construction and operation including disposal of the waste stream in licensed facilities given in Table 8-4.

### Construction Phase

Solid wastes likely to be generated during construction will include excavation waste, contaminated soils sanitary and domestic wastes from site offices and kitchens and clean-up materials from accidental spills. If not handled and disposed of in an appropriate manner, the generation of these wastes can give rise to major impacts. All wastes during construction can be managed in line with the waste management plan (WMP) given in Annex G; and the regulatory framework which will render the impact of solid wastes negligible with the exception of the excavated soil.

Excavation soil has the potential to cause local nuisance due to dust generation during construction phase which will require disposal in a licensed excavated soil and construction waste disposal facility or at another appropriate permitted site. The excavated soil will be disposed at the former mining area at the north of the Project site. If the mining area storage capacity is insufficient another appropriate location will need to be used to dispose the excavated soil. Thus, the impact will be major if there will be no suitable location identified to dispose of the excavated material in a licensed facility and/or to use the excavated soils for other purposes such as fill material for road construction based on discussions with and approval by the Municipality.

Excavated soil which is contaminated at the site has a major potential for pollution of land, surface water and groundwater if it is not segregated from the clean excavated soil, transported and disposed of properly, as hazardous waste. The site survey indicated the presence of high levels of high metals at certain locations within the site. The excavated material from these locations should be further tested prior to disposal off-site to ensure that contaminated soil is disposed in a suitable licensed facility. Contaminated soils can be disposed in suitable licensed facilities following testing for hazardous contents. The impacts can be considered negligible if these actions are taken.

Any oil and/or chemical spills during maintenance activities at the workshops during construction may create health and safety impacts as well as environmental impacts. Related impacts may vary from minor to major significance depending on the amount of spills, the environment where the spill has occurred and the response time to the incident. Clean-up materials such as spill kits should be managed as hazardous waste and disposed of appropriately.

Domestic solid waste, especially the organic part from foods, attracts vermin and other disease carriers. Also if not managed properly, the solid waste generate irritant odor in and around the project area. The domestic waste will need to be appropriately collected, stored and disposed off site in accordance with the regulatory framework.

If not managed properly, special waste such as waste mineral oils, waste vegetable oils, battery and accumulators, waste electronic and electronic equipment, can also give rise to adverse impacts to human and environmental health. These wastes must be managed appropriately during construction in line with the regulations and disposed in licensed facilities.

Domestic wastewater generated during construction phase If not managed properly, can have significant adverse effects on the environment. Either wastewater discharge will need to be connected to a nearby wastewater collection line or will need to be collected in a septic tank..

### Operation Phase

*Health care wastes* (particularly medical wastes) may cause extremely adverse impacts on human and environmental health if managed improperly. Table 8-9 shows that there will be substantial amount of medical waste which will be generated during operation. The amount of health care waste that will be expected to be generated is 1.85 kg/day with the breakdown in categories given in Table 8-9. The ISTAC Medical Waste Incineration Plant has 24 tons/day disposal capacity. The IHC Project will not create medical waste disposal overload on the incineration plant. The other types of health care wastes (other than medical wastes) will be managed according to Turkish Environmental Legislation at the licensed facilities shown at the Table 8-4. There are adequate numbers of facilities that are licensed and can be used for disposal of health care waste stream that will be generated in the IHC Project. Therefore, the health care wastes can be disposed of properly without any adverse impact.

*Domestic wastewater* generated in health care facilities will contain a variety of pathogens, organic pollutants, nitrogen, phosphorous and suspended solids due to its sewage content. If not managed properly, discharge of untreated domestic wastewater can have major impact on the water supplies and the local population. Proper management during operation phase is an essential step to protect public and environmental health. Also, contaminated wastewater may result from discharges from medical wards and operating theaters, 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, and chemical disinfection. These waste stream will need to be collected separately otherwise there will be a major impact if the domestic wastewater stream is contaminated with this wastewater and the legal wastewater limits are not met for discharging into the municipal wastewater collection lines.

Water consumption of the Istanbul İkitelli IHC is predicted to vary between 3,030 and 4,290 m<sup>3</sup>/day. All the water consumed is assumed to be converted into wastewater and will be discharged into municipality sewer lines. The treatment capacity of the Ambarlı WWTP at the region is 400,000 m<sup>3</sup>/day. The existing wastewater flow coming in to the WWTP is 93,317 m<sup>3</sup>/day and the IHC wastewater load will represent less than 5% maximum increase in the existing flow rate indicating that this will still be within the treatment capacity of the WWTP. Therefore, the risk of inadequate treatment from the existing WWTP is negligible.

*Special waste* such as waste mineral oils, waste vegetable oils, battery and accumulators, waste electronic and electronic equipment can also give rise to adverse impacts to human and environmental health, if not managed properly. These wastes must be managed appropriately during construction in line with the regulations and disposed in dedicated licensed facilities.

*The domestic waste* that will be generated in the hospital is expected to be 6.3 tons/day which is a negligible increase in the approximately 15,000 tons/day being collected and disposed of by the Municipality in Istanbul.

*Hazardous waste* has the potential for pollution of land, surface water and groundwater as other waste classes; however, the consequences of inadequate management of hazardous waste are more serious than pollution by other waste classes. Direct contact with toxic components or uptake of those components such as heavy metals through the food chain may cause significant impacts to human and environmental health. The hazardous waste that have been identified need to be disposed at the appropriate licensed facilities that are given in Table 8-4. There will be negligible risk in disposing of the hazardous wastes generated during the operational phase of the IHC Project.

The previous discussions indicate that the Turkish regulatory framework is in place for assigning specific waste codes to each of the waste stream to be generated in the construction and operation phases. Furthermore, the waste disposal infrastructure for domestic, medical, hazardous and wastewater streams are available and operational in Istanbul as well as outside the Province boundaries. The impacts related to regulatory non-compliance and improper disposal with Turkish, EU Regulatory framework and IFC EHS guidelines can be considered negligible for disposal and treatment aspects. However, the management of these wastes needs to be performed adequately to ensure that the stages of temporary storage and management within the facilities do not cause adverse impacts which may range between minor to major impacts if these wastes are not managed properly. These are discussed in the following section.

## 8.7 Mitigation Measures

The following mitigation measures will be implemented related to waste management:

- Necessary permits related with disposal of excavated earth material during construction phase will be obtained from the Local environmental Authorities. An appropriate disposal facility and/or alternative options must be identified prior to the excavation process.
- The excavation waste will be disposed in line with Regulation on Control of the Excavated Soil, Construction and Demolition Wastes. Contaminated soils will be disposed in line with the Regulation on Soil Pollution Control and Point Source Contaminated Sites.
- The waste management practices given in the IFC EHS guidelines for Health Care Facilities will be implemented.
- The IHC will establish, operate and maintain a Health Care Waste Management System adequate for the scale and type of activities and identified hazards.
- All waste will be collected, segregated, labeled and stored on site according to the Waste Management Plan (WMP) as provided in Annex G. that has been developed for this project. The WMP addresses waste minimization, segregation, labeling, storage, transportation and recycling/disposal to meet the National and International standards.
- Domestic wastewater discharge will be done to the municipality infrastructure and the necessary permits and protocols will be maintained for connection to the municipal sewer system.
- Procedures and mechanisms will need to be in place for the separate collection of urine, feces, blood, and vomit from patients treated with geno-toxic drugs to avoid their entry into the wastewater stream. There will most likely be a need for the treatment of contaminated wastewater during the operation of the IHC to meet the discharge limits for connection to municipal sewer line. In other words, designated medical wastewater management should be considered prior to project beginning.
- All wastes must be segregated according to their category and will be disposed of at relevant licensed facilities in accordance with regulatory requirements. Record keeping about waste generation, storage and transportation to third party waste management facilities will be maintained according to the details given in WMP. Periodic inspections will be conducted in the waste recycling/ disposal facilities to ensure proper disposal practices are implemented.
- TAEK should be informed due to the radioactive waste generation and the radioactive waste management options should be prior to implement any practice with TAEK.

Additionally the detailed technical waste management best practices are defined in the Waste Management Plan in Annex G.

## 8.8 Residual Impacts

The residual impact as a result of waste generation is estimated to be negligible when the Waste Management Plan and the mitigation measures that are described above are fully implemented throughout the lifetime of the project.

## 9.0 AIR QUALITY

### 9.1 Scope

Emissions during construction and operation of the Project will contribute to regional air pollutant levels and thereby may impact health of nearby communities, workers and other sensitive receptors. This chapter presents the assessment of the impacts of Project-related emissions on air quality and sets out the mitigation measures to avoid or minimize the risks together with the residual impacts that are foreseen to remain.

The most significant direct or indirect sources of air pollutants from the hospital operations will include emissions from increased road traffic; exhaust air from heating, ventilation and air conditioning systems; cogeneration system, mainly containing NO<sub>x</sub>; and exhaust air (released from sources such as medical waste storage areas, medical technology areas and isolation wards) that may potentially be contaminated with biological agents, pathogens, or toxic materials.

In addition to impacts on air quality during the operation of the Project, the assessment also considers short term effects from construction activities. Adverse effects can be caused by emissions from construction machinery and vehicles and also from activities generating particulate matter (such as earthworks and storage of dusty materials). In addition to affecting health, dust can lead to unsightly and potentially harmful deposits on property, vegetation, etc. if not managed properly.

The following sources of information have been used during the assessment:

- Background Air Quality Measurement Report by Ekotest
- Air Quality Modeling Report by Ennotes Ltd.
- Data provided by the General Directorate of Meteorology
- General Directorate of Meteorology website (<http://www.mgm.gov.tr>)
- Istanbul Province Environment Status Report, 2010-2011
- Information and data collected during field studies

The significance criteria that are used related to impacts on air quality are presented below.

Impact Significance	Description
Negligible	- No perceptible change in baseline conditions
Minor	- Temporary dust and gas emissions within the Project area during construction activities - Temporary emissions due to construction equipments and vehicular movements resulting in change in baseline air quality by 20%
Moderate	- Temporary dust and gas emissions extending outside the Project area during construction activities - Temporary emissions due to construction equipments and vehicular movements resulting in change in baseline air quality by 40%
Major	- Temporary emissions due to construction equipments and vehicular movements resulting in change in baseline air quality by 70%

## 9.2 Legal Context

This section provides an overview of Turkish and international ambient air quality standards. In Turkey, ambient air quality is regulated under the Regulation on Assessment and Management of Air Quality - RAMAQ (Official Gazette Date/Number: 06.06.2008/26898) and the Industrial Air Pollution Control Regulation – IAPCR (Official Gazette Date/Number: 03.07.2009/27277). Both regulations set up a tiered system to reduce air quality limits (general air quality limits and limits applicable to industries) over time and both provide mostly identical ambient air quality limits for pollutants.

Annexes of these regulations specify air quality targets as summarized in Table 9-1 below. As Turkey is a candidate for accession to the EU, standards set out in the EU Council Directive 2008/50/EC on ambient air quality, which are generally equivalent to IFC and WHO targets, are also considered to be relevant and included in Table 9-1.

Table 9-1: EU Council Directive 2008/50/EC and Turkish ambient air quality standards (as per RAMAQ Annexes 1 and 1A and IAPCR Annex 2)

Parameter	Concentration in $\mu\text{g}/\text{m}^3$					
	Short-term value, STV (Hourly average)		Short-term value, STV (Daily average)		Long-term value, LTV (Annual average)	
	EU standards	Turkish standards	EU standards	Turkish standards	EU standards	Turkish standards
Nitrogen dioxide (NO <sub>2</sub> )	200	2014 <sup>a,b</sup> = 300 2024 <sup>a</sup> = 200	-	-	40	2014 <sup>a,b</sup> = 60 2024 <sup>a</sup> = 40
Sulfur dioxide (SO <sub>2</sub> )	350	2014 <sup>a,b</sup> = 500 2019 <sup>a</sup> = 350	125	2014 <sup>a,b</sup> = 250 2019 <sup>a</sup> = 125	-	2014 = 20
Carbon monoxide (CO)	-	-	10,000 (8-hr)	2014 <sup>a</sup> = 10,000 2014 (8-hr) <sup>a,b</sup> = 16,000 2017 (8-hr) <sup>a</sup> = 10,000	-	-
Particulate matter with diameter of 10 $\mu\text{m}$ or less (PM <sub>10</sub> )	-	-	50	2014 <sup>a,b</sup> = 100 2019 <sup>a</sup> = 50	40	2014 <sup>a,b</sup> = 60 2019 <sup>a</sup> = 40

<sup>a</sup>as provided in RAMAQ Annex 1

<sup>b</sup>limit value will decrease equally each year to reach the next limit value

### 9.2.1 Air Quality Index

Air quality index is a scale defined by the Ministry of Environment and Urban Planning (MEUP) to identify air quality. The index classifies ambient air quality into 6 categories from 1 (very good) to 6 (very bad) and every category is visualized by colors. The index is based on the concentrations of five pollutants.

These pollutants and their air quality index levels are shown in Table 9-2.

Table 9-2: Air quality indexes of main pollutants

Air Quality Index	SO <sub>2</sub>	NO <sub>2</sub>	CO	O <sub>3</sub>	PM <sub>10</sub>
	Hourly Average	Daily Average	Daily Average	Hourly Average	Daily Average
	[µg/m <sup>3</sup> ]	[µg/m <sup>3</sup> ]	[mg/m <sup>3</sup> ]	[µg/m <sup>3</sup> ]	[µg/m <sup>3</sup> ]
1-(Very Good)	0 – 50	0 – 45	0 – 1.9	0 – 35	0 - 25
2 (Good)	51 – 199	46 – 89	2.0 – 7.9	36 – 89	26 - 69
3 (Moderate)	200 – 399	90 – 179	8.0 – 10.9	90 – 179	70 - 109
4 (Medium)	400 – 899	180 – 299	11 – 13.9	180 – 239	110 - 139
5 (Bad)	900 – 1499	300 – 699	14.0 – 39.9	240 – 359	140 - 599
6 (Very Bad)	>1500	> 700	> 40.0	> 360	> 600

### 9.3 Climate and Meteorological Conditions

Istanbul is influenced by two types of climates. The Northern part of Istanbul is influenced by the Black Sea Climate (winters are chilly, summers are fresh and four seasons rainy), while the Mediterranean Climate (winters are mild and wet, summers are hot and dry) is observed in the other part of the city.

Meteorological data on temperature, precipitation, relative humidity, pressure and wind flow, as given in the official website of the General Directorate of Meteorology (based on data recorded at the Kartal meteorological station to represent Istanbul province – Kartal Station Elevation from sea level: 0 m, Latitude: 29.2075 N, Longitude: 40,8900 E) or Istanbul Florya meteorological station (Elevation from sea level: 30 m, Latitude: 28.78719 N, Longitude: 40.975434 E) are described in following sections.

#### 9.3.1 Temperature and Sunshine

Monthly average values of temperature parameters based on data collected for a period of 52 years (1960-2012) are provided in Table 9-3.

Table 9-3: Average temperature and sunshine data for a period of 52 years (1960-2012)

Temperature parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean temp.(°C)	6.5	6.5	8.3	12.7	17.5	22.1	24.4	24.2	20.9	16.4	12.2	8.7
Mean high temp.(°C)	9.2	9.8	12.0	17.1	22.2	27.0	29.4	29.2	25.6	20.4	15.5	11.4
Mean low temp. (°C)	4.0	4.0	5.4	9.2	13.6	18.0	20.4	20.5	17.4	13.6	9.5	6.3
Max. recorded temp.(°C)	22.4	22.1	26.8	33.3	36.4	40.6	40.6	40.1	36.6	33.5	27.0	25.0
Min. recorded temp. (°C)	-6.8	-6.4	-5.6	0.2	4.8	9.8	13.6	14.3	7.7	3.3	-2.0	-4.2
Mean daily sunshine (hrs.)	2.3	3.1	4.3	6.0	8.1	10.0	10.4	9.5	8.1	5.3	3.4	2.2

The annual mean temperature, annual mean maximum temperature and annual mean minimum temperature observed in Istanbul are 13.6°C, 19.1°C and 11.8°C, respectively. The minimum and maximum temperatures measured in the province are -6.8°C and 40.6°C.

### 9.3.2 Precipitation

Based on the meteorological data obtained from the Istanbul Florya meteorological station between 1975-2012, the total average annual precipitation in the region is 657.1 mm with average monthly precipitations ranging from 22.1 mm in July to 98.3 mm in December (Table 9-4).

Table 9-4: Precipitation data for Istanbul

Precipitation parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average data for a period of 52 years (1960-2012)												
Mean number of days with precipitation	16.1	14.1	11.9	10.8	7.3	5.2	3.5	3.9	5.4	9.7	11.1	15.9
Mean total monthly precipitation (kg/m <sup>2</sup> )	83.4	65.5	60.2	53.3	29.3	25.8	20.9	24.5	35.8	67.9	74.0	99.1
Average data for a period of 37 years (1975-2012)												
Total average precipitation (mm)	81.5	67.4	57.8	49.8	27.7	31.1	22.1	23.0	34.0	73.1	81.3	98.3
Maximum precipitation (mm)	49.9	44.8	45.1	41.1	27.8	41.8	57.9	70.8	62.7	111.0	58.4	65.4

### 9.3.3 Humidity and Pressure

Based on the meteorological data obtained from the Istanbul Florya meteorological station for a period of 37 years (1975-2012), the average monthly humidity in the region ranges from 67.1% in July to 76.8% in January (Table 9-5).

Table 9-5: Relative humidity and pressure data for a period of 37 years (1975-2012)

Humidity and pressure parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average humidity (%)	76.8	75.7	74.5	72.3	72.0	68.4	67.1	68.8	70.5	74.9	75.7	76.4
Minimum humidity (%)	27	31	13	14	24	21	16	24	17	20	29	32
Mean pressure (kPa)	101.5	101.4	101.2	100.9	101.0	100.9	100.8	100.8	101.1	101.4	101.5	101.5
Max. pressure (kPa)	103.4	103.4	103.7	102.8	102.1	102.0	101.7	101.8	102.4	102.7	103.1	103.1
Min. pressure (kPa)	98.7	99.0	98.8	98.8	99.6	99.5	99.7	99.8	99.7	99.9	98.8	98.6

### 9.3.4 Wind Characteristics

The prevailing wind direction in Istanbul is North-Northeast (NNE) for the majority of the year, while the number of winds in August, September and December are mostly from the Northeast (NE). The average wind speed is 2.5 m/s.

The observed annual average wind speed is 2.5 m/s (Table 9-6).

Table 9-6: Monthly average wind speed between the years 1975-2012

Wind speed (m/s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual average
Ave. wind speed	2.8	2.8	2.6	2.3	2.2	2.2	2.7	2.7	2.4	2.3	2.5	2.9	2.5
Max. wind speed and direction	23.1 NNW	20.7 NE	19.3 SSW	19.8 N	18.3 NE	16.0 N	15.8 NNW	15.5 NE	18.3 NW	28.1 NNE	21.7 SSW	21.7 SSW	19.9 -

## 9.4 Air Quality Baseline Conditions

### 9.4.1 Background

The land use around the Project area is described in *Chapter 5: Land Use and Zoning*. There is an excavated material disposal area located approximately 1 km north of the Project boundaries. Currently, trucks are carrying excavated materials to this area from the haul road passing within the Project area which then continues adjacent to the west boundary of the northern part of the Project area. As it is observed during site visits, there is an occurrence of dust emissions as the trucks pass through the haul road.

The major industries and thus potential sources of emissions in the region (together with air distances to the Project location) are Ikitelli Organized Industrial Zone (1 km), Beylikduzu Organized Industrial Zone (13 km) and Europe Free Zone (13 km). Additionally, there is Istanbul Atatürk Airport in 11 km proximity of the Project area as potential fuel emission sources.

According to the Istanbul Environmental status report 2010-2011, the primary pollutant sources in the province are industrial establishments as a point source, traffic caused by vehicles, house heatings as an area source, marine vessels and accidents and explosions. Unplanned urbanization is also an important factor causing air pollutions as a result of generating high traffic loads, reducing forest areas and blocking winds by high-raised buildings.

Average concentrations of air pollutants in the province in 2012 are given in Table 9-7. In addition, concentrations of SO<sub>2</sub> and PM<sub>10</sub> at the two nearest air quality monitoring stations to the Project area is given in Table 9-8.

Table 9-7: Average concentrations of air pollutants in the province in 2012<sup>1,2,3</sup>

Months	SO <sub>2</sub>	PM <sub>10</sub>	CO	NO	NO <sub>2</sub>	NO <sub>x</sub>	O <sub>3</sub>
January	8	46	685	55	50	135	19
February	9	57	655	48	60	134	28
March	6	55	597	42	55	115	31
April	7	60	595	44	68	135	28
May	5	54	458	29	55	100	28
June	4	56	499	31	55	103	39
July	3	58	532	21	50	81	41
August	3	44	537	27	57	98	42
September	4	53	518	44	59	129	32
October	3	56	540	60	60	152	19
November	4	45	621	48	52	125	13
December	5	53	765	60	62	153	14

<sup>1</sup> Unit: µg/m<sup>3</sup>

<sup>2</sup> Source: <http://www.havaizleme.gov.tr>

<sup>3</sup> SO<sub>2</sub>, PM<sub>10</sub> data are unvalidated raw data.

Table 9-8: SO<sub>2</sub> and PM<sub>10</sub> concentrations in the Esenler and Yenibosna Air Quality Monitoring Stations between 2010-2012

Months	Esenler Air Quality Monitoring Station						Yenibosna Air Quality Monitoring Station					
	SO <sub>2</sub>			PM <sub>10</sub>			SO <sub>2</sub>			PM <sub>10</sub>		
	2010*	2011*	2012**	2010*	2011*	2012**	2010*	2011*	2012**	2010*	2011*	2012**
January	6	8	12	59	74	44	4	8	8	57	84	52
February	6	13	22	51	58	63	5	10	10	63	66	66
March	9	13	9	52	57	70	8	11	8	59	69	64
April	7	11	N.A.	45	38	N.A.	5	7	N.A.	63	44	N.A.
May	7	7	N.A.	52	48	N.A.	4	6	N.A.	85	67	N.A.
June	4	5	N.A.	45	39	N.A.	2	4	N.A.	50	50	N.A.
July	3	5	N.A.	47	58	N.A.	4	4	N.A.	54	52	N.A.
August	3	6	N.A.	45	51	N.A.	3	6	N.A.	61	42	N.A.
September	5	2	N.A.	38	49	N.A.	3	1	N.A.	51	42	N.A.
October	3	4	8	34	51	65	-	2	-	58	49	51
November	3	-	-	79	-	53	5	-	6	79	-	40
December	5	-	-	57	-	52	6	-	7	64	-	44

Units: µg/m<sup>3</sup>

"-" Sign means, air quality monitoring stations failed to provide %75 valid data so monthly average is not computed.

\*Source: Turkish Statistical Institute; (<http://www.turkstat.gov.tr/>)

\*\*Source: Ministry Of Environment and Urbanization, General Directorate of Environmental Management; (<http://www.csb.gov.tr/gm/cygm/>)

#### 9.4.2 Baseline Measurements Methodology

The air quality baseline measurements have focused on the following pollutants of concern:

- PM Deposition
- Particulate matter of 10 microns or below (PM<sub>10</sub>)
- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO<sub>2</sub>)

In air quality measurements, continuous monitoring with Met One Instruments BAM 1020 was applied for PM<sub>10</sub> measurement, APNA370 NO<sub>x</sub> analyser used for determining the nitrogen dioxide and nitrogen monoxide concentration, APMA370 carbon monoxide analyser is used for measuring carbon monoxide concentrations and quadrivial (A,B,C,D) dust sampling system was used for PM Deposition measurement using the methods given in Table 9-9.

Table 9-9: Air pollutant measurement methods

Emissions	Method	Method No
PM Deposition	Gravimetric	BS 1747
PM <sub>10</sub>	Beta Ray Absorption Method	TS ISO 10473-2003
CO	Determination of the Mass Concentration of Carbon Monoxide (CO)-Non Dispersive Infrared Spectrometer	TS EN 14626-2006
NO and NO <sub>2</sub>	Chemiluminescence Method	TS EN 14211-2006

A total of six investigation locations were chosen within the Project area for sampling of the air quality parameters (Figure 9-1). In accordance with IAPCR Annex 2, two sampling points were identified for each parameter within the investigation location exhibiting the highest Air Pollution Contribution Value (APCV). Locations of the measurement systems are indicated in Figure 9-1 below. Continuous measurements of PM Deposition have been conducted at two locations over a period of 30 days (from 6<sup>th</sup> November to 6<sup>th</sup> December 2013) via two measurement systems for each location, whereas one measurement system was used for PM<sub>10</sub>, NO<sub>x</sub> and CO<sub>2</sub> measurements 15 days in turn for each of the two locations with 24-hour cycles.

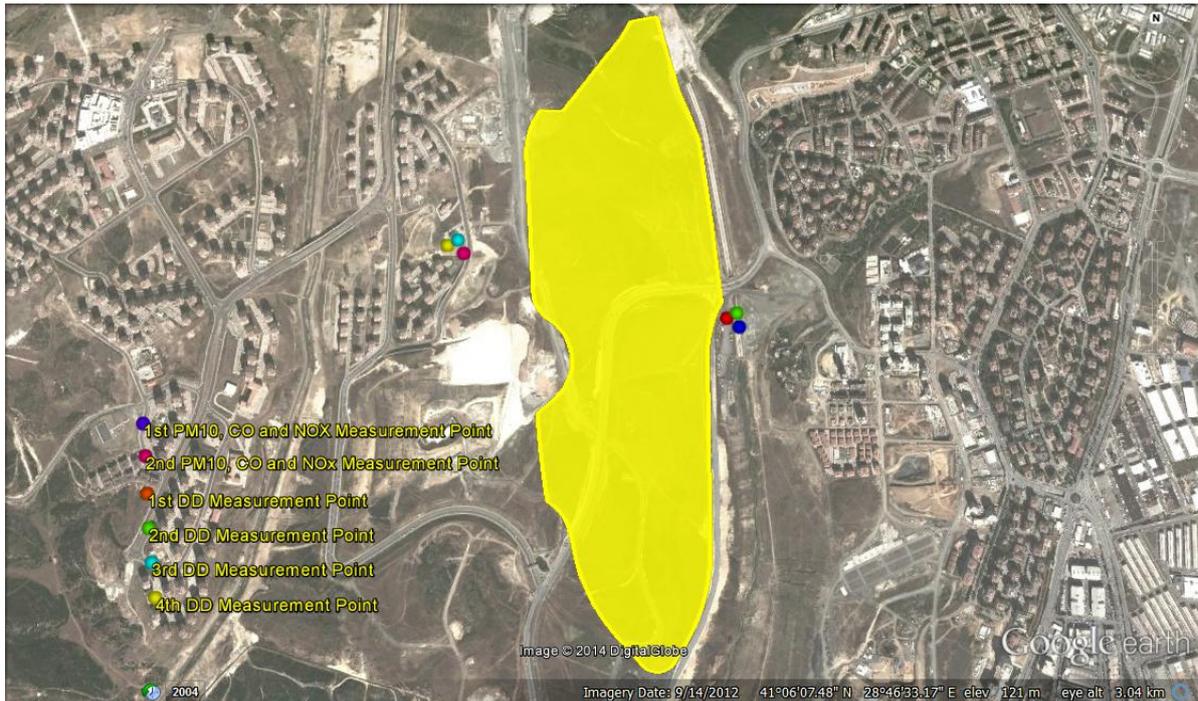


Figure 9-1: Air pollutant investigation locations (all measurement systems)

Upon obtaining the sampling results, the following values were calculated for each parameter, as per the aforementioned regulation:

- Long-Term Value (LTV): Arithmetical mean of the sampling results
- Short-Term Value (STV): Maximum daily average value or the value remaining below 95% of all measurements when sorted in numerical order
- Total Pollution Value (TPV): Sum of Air Pollution Contribution Value (APCV) and Long Term Value (LTV), which is considered for proposed projects/new facilities.

Further details on air pollutant measurement methodology are provided in the Background Air Quality Measurement Report by Ekotest (2013) which is provided as Annex H-1.

### 9.4.3 Results of PM Deposition Sampling

Results of PM Deposition sampling and comparison of the calculated LTV and STV values with Turkish regulatory limits are presented in Table 9-10 and Table 9-11, respectively. Hourly data are provided in Annex H-1.

Table 9-10: PM Deposition Sampling Results

Measurement Location	PM Deposition (mg/m <sup>2</sup> -day)						
	Start date	End date	Daily average concentration				
			A	B	C	D	Average
1	06.11.2013	06.12.2013	61.94	42.70	65.61	90.50	<b>65.19</b>
2			89.78	271.26	222.51	92.87	<b>169.10</b>
3			255.08	209.60	411.35	454.03	<b>332.52</b>
4			142.43	167.77	403.58	183.59	<b>224.34</b>

Table 9-11: Comparison of PM Deposition sampling results with Turkish regulatory limits

Parameter	PM Deposition (mg/m <sup>2</sup> -day)	
	Value	Limit value <sup>1</sup>
Short term value (STV)	332.5	390
Long term value (LTV)	197.8	210

<sup>1</sup> As per IAPCR Annex 2, Table 2.2

#### 9.4.4 Results of PM<sub>10</sub> Sampling

Results of PM<sub>10</sub> sampling and comparison of the calculated LTV and STV values with Turkish regulatory limits are presented in Table 9-12 and Table 9-13, respectively. Hourly data are provided in Annex H-1.

Table 9-12: PM<sub>10</sub> sampling results

Investigation Location	PM <sub>10</sub> (µg/m <sup>3</sup> )		
	Start date	End date	Daily average concentration
1	06.11.2013	20.11.2013	33.96
2	21.11.2013	06.12.2013	19.89

Table 9-13: Comparison of PM<sub>10</sub> sampling results with Turkish regulatory limits

Parameter	PM <sub>10</sub> (µg/m <sup>3</sup> )	
	Value	Limit value <sup>1</sup>
Long term value (LTV)	26.7	60
Short term value (STV)	45.4	100

<sup>1</sup> As per RAMAQ Annex I/A 2013 Limit Values. Note: Due to the fact that the baseline measurements were made in 2013, comparison in the table was made with limit values of 2013.

#### 9.4.5 Results of CO Sampling

Results of CO sampling and comparison of the calculated LTV and STV values with Turkish regulatory limits are presented in Table 9-14 and Table 9-15, respectively. Hourly data are provided in Annex H-1.

Table 9-14: CO sampling results

Investigation Location	CO ( $\mu\text{g}/\text{m}^3$ )		
	Start date	End date	Daily average concentration
1	06.11.2013	20.11.2013	474.97
2	21.11.2013	06.12.2013	417.23

Table 9-15: Comparison of CO sampling results with Turkish regulatory limits

Parameter	CO ( $\text{mg}/\text{m}^3$ )	
	Value	Limit value <sup>1</sup>
Long term value (LTV)	0.445	10
Short term value (STV)	0.685	10

<sup>1</sup> As per RAMAQ Annex I/A 2013 Limit Values. Note: Due to the fact that the baseline measurements were made in 2013, comparison in the table was made with limit values of 2013.

#### 9.4.6 Results of NO<sub>2</sub> Sampling

Results of NO<sub>2</sub> sampling and comparison of the calculated LTV and STV values with Turkish regulatory limits are presented in Table 9-16 and Table 9-17, respectively. Hourly data are provided in Annex H-1.

Table 9-16: NO<sub>2</sub> sampling results

Investigation Location	NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )		
	Start date	End date	Daily average concentration
1	06.11.2013	20.11.2013	11.79
2	21.11.2013	06.12.2013	14.68

Table 9-17: Comparison of NO<sub>2</sub> sampling results with Turkish regulatory limits

Parameter	NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	
	Value	Limit value <sup>1</sup>
Long term value (LTV)	13.3	60
Short term value (STV)	19.3	300

<sup>1</sup> As per RAMAQ Annex I/A 2013 Limit Values. Note: Due to the fact that the baseline measurements were made in 2013, comparison in the table was made with limit values of 2013.

#### 9.4.7 Assessment of Baseline Air Pollutant Levels

It is observed that the detected baseline long-term and short-term values of PM deposition remain below the Turkish air quality limits that should be complied by the industrial facilities in their ambient air. In addition, both LTV and STV values for PM<sub>10</sub>, CO and NO<sub>2</sub> remains below the regulatory limit as seen on Table 9-13, Table 9-15 and Table 9-17 above. It is important to note that comparison of the baseline measurements are made with the limit values of year 2013 due to the fact that the baseline measurements were conducted in 2013. However, the baseline levels also remain below the national limit values as provided in Table 9-1.

On the other hand, air quality indexes of the daily PM<sub>10</sub> values are Level 1 (very good) and Level 2 (good) for measurement locations 1 and 2, respectively. Air quality indexes of the daily CO and NO<sub>2</sub> values are both Level 1 (very good) for all measurement locations.

## 9.5 Air Quality Modeling

The air quality modeling study was conducted by Ennotes Environmental Engineering Consultancy Contracting Co. (Ennotes) and results are provided in the Air Quality Assessment and Modeling Report by Ennotes (2014) which is provided as Annex H-2.

### 9.5.1 Methodology

Air quality modeling study was conducted using “Lakes Environmental AERMOD View” dispersion model software (under License No: AER0005591).

This model is a state-of-the-art computer model, which can estimate hourly, daily and annual ground level concentration (GLC) values, based on real time data varying over time. The model comprises the calculations of different dispersion models for different sources (point, volume, area) ranging from isolated stacks to fugitive pollutants and also takes into consideration aerodynamic waves, turbulence and similar phenomena that may affect the pollutants released from the sources in any industrial site.

Hourly, daily and annual average GLC values of the pollutants in the ambient air can be estimated by running the model after transferring to the program the above ordered information.

Long term meteorological data needed for modeling studies is obtained from the regional meteorological stations. In this study, Istanbul Florya Meteorological Station of the Turkish State Meteorological Service is considered as suitable and the meteorological data recorded in this station was used in the modeling study. Since upper air observation values of the region are not measured by this station, these records were obtained from Goztepe Meteorological Station. The locations of the mentioned meteorological stations together with the Project area are shown in Figure 9-2.



Figure 9-2: Locations of meteorological stations and the Project area

The meteorological data year was chosen by comparing the long term wind direction frequency distribution to the wind direction frequency distribution of the last 10 years. Year 2004 was determined as the most appropriate year. Long term and year 2004 wind direction distribution diagrams are shown in Figure 9-3.

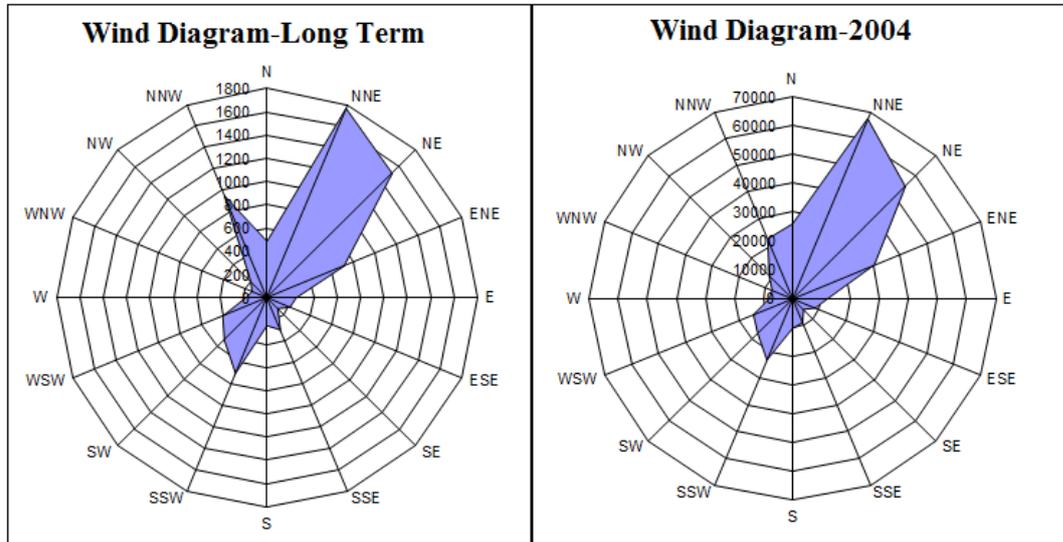


Figure 9-3: Wind Direction Frequency Distribution Diagrams for Istanbul Florya Station

## 9.5.2 Emissions

The Project will comprise of a construction and operation phase; therefore air quality effects of the Project have been considered for these two phases. These effects are explained in the following section.

### 9.5.2.1 Construction Phase

The construction activities cover both earthwork and main construction activities. Earthwork activities cover land arrangement (land preparation and excavation) activities of the Project area. Dust will be a significant pollutant during the earthworks activities mainly generated from excavation, load on trucks and transportation and the release of engine emissions from construction equipment and vehicles at the construction site. During the main construction works, movement of construction equipment such as cement mixers, trucks, backhoes will cause particulate matter emissions from land and engine emissions. Earthworks are expected to continue for 8 months, of which 6 months will cover excavation activities. The earthwork activities and construction activities are expected to overlap for a period of time. After earthwork activities are completed, main construction activities will continue for a further 28 months.

In order to calculate dust and engine emissions, emission factors were used. Particulate matter emission factors are taken from Regulation on the Industrial Air Pollution Control Regulation (IAPCR) Annex-12 Table 12: Emission Factors used to Calculate Dust Emissions. Engine emissions are considered in two categories as road and non-road machine emissions. Road emissions cover emissions from vehicles which are used for transportation/carrying operations. Non-road emissions arise from mobile machinery which do not travel on road. Road emission factors are derived from *The EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013-Exhaust Emissions from Road*

*Transport-Tier 3 Emission Factors* and non-road emission factors are taken from *The EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013-Exhaust Emissions from Road Transport- Table 3-10 Tier 3 Baseline emission factors for uncontrolled diesel engines*. Since the dust emission specifications have important differences between land based emissions and engine emissions, they have not been evaluated under the same criteria.

Dust emissions emitted from earthwork activities (excavation, loading, transport, etc.) and vehicle movements are calculated by using IAPCR Annex-12 emission factors. Road and non-road equipment emissions are also calculated. To calculate emission factors, it is assumed that trucks are rigid, heavier than 32 tons with full capacity and have Euro 4 technology. No corrections (age, engine type etc.) have been made on emission factors. Engine power of non-road equipment is taken as 130 kWh. Details of these calculations are provided in the Air Quality Assessment and Modeling Report presented in Annex H-2.

### *Dust Emissions*

*Earthwork Activities:* Due to the fact that the excavation activities within earthwork activities will take 6 months, calculations considered the period of 6 months instead of 8 months in order to assess worst case conditions. In this phase, 5,000,000 m<sup>3</sup> soil will be excavated. 1,500,000 m<sup>3</sup> soil (30% of total) will be used for filling activities in the Project area. Remaining soil will be carried to a disposal site located at the north of the Project site. Assumptions that were used in calculating the dust emissions from earthwork activities are given in Annex H-2.

*Main Construction Activities:* The main construction activities include construction of buildings, ready-mix concrete plant activities, mechanical works, electricity works, trim works and landscape works. Assumptions that were used in calculating the dust emissions from main construction activities are given in Annex H-2.

### *Engine Emissions*

As mentioned in the previous section, engine emissions are split into two categories as road and non-road vehicle emissions. Vehicle types, quantities and working times during the construction phase in the Project site during 1-hour period are shown in Table 9-18 (Note: Equipment working with electricity are not included in engine emission calculations. In addition, generators are also not included as they will operate as needed and their operating period is unknown).

Table 9-18: Equipment that will be used during the construction phase in the project site during 1-hour period

Phase		Road		Non-Road	
		Equipment	Number	Equipment	Number
Earthworks	Land Preparation	Truck	10	Excavator	2
				Loader	1
				Grader	1
				Bulldozer	1
		<b>Total</b>	<b>10</b>	<b>Total</b>	<b>5</b>
	Excavation Works	Truck	75	Excavator	15
Bulldozer				1	
Loader				2	
	<b>Total</b>	<b>75</b>	<b>Total</b>	<b>18</b>	
Main Construction	Main Construction	Truck	12	Crane (Mobile)	4
				Concrete Mixer	3
				Mobile Concrete Pump	4
				Backhoe	2
				Grader	3
				Sprinkler	2
				Hi-Up Crane	2
				Pick-Up	25
				Roller	4
					<b>Total</b>

Table 9-19 shows emission calculations for equipment shown in Table 9-18.

Table 9-19: Engine Emissions

Pollutant	Type	Emission Factor	Emission Per Vehicle (kg/h)	Phase			
				Earthwork		Main construction	
				Number of Vehicle	Total Emission (kg/h)	Number of Vehicle	Total Emission (kg/h)
NO <sub>x</sub>	Road	4.70902	0.002354	85	<b>0.2</b>	12	<b>4.2372</b>
	Non-Road	3.5	0.455	23	<b>10.465</b>	49	<b>401.31</b>
CO	Road	0.74319	0.003716	75	<b>0.2787</b>	12	<b>6.6888</b>
	Non-Road	3.5	0.455	23	<b>10.465</b>	49	<b>401.31</b>
PM	Road	0.03544	0.000017	75	<b>0.001275</b>	12	<b>0.0306</b>
	Non-Road	0.2	0.026	23	<b>0.598</b>	49	<b>22.932</b>
SO <sub>2</sub>	Road	0.0016	0.0016	75	<b>0.12</b>	12	<b>2.88</b>
	Non-Road	0.0016	0.0016	23	<b>0.0368</b>	49	<b>1.4112</b>
VOC	Non-Road	0.5	0.065	75	<b>4.875</b>	12	<b>117</b>
HC	Road	0.04639	0.000023	23	<b>0.000529</b>	49	<b>0.020286</b>

Results are calculated for the worst case scenario which considers operation of all vehicles at the same time, which is highly unlikely.

### 9.5.2.2 Operation Phase

There will be a cogeneration system during operation phase, which is planned to include 5 natural gas fired gas turbines each with a capacity of 3.349 MW electrical power.

Since the fuel to be used at the proposed cogeneration system is natural gas, main pollutant resulting from combustion process will be NO<sub>x</sub>. In order to calculate these emissions, *The EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013-Small Combustion-Table 3-34 Tier 2 Emission Factors for Non-Residential Sources, Gas Turbines Burning Natural Gas* emission factors were used (provided in Annex H-2). The technical information about the 3.349 MW engine unit is obtained from the manufacturer. Minimum stack height of the cogeneration system is calculated using PK 3781 software developed by the German air pollution control regulation TA LUFT in accordance with VDI 3781 standard. Minimum stack height is calculated as 10 m. On the other hand, based on the information obtained from the manufacturer, the cogeneration system will have 5 stacks, each with a stack height of 12 m which is in line with the calculated minimum stack height. Emission values, amount of pollutants and the characteristics of the stack gas are provided in Annex H-2. Moreover, a catalytic converter system with 55% NO<sub>x</sub> reduction has been considered to be part of the cogeneration system and included in the modeling.

#### NO<sub>x</sub> Emissions

There are two factors causing NO<sub>x</sub> emissions through combustion process. The first factor is the nitrogen content of the fuel. Nevertheless, another source of NO<sub>x</sub> which is of higher concern is the oxidation of free nitrogen in the air at high temperature during combustion. The factors which will determine the mentioned emissions from the proposed cogeneration system are boiler firing technique, combustion temperature and pressure, etc.

According to IAPCR, Annex-5, stack gas NO<sub>x</sub> emission standard for gas-fired plants is 300 mg/Nm<sup>3</sup> with 15% O<sub>2</sub> in volume. NO<sub>x</sub> emissions from the proposed plant will be approximately 45 mg/Nm<sup>3</sup> in dry base. Therefore, the emission level complies with the pertinent limit value. Dust, CO and SO<sub>2</sub> emissions from the cogeneration system were also calculated and will be negligible (explained in Annex H-2).

### 9.5.3 Dispersion Modeling Results

#### 9.5.3.1 Construction Phase - Ground Level PM<sub>10</sub> and PM Deposition Concentrations

Modeling studies are carried out for dust emissions (PM<sub>10</sub> and PM deposition) for construction activities. As mentioned previously, earthwork activities (land preparation and excavation) will be undertaken in parallel with main construction activities for a few months within the first 8 months. After earthworks are completed, main construction activities will continue. For this reason, modeling studies for the construction phase were carried out in two phases, which include earthwork and main construction activities (Phase 1) and single main construction activities (Phase 2). Ground level concentrations (GLC) of PM<sub>10</sub> and PM Deposition, determined from the modeling studies are listed in Table 9-20 for uncontrolled working conditions and Table 9-21 for controlled working conditions. PM<sub>10</sub> Air Pollution Contribution Values (APCV) and Total Pollution Values calculated according to background monitoring results are shown in Table 9-22.

Table 9-20: Construction Phase Maximum GLC Values Determined from the Modeling Studies for Uncontrolled Conditions

Parameter	Averaging Period	Maximum GLC Values and Coordinates ( $\mu\text{g}/\text{m}^3$ for $\text{PM}_{10}$ ) ( $\text{mg}/\text{m}^2.\text{day}$ for PM Deposition)		National Limit Values ( $\mu\text{g}/\text{m}^3$ )				EU Limit Values ( $\mu\text{g}/\text{m}^3$ )	WHO Limit Values ( $\mu\text{g}/\text{m}^3$ )
		Phase 1: (Earthworks and Main Construction)	Phase 2: Main construction	2014	2015	2016	2017		
$\text{PM}_{10}$	Hourly (max.)	280.74 (648666, 4551982)	82.50 (688949, 4550462)	-	-	-	-	-	-
	Daily (90.41%)	105.70 (648687, 4551994)	44.63 (688449, 4550712)	100	90	80	70	50	50
	Yearly	51.88 (648687, 4551994)	22.30 (648449, 4550712)	60	56	52	48	40	20
PM Deposition	Monthly	51.48 (648449, 4550712)	32.46 (648449, 4550712)	390				-	-
	Yearly	53.95 (648687, 4551994)	29.67 (648449, 4550712)	210				-	-

Table 9-21: Construction Phase Maximum GLC Values Determined from the Modeling Studies for Controlled Conditions

Parameter	Averaging Period	Maximum GLC Values and Coordinates ( $\mu\text{g}/\text{m}^3$ for $\text{PM}_{10}$ ) ( $\text{mg}/\text{m}^2.\text{day}$ for PM Deposition)		National Limit Values ( $\mu\text{g}/\text{m}^3$ )				EU Limit Values ( $\mu\text{g}/\text{m}^3$ )	WHO Limit Values ( $\mu\text{g}/\text{m}^3$ )
		Phase 1: Earthworks and Main Construction	Phase 2: Main construction	2014	2015	2016	2017		
$\text{PM}_{10}$	Hourly (max.)	140.80 (648666, 4551982)	41.41 (648449, 4550462)	-	-	-	-	-	-
	Daily (90.41%)	53.06 (648687, 4551994)	22.78 (688449, 4550712)	100	90	80	70	50	50
	Yearly	26.07 (648687, 4551994)	11.42 (648449, 4550712)	60	56	52	48	40	20
PM Deposition	Monthly	26.04 (648449, 4550712)	16.60 (648449, 4550712)	390				-	-
	Yearly	27.30 (648687, 4551994)	15.21 (648449, 4550712)	210				-	-

Table 9-22:  $\text{PM}_{10}$  Air Pollution Contribution Values (APCV) and Total Pollution Values (TPV) of Construction Phase for Controlled Conditions\*

Location	Background Concentration ( $\mu\text{g}/\text{m}^3$ )	APCV ( $\mu\text{g}/\text{m}^3$ )		Total Pollution Value (TPV) ( $\mu\text{g}/\text{m}^3$ )			
		LTV	LTV	LTV		Contribution(%)	
				Phase 1	Phase 2	Phase 1	Phase 2
Monitoring Average	53	26.07	11.42	79.07	64.42	32.97	17.73
Baseline Measurement Location 1	33.96	23.71	12.86	57.67	46.82	41.11	27.47
Baseline Measurement Location 2	19.89	24.53	13.28	44.42	33.17	55.22	40.04

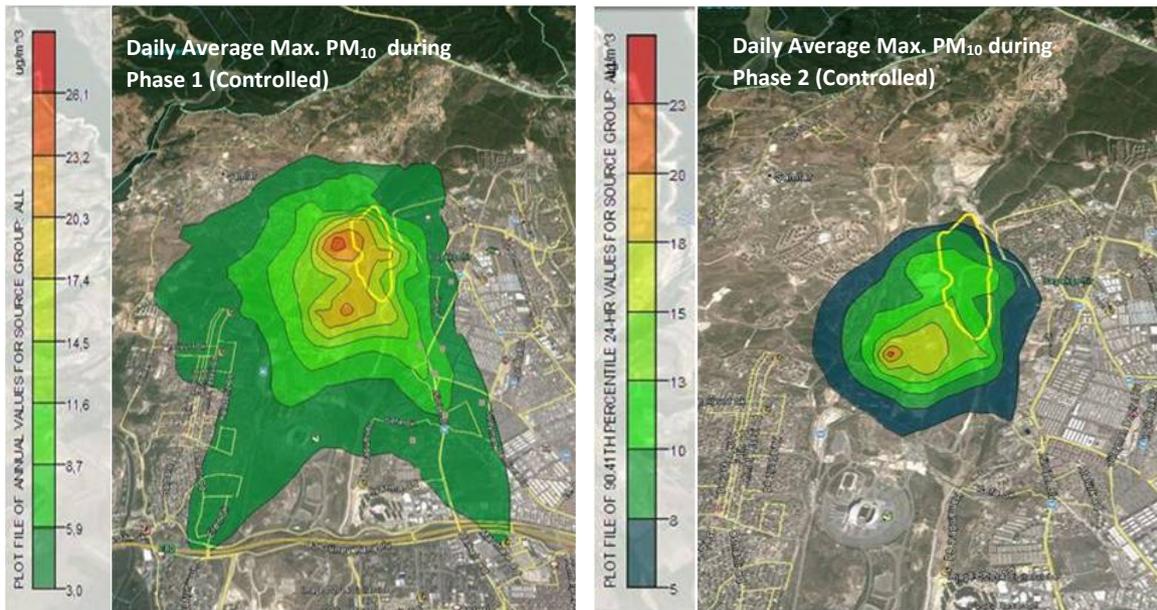
\*APCV and TPV values represent the modeled concentrations at measurement locations.

Based on the modeling results, average maximum GLC dispersions during Phase 1 and Phase 2 for controlled conditions are given in Figure 9-4 and Figure 9-5 for  $\text{PM}_{10}$  and PM deposition,

respectively (also presented in Annex H-2). PM<sub>10</sub> emission dispersion is to the south west direction as a result of the prevailing winds and the topography.

As shown in Table 9-20, daily and yearly GLC values of PM<sub>10</sub> to be originated during Phase 1 in uncontrolled working conditions are 105.70 µg/m<sup>3</sup> and 51.88 µg/m<sup>3</sup>, respectively and 44.63 µg/m<sup>3</sup> and 22.30 µg/m<sup>3</sup>, respectively during Phase 2. The daily GLC value of PM<sub>10</sub> during Phase 1 is higher than the limit values to comply with the RAMAQ and higher than the limit values of EU Directives and WHO Guidelines. Yearly GLC value of PM<sub>10</sub> during Phase 1 complies with RAMAQ values (for year 2014 and 2015 as Phase 1 is expected to be completed by 2015 or early 2015) but exceeds the international legislation limit values. Monthly and yearly PM Deposition values during Phase 1 are 51.48 mg/m<sup>2</sup>.day and 53.95 mg/m<sup>2</sup>.day respectively and 32.46 mg/m<sup>2</sup>.day and 29.67 mg/m<sup>2</sup>.day during Phase 2, respectively and these values are lower than the limit values given in IAPCR.

As shown in Table 9-21, daily and yearly GLC values of PM<sub>10</sub> to be originated during Phase 1 in controlled working conditions are 53.06 µg/m<sup>3</sup> and 26.07 µg/m<sup>3</sup>, respectively and 22.78 µg/m<sup>3</sup> and 11.42 µg/m<sup>3</sup>, respectively during Phase 2. These values are lower than the limit values to comply with the national limit values stipulated in RAMAQ. Daily GLC value of PM<sub>10</sub> during Phase 1 is close to but slightly exceeds EU Directive and WHO Guideline limit values. Monthly and yearly PM Deposition values during Phase 1 are 26.04 mg/m<sup>2</sup>.day and 27.30 mg/m<sup>2</sup>.day, respectively and 16.60 mg/m<sup>2</sup>.day and 15.21 mg/m<sup>2</sup>.day during Phase 2, respectively and these values are lower than the limit values to be complied with the IAPCR.



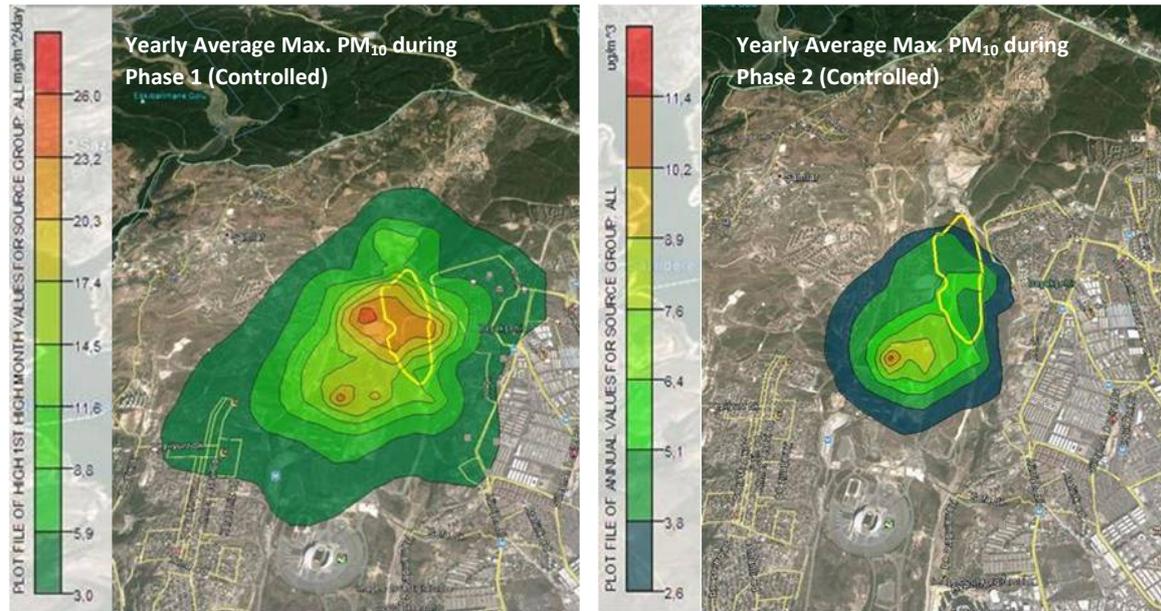
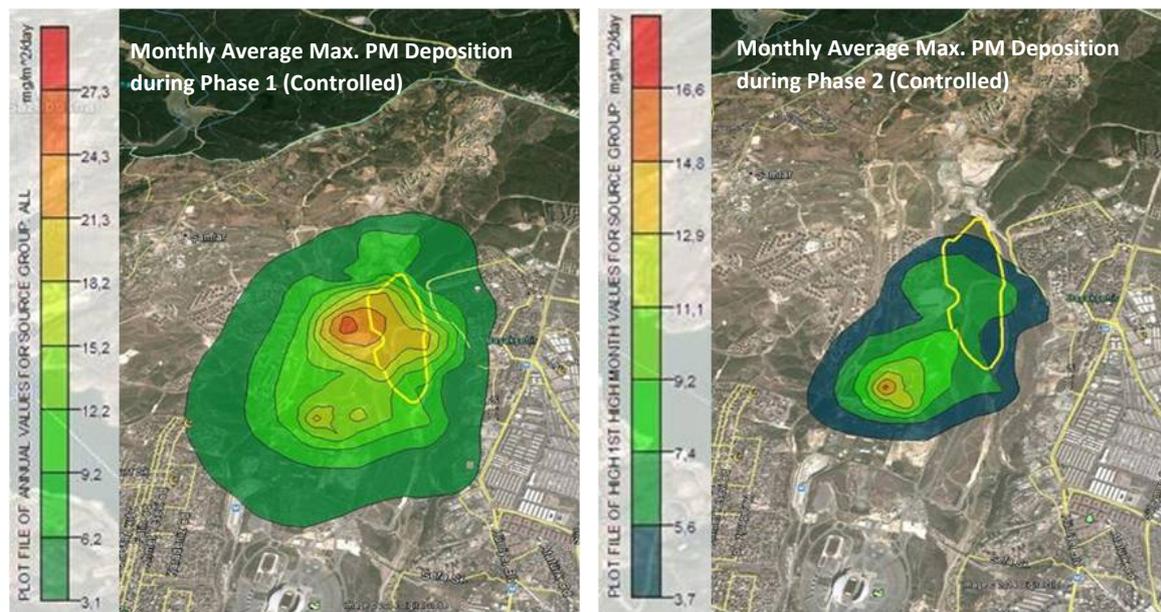


Figure 9-4: Average maximum GLC dispersion of PM<sub>10</sub> and during phase 1 and phase 2 activities under controlled conditions (Project site boundaries are shown with yellow lines)



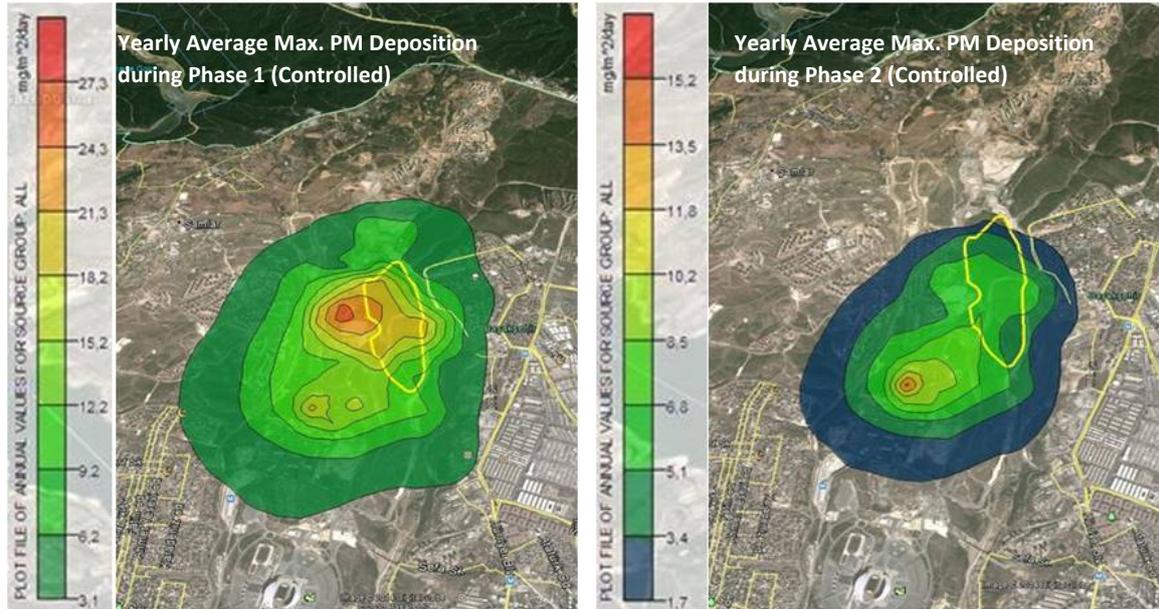


Figure 9-5: Average maximum GLC dispersion of PM deposition during phase 1 and phase 2 under controlled conditions (Project site boundaries are shown with yellow lines)

GLC values calculated for PM<sub>10</sub> originated from the construction phase in the PM<sub>10</sub> air quality monitoring points are presented in Table 9-22 for controlled conditions. As shown in Table 9-22, Total Pollution Value of PM<sub>10</sub> originated from Phase 1 activities is lower than the regulatory limit values. According to the table, Phase 2 Total Pollution Value of PM<sub>10</sub> is also lower than the limit values of working period. Based on the monitoring average results, it can be concluded that the background PM<sub>10</sub> value is close to the national limit value. For this reason, even though APCVs are lower than these limits and their contributions are low, total pollution values exceed limit values.

9.5.3.2 Operation Phase - Ground Level NO<sub>2</sub> Concentrations

Modeling studies were performed for NO<sub>2</sub> parameter for operation activities (for emissions from the cogeneration system). GLC's of NO<sub>2</sub>, determined from the modeling studies are listed in Table 9-23. GLC values estimated in the measurement points and the associated limit values are presented in Table 9-24.

Table 9-23: Operation Phase GLC Values Determined from the Modeling Studies

Parameter	Averaging Period	Values (µg/m³)	National Limit Values (µg/m³)		EU Limit Values (µg/m³)	WHO Limit Values (µg/m³)
			Year			
			2017	2024		
NO <sub>2</sub>	Hourly (99.71%)	18.07 (648852, 4551781)	270	200	200	200
	Annual	1.53 (649102, 4551531)	54	40	40	40

Table 9-24: Air Pollution Contribution Values (APCV) of Operation Phase

Location	Background Concentration ( $\mu\text{g}/\text{m}^3$ )	APCV ( $\mu\text{g}/\text{m}^3$ )	Total Pollution Value (TPV) ( $\mu\text{g}/\text{m}^3$ )	
	LTV	LTV	LTV	Contribution (%)
Monitoring Average	57	18.07	75.07	24
Baseline Measurement Location 1	11.62	0.26	11.88	2.19
Baseline Measurement Location 2	14.71	0.18	14.89	1.21

As shown in Table 9-23, hourly and annual GLC values of  $\text{NO}_2$  to be originated from the cogeneration plant are  $18.07 \mu\text{g}/\text{m}^3$  and  $1.53 \mu\text{g}/\text{m}^3$ , respectively. These values are significantly lower than the associated limits to be complied by the year 2024 which are set forth by the RAMAQ and international limit values. In accordance with the Table 9-24, contribution of the planned cogeneration plant to ambient air quality is maximum 24 %.

Hourly and annual average maximum GLC dispersion of  $\text{NO}_2$  during operation phase are shown in Figure 9-6. Pollutant dispersion is in north direction due to the effects of the prevailing winds and the topography.

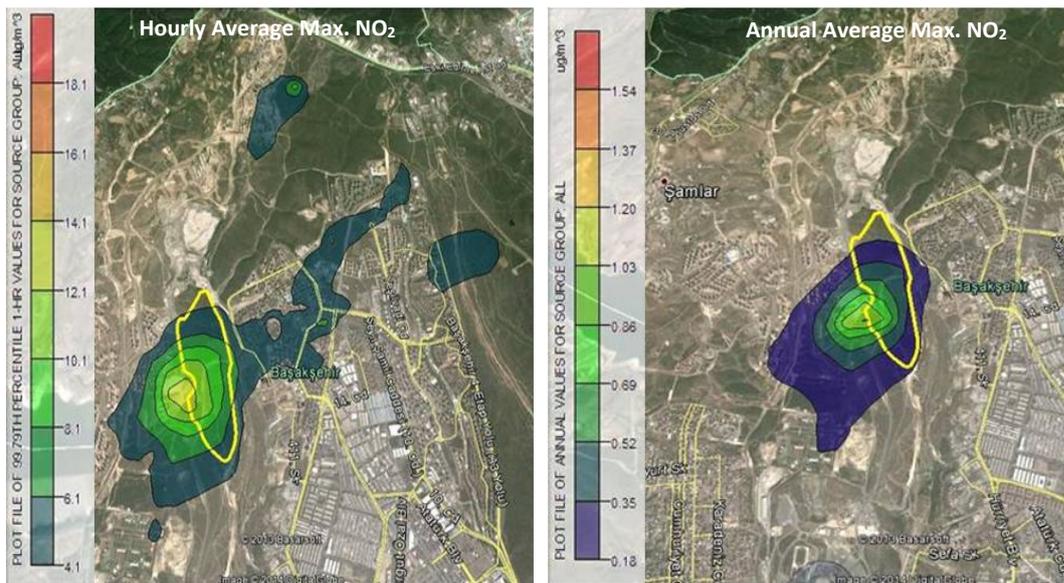


Figure 9-6: Average maximum GLC dispersion of  $\text{NO}_2$  during operation phase (Project site boundaries are shown with yellow lines)

## 9.6 Greenhouse Gases

Greenhouse gases can be described as gases that trap heat in the atmosphere. These gases allow sunlight to reach the Earth’s surface unimpeded. The visible part of the sunlight which is shortwave energy heats the surface and invisible long wave energy reradiate to the atmosphere. Greenhouse gases absorb long wave energy, thereby allowing less heat to escape back to space, and trapping it in the lower atmosphere. Greenhouse gases are responsible for the greenhouse effect, which ultimately leads to global warming. The main anthropogenic source of the greenhouses gases is burning of fossil fuels.

In order to monitor, verify and report greenhouse gases, the Regulation on the Monitoring of Greenhouse Gases (RMGG) was released. This regulation covers the procedures and principles for activities which take part in Annex-I of this regulation. In regard to the regulation, greenhouse gases are listed as CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFC's, PFC's and SF<sub>6</sub>.

As mentioned above, the main source of the greenhouse gases is burning of fossil fuels. Fossil fuel burning activities will be conducted in both construction and operation phases of the Project. Greenhouse gases will be emitted from vehicle engines during the construction phase and the cogeneration system during the operation phase. Vehicle emissions are excluded from RMGG Annex-I and combustion activities are only considered when they are above the 20 MW limit. Since the total thermal power of the cogeneration plant (16.7 MW) is lower than this limit, the Project is exempt from RMGG. Despite this, CO<sub>2</sub> emissions are calculated for the cogeneration plant by Ingovernmental Panel on Climate Change (IPCC) emission factors.

Default Emission Factor for Natural Gas: 56,100 kg gas/TJ

Fuel Consumption=135 GJ/h=0.135 TJ/h

CO<sub>2</sub> Emissions= 0.135 TJ/h x 56,100 kg/TJ =7,573.5 kg/h CO<sub>2</sub> emissions.

## 9.7 Impacts on Air Quality

### 9.7.1 Impacts during Construction

During the construction of the Project, dust emissions will arise from earth movements, transport of construction materials and resources, transport of excavated soils outside the Project area, working of machinery and vehicle movements inside the Project area. There will also be gas emissions from construction vehicles and equipment such as generators, excavators, bulldozers, trucks, cars. Air dispersion modeling study (for PM<sub>10</sub> and PM dispersion) was undertaken to estimate the air quality impacts associated with the construction. Within the scope of the modeling study, construction activities were considered in two phases: earthworks (land preparation and excavation) and main construction activities (phase 1) and main construction activities (phase 2). In accordance with the result of the modeling studies, daily and yearly GLC values of PM<sub>10</sub> to be generated in controlled working conditions are 53.06 µg/m<sup>3</sup> and 26.07 µg/m<sup>3</sup>, respectively during Phase 1 and 22.78 µg/m<sup>3</sup> and 11.42 µg/m<sup>3</sup>, respectively during Phase 2. These values (both daily and yearly) are lower than the limit values to comply with the national limit values stipulated in RAMAQ. Daily GLC value of PM<sub>10</sub> during Phase 1 slightly exceeds EU Directive and WHO Guideline limit values, whereas yearly GLC value of PM<sub>10</sub> during Phase 1 exceeds the WHO Guideline limit value. It is important to note that the international limit values are slightly exceeded but this is using the assumption that all activities during Phase 1 are considered to be undertaken at the same time to evaluate worst-case conditions. In this regard, it is expected that the emissions would be lower than the calculated values as it is practically impossible to carry out all activities concurrently. This reduction in emission will most likely result in the values meeting the international limit values and related impacts will be of minor significance. Monthly and yearly PM Deposition values during Phase 1 are 26.04 mg/m<sup>2</sup>.day and 27.30 mg/m<sup>2</sup>.day respectively and 16.60 mg/m<sup>2</sup>.day and 15.21 mg/m<sup>2</sup>.day during Phase 2, respectively and these values are lower than the limit values to comply with the IAPCR.

Based on the monitoring average results, it can be concluded that the background PM<sub>10</sub> value is close to the national limit value. For this reason, even though APCVs are lower than these limits and their contributions are very low, total pollution values exceed limit values.

Transport of construction materials and transport of excavated soils outside the Project area will result in emissions related to construction traffic which may have the potential to affect the ambient air quality. Transport of excavated soils to the disposal site located at the north of the Project area is considered in the modeling study. Regarding the transport of the construction materials, it is expected that they will be transported through the E-80 Motorway and then through the Olimpiyat Road. Considering that this type of transportation will be temporary and there are limited settlements along the road, it is anticipated that the impacts will be of minor significance.

### **9.7.2 Impacts during Operation**

- There will be impacts on the air quality from the health campus during the operation phase which will mainly be related with the emissions from the cogeneration system and fugitive emissions (released from sources such as medical waste storage areas, medical technology areas and isolation wards) that may be potentially contaminated with biological agents, pathogens, or toxic materials. It is expected that necessary exhaust/treatment systems will be included in the design of the health campus to eliminate mentioned emissions and no significant impacts will occur. There will also be impacts related to increase in emissions from road traffic during the operation of the health campus.
- In order to identify the impact of the cogeneration system, an air dispersion modeling study was undertaken for the NO<sub>2</sub> parameter which is the significant emission source from the cogeneration system. The modeling study considered a stack height of 12 m for each gas turbine (5 stacks in total). Hourly and annual GLC values of NO<sub>2</sub> estimated from the cogeneration plant are 18.07 µg/m<sup>3</sup> and 1.53 µg/m<sup>3</sup>, respectively. These values are significantly lower than the associated limits to be complied by in year 2024 which are set forth by the RAMAQ and international limit values. When the total contribution value to the ambient air quality is calculated, it is seen that the maximum contribution rate to the ambient air quality is 24% which is related with the high background values.
- In addition, there will a generation of greenhouse gas emissions during the operation of the cogeneration system which is calculated as 66,344 tonnes CO<sub>2</sub>/year. According to the IFC Performance Standard 3, for projects that produce more than 25,000 tonnes of CO<sub>2</sub> equivalent annually, there is a need to quantify the direct and indirect emissions annually. The Project will be expected to meet this requirement and undertake necessary actions to minimize the greenhouse gas emissions.

## **9.8 Mitigation**

### **9.8.1 Mitigation of Air Quality Impacts during Construction**

An Air Quality Control and Monitoring Plan will be prepared, which will include mitigation measures that will be taken to reduce the dust emissions during construction. Additionally, air pollutants will be monitored at nearby sensitive locations to ensure minimal impacts in accordance with the Air Quality Control and Monitoring Plan.

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The following mitigation measures will be implemented to address dust emissions during construction:

- Minimal particulate emission from the construction activities will be maintained by good management and housekeeping practices and use of dust suppression methods. Water spraying will be performed at dust generating areas inside the Project area especially during dry weather conditions.
- Turkish Regulation on the Control of Excavated Soils, Construction and Demolition Wastes (Official Gazette Date/No: 18.03.2004/25406) will be followed which requires taking necessary measures to minimize dust emissions during excavations.
- Excavated soils will be stockpiled (as necessary) at designated areas and will be placed as far as possible from the settlements particularly located in the west. Dusty and loose materials will be properly covered or top layers will be kept moist.
- Screens will be placed as necessary at the construction site to reduce dust emissions.

The following mitigation measures will be implemented to minimize dust emissions related to transport of materials during construction:

- Vehicle speed limits will be applied inside the Project area. Truck operators will be trained to comply with speed limits and good construction site practices.
- Trucks carrying excavated soils will be covered before leaving the construction area.
- Transfer roads will be sprayed with water as necessary (for example using mobile bowsers) to prevent significant dust emissions especially in dry weather conditions.

### *Exhaust Emissions*

The construction equipment and trucks will be maintained regularly to keep them in good working condition to minimize exhaust emissions caused by poor performance. Low sulphur fuel will be preferred as far as possible. Engines of the equipment/trucks will be prevented from idling and running unnecessarily. A Traffic Management Plan will be prepared and implemented which will decrease the impacts of the traffic load resulting from the construction activities. This, in turn, will lower the exhaust emissions from the truck movements.

### **9.8.2 Mitigation of Air Quality Impacts during Operation**

The Air Quality Control and Monitoring Plan to be developed will include mitigation measures that will be taken to minimize emissions during operation.

The most significant pollutant emitted from natural gas fired cogeneration systems is NO<sub>2</sub>. In order to reduce stack emission from the cogeneration system, a catalytic converter system or equivalent will be used which is already considered during the modeling study. A catalytic converter is a device that uses a catalyst to convert hydrocarbons, NO<sub>x</sub> and CO compounds into harmless compounds. Efficiency of the reduction system will be monitored periodically.

A Traffic Management Plan will be prepared and implemented which will decrease the impacts of the traffic load resulting from the operation activities. This, in turn, will lower the exhaust emissions from the vehicle movements.

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## 9.9 Residual Impacts

Impacts from air emissions during the construction phase can be effectively mitigated through good management practices and implementation of mitigation measures mentioned above. For this reason, it is assumed that the residual impacts on air quality will not be significant.

Based on the results of the dispersion modeling studies, the residual impacts from emissions generated by the operation of the proposed Project, mainly due to operation of a cogeneration system, are predicted to be minimal.

## 10.0 NOISE

### 10.1 Introduction

This chapter presents the assessment of the noise impacts that will be generated by the construction and operation of the Project. In order to evaluate the impact of noise due to the Project activities, a noise modeling study was undertaken covering the Project area and its surroundings, for excavation/earthworks, main construction and operation phases.

In addition to the noise modeling study, baseline noise measurements were conducted at the nearest receptors, to have background data prior to the start of the construction of the Project and also in order to compare the modeling results with the background values.

The results of the noise modeling and the background values for noise were then compared with the Turkish and international standards.

The impact significance criteria that are used related to noise are presented below.

Impact Significance	Description
Negligible	- Generation of noise that does not exceed limit values defined in Turkish Regulation on Environmental Noise and the background noise levels
Minor	- Generation of noise that does not exceed limit values defined in Turkish Regulation on Environmental Noise and the background noise levels by 3 dBA
Moderate	- Generation of noise that exceeds the limit values defined in Turkish Regulation on Environmental Noise and the background noise levels by 5 dBA
Major	- Generation of noise that exceeds the limit values defined in Turkish Regulation on Environmental Noise and the background noise levels by 10 dBA and more

### 10.2 Definitions and Methodology

#### 10.2.1 Definitions

Before explaining the studies that were undertaken, it would be helpful to provide definitions of basic acoustical terms and concepts, as given below.

**Sound:** Sound is vibrational disturbance, exciting hearing mechanisms, transmitted in a predictable manner determined by the medium through which it propagates. To be audible, the disturbance must fall within the frequency range 20Hz to 20,000Hz.

**Noise:** Noise is typically defined as "unwanted sound", sound being the human sensation of pressure fluctuations in the air. Sound levels are expressed in decibels (dB) on a logarithmic scale, where 0 dB is nominally the "threshold of hearing" and 120 dB is nominally the "threshold of pain".

**Background (Baseline) noise:** Prevailing noise in a specified environment measured in the absence of the noise being studied.

**Decibels (dB):** It is the unit describing the amplitude of the sound. The human hear responds to sound logarithmically. The bel is logarithm of the ratio of the two powers and decibel is 1/10 bel.

**Frequency:** The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or Hz.

**Sound pressure level ( $L_p$ ):** It is a logarithmic measure of the effective sound pressure of a sound relative to a reference value. It is measured in decibels (dB) above a standard reference level. The commonly used "zero" reference sound pressure in air is 20  $\mu$ Pa RMS (root mean square), which is usually considered the threshold of human hearing (at 1 kHz).

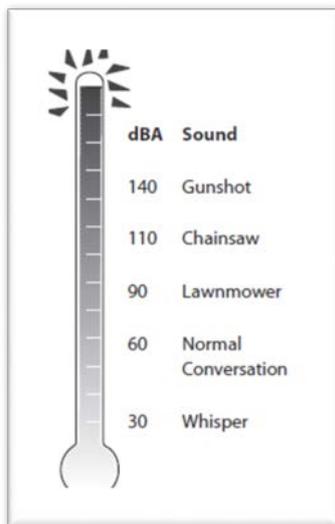
**Sound power level ( $L_w$ ):** Ten times the logarithm of the ratio of the sound power under consideration of the standard reference power of 1 pW ( $10^{-6}$  W). The quantity obtained is expressed in decibels.

**Equivalent Sound Level ( $L_{eq}$ ):** Quantifies the noise environment as a single value of sound level for any desired duration.  $L_{eq}$  correlates well with the effects of noise on people.  $L_{eq}$  is also sometimes known as Average Sound Level.

**$L_{10}$ :** Sound pressure level that is exceeded 10% of the time of measurement.

**$L_{90}$ :** Sound pressure level that is exceeded 90% of the time of measurement.

**A-Weighting:** A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear's response, it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA).



Several methods are present to characterize sound. The most common is the A-weighted sound level or dBA. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Studies have shown that the A-weighted level is closely correlated with annoyance.

**C-Weighting:** A measure of sound pressure level designed to reflect the response of the human ear, for higher levels above 100 dB when the human ear's response is flatter.

**$L_{Aeq}$ :** A weighted equivalent sound pressure level.

**$L_{Amax}$ :** The maximum A weighted sound pressure level detected in the measurement time domain.

LCeg: C weighted equivalent sound pressure level.

Point Source: A source of sound which is concentrated to a point.

Area Source: A source of sound which is distributed over an area.

Line Source: A source of sound emanating from a linear geometry.

The threshold of perception of the human ear is approximately 3 dB, and a 5 dB change is considered to be clearly noticeable to the ear. This is primarily due to the logarithmic measuring metric typically associated with decibels. The perceived change with regard to decibel levels is shown below:

Change in sound level	Perceived Change to the Human Ear
± 1 dB	Not perceptible
± 3 dB	Threshold of perception
± 5 dB	Clearly noticeable
± 10 dB	Twice as loud
± 20 dB	Four-fold change

### 10.2.2 Methodology

#### Noise Modeling

The noise model was developed using the commercial noise modeling software IMMI from Woelfel. The important parameters for the modeling and the methods used are described below.

The information on ground topography and buildings is important to be included in the noise model, since sound propagation is strongly affected by the terrain levels as obstacles, and by the buildings between sources and receivers as barriers. To develop the noise model of the Project, the ground topography data was obtained for an area of 8.1 km<sup>2</sup> area from the Digital Elevation Model Dataset from NASA, Reverb Earth Science Discovery tool as shown in Figure 10-1.

The surrounding buildings and facilities were digitized manually using the Google Earth imagery. The number of storeys and height of the surrounding buildings are based on field observations. Height of surrounding buildings is presented in Figure 10-2.

Meteorological data (average relative humidity, average temperature, wind frequencies and directions as obtained from General Directorate of Meteorology) was entered to noise mapping software.

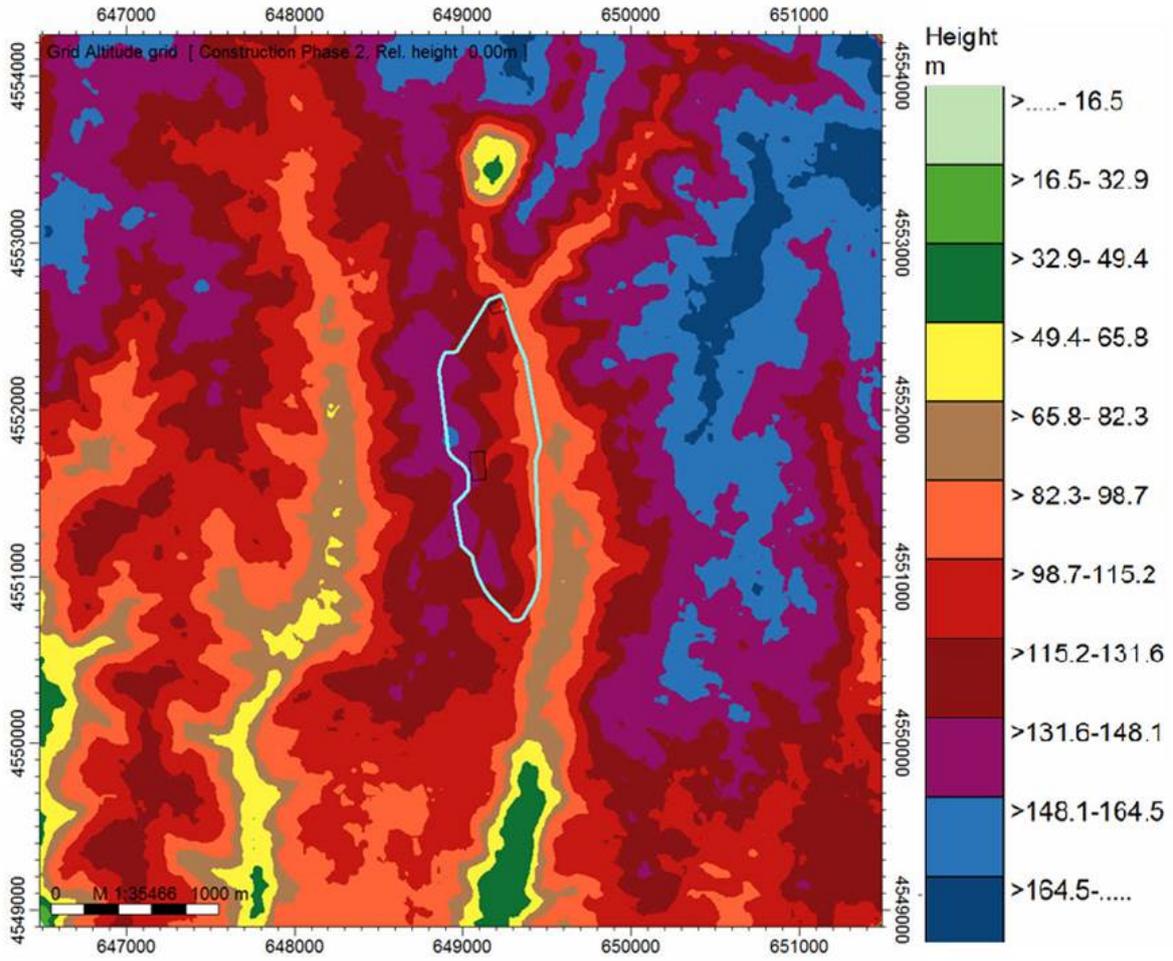


Figure 10-1: Terrain levels of the Project area (Project area is indicated by the light blue line)

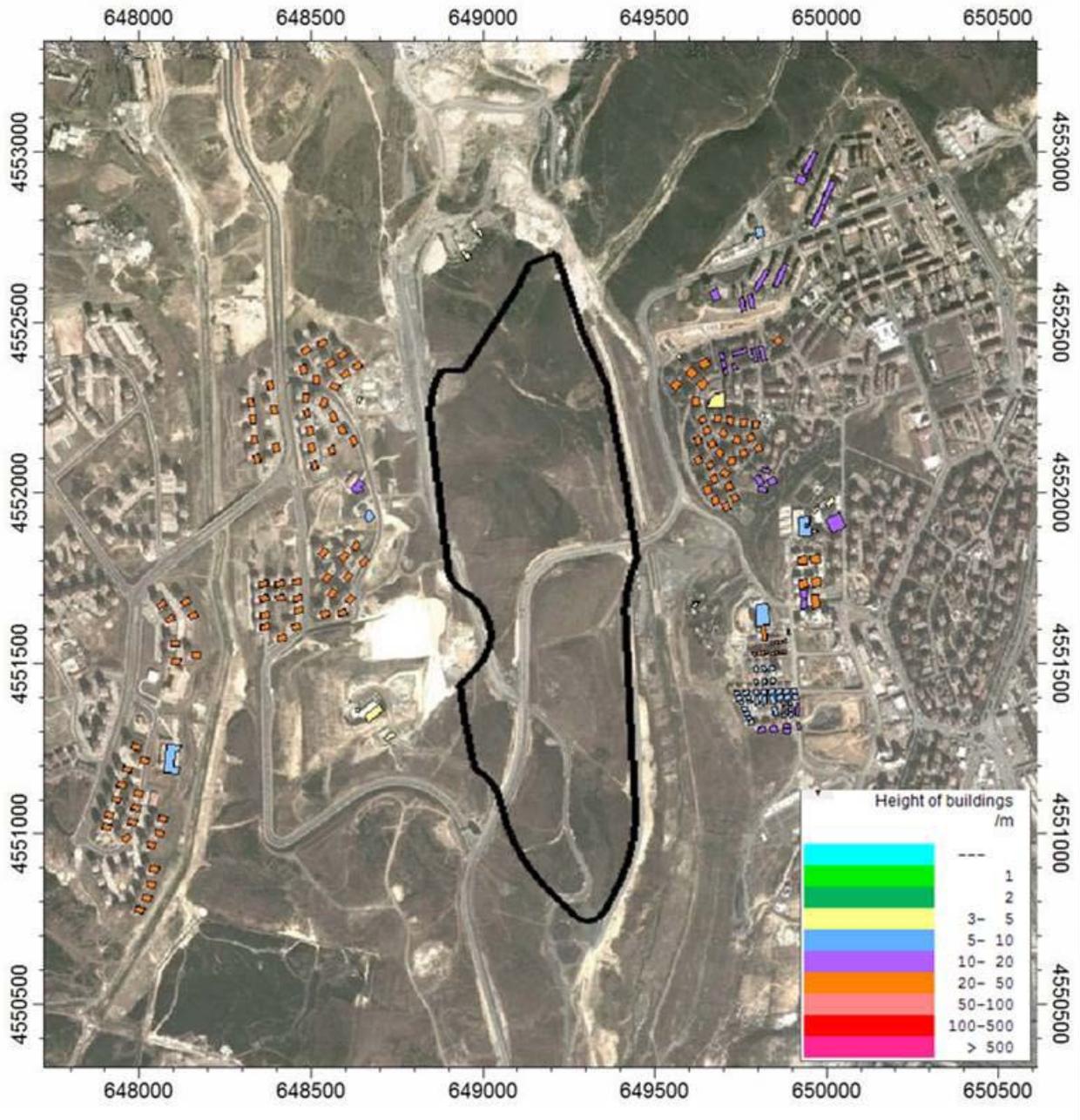


Figure 10-2: Building heights around the Project area

The noise model was developed with the commercial noise modeling software IMMI v2011-2. The calculations were carried out with ISO 9613 which is recommended by the Turkish Regulation on the Assessment and Management of Environmental Noise (Official Gazette Date and Number: 10.06.2010/27601).

The ISO 9613-2:1996 standard was used for calculating the noise from the machinery and equipment such as exhaust, turbine, generator, engine and construction equipment. The sound power level ( $L_w$ ) of each source was entered into the noise model.  $L_w$  denotes the loudness of the equipment. There are three different approaches for determining  $L_w$ .

- First method is to calculate  $L_w$  from sound pressure level ( $L_p$ ) measurements (Sound power levels of existing equipment which will be used at the beginning of the project were calculated from measurements performed in the Project as detailed in relevant sections).

- Second method includes using reference values. In order to determine  $L_w$  of construction machine and equipment, Roadway Construction Noise Model User's Guide (RCM) of the U.S. Federal Highway Administration was used. This guide includes sound pressure levels of various construction equipment.  $L_w$  was calculated based on the information submitted in this guide.
- Last approach is, calculation of sound power levels from engine powers of equipment which are planned to be used in the Project. This  $L_w$  prediction approach is more theoretical and mainly depends on conversion of engine power to acoustical power.

In addition to  $L_w$ , type of the noise source is an important parameter for the noise model. Different types of noise sources can be used in the model including point, line and area sources. Because of the mobility and dynamic behaviors of the construction equipment, they were modeled as an area source.

The calculation of traffic caused by construction trucks and equipment were carried out with XPS31-133 French Standard which is recommended by the Turkish Regulation on the Assessment and Management of Environmental Noise and European Commission for the Assessment of environmental noise caused by sources such as highway, bridges, and tunnels by using the emission values mentioned in "Guide du bruit des transports terrestres, fascicule prevision des niveaux sonores CETUR 1980" document.

Another important parameter for the noise model is the ground absorption (G). Ground absorption varies between 0 to 1 for hard - reflective surfaces and soft - absorptive surfaces, respectively. When calculating the noise propagation, G for land area was assumed to be 0.5.

The noise prediction model used in this study is limited with the defined noise sources as described in the next sections of this chapter. There may be other noise sources that cannot be foreseen at this stage. For this reason, modeling results provide information on noise propagation based on the noise sources considered.

#### *Project Phasing and Noise Modeling Conditions*

Within the scope of the Project, noise modeling was undertaken considering three phases as below:

- Phase 1 (0-8 months): Land Preparation & Earthworks & Main Construction
- Phase 2 (9-36 Months): Main Construction
- Phase 3 (after 36 months): Operation phase

As indicated above, the construction activities are separated in two phases. Land preparation and excavation works will last for 8 months. Within this period, construction activities will also start. Excavation and main construction works will be undertaken within the immediate Project area. Although several equipment and machinery will not be used continuously during construction, all types of equipment and machinery are assumed to be operated together to assess the worst scenario.

## 10.3 Environmental Noise Standards and Guidelines

### 10.3.1 Turkish Regulations

#### Noise

Environmental noise is regulated by the Turkish Regulation on the Assessment and Management of Environmental Noise (Official Gazette Date/Number: 07.03.2008/26809). The regulation sets noise limits applicable to various areas (e.g. industrial areas, residential areas or combination of both) for three time periods (day, evening and night time). Noise limits for construction sites are given in Table 10-1.

Table 10-1: Environmental Noise Limits for Construction Sites

Type of activity (construction, demolition and renovation)	Leq-daytime (dBA) Day (07:00 - 19:00)
Building	70
Road	75
Other sources	70

In accordance with the mentioned regulation, construction activities inside or close to residential areas are not allowed to be conducted within evening and night time periods unless a consent is obtained from the relevant authorities. The construction working hours for the Project will be between 08:00 to 18:00 which falls to the daytime period. Construction activities will also continue throughout the night time as necessary. During excavation works, the working hours of the trucks will be between 10:00 to 16:00 and 22:00 to 06:00. Excavation works are likely to be undertaken during the time period 22:00 to 06:00 which requires obtaining necessary consent from Istanbul Provincial Directorate of Environment and Urban Planning and other relevant authorities (i.e. municipalities) as needed.

Related to the operation phase of the Project, there is no defined limit value for noise emission sources of hospital activities to the surrounding buildings in the Turkish Regulation on the Assessment and Management of Environmental Noise. The most important noise source inside the IHC during the operation phase will be the cogeneration system, which is regarded as industrial noise and evaluated with respect to the environmental noise limits for industrial facilities as defined in the Turkish Regulation as given in Table 10-2. Table 10-2 presents maximum allowable environmental noise levels that shall be met at the nearest off-site receptor.

Table 10-2: Environmental Noise Limits for Industrial facilities (Leq-dBA)

Areas	Day (07:00 - 19:00)	Evening (19:00 - 23:00)	Night (23:00 - 07:00)
Areas where sensitive receptors are located including education, culture, health, summer houses and camping areas	60	55	50
Commercial and residential areas where residential buildings dominate	65	60	55
Commercial and residential areas where workplaces dominate	68	63	58
Industrial areas	70	65	60

The Project area is selected to fall within the area “Commercial and residential areas where residential buildings dominate” and therefore the associated noise limits are applicable to the operation of the cogeneration system during the operation phase of the Project. In addition, the mentioned regulation requires that the noise level at the nearest sensitive area (e.g. residential building) shall not exceed the baseline noise levels by more than 5 dBA. In addition to the cogeneration system, there will be generators at the IHC but their capacities and location inside the IHC is not determined at this stage by IHIC and therefore could not be included in the assessment and modeling study.

In addition, the Turkish Regulation on the Assessment and Management of Environmental Noise defines indoor noise levels for sensitive areas including health facilities as given in Table 10-3. These limits were also considered in assessing the impacts from the cogeneration system during operation phase.

Table 10-3: Indoor Noise limits for health facilities (Leq-dBA)

Health Facilities	Closed window	Open window
Inpatient treatment institutions, dispensary, polyclinic, nursing center and similar	35	45
Resting and treatment rooms	25	35

### Vibration

The Turkish Regulation on the Assessment and Management of Environmental Noise also sets limits for ground vibrations to be perceived at very sensitive and sensitive receptors. The relevant limits for the Project are those limits that are set for piling activities during construction and construction machinery as given in Table 10-4. However, it is important to note that there will be no pile driving during the construction of the Project and only vibrations related to construction machinery is considered.

Table 10-4: Maximum allowable ground vibration limits for pile driving and construction machinery

Area	Maximum Allowable Vibration Velocity (peak value in mm/s) (Frequency band between 1 Hz to 80 Hz)	
	Continuous vibration	Intermittent Vibration
Residential areas	5	10
Industrial and commercial areas	15	30

### 10.3.2 IFC Guidelines

IFC General Environmental, Health and Safety Guidelines sets limits for noise for two types of receptors and two time periods, as given in Table 10-5.

Table 10-5: IFC noise level guidelines (One hour Leq-dBA)

Receptor	Daytime (07:00 - 22:00)	Nighttime (22:00 - 07:00)
Residential areas	55	45
Commercial/industrial areas	70	70

The guideline requires that noise levels do not exceed the limits given in Table 10-5, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

## 10.4 Baseline Measurements

Baseline environmental noise measurements were conducted in November 2013 at the nearest receptors to the Project area (4 measurement locations). The measurements at each location were conducted for 24 hours. The measurement locations are shown in Figure 10-3. The measurements were conducted by Frekans Çevre Ölçüm Mühendislik Danışmanlık Tic. İhr. Ltd. Şti. The measurement report is presented in Annex I-1. The baseline measurements were conducted on the east side of the Project area due to the fact that there was a construction activity (residential buildings) progressing on the west side of the project area. Moreover the west side of the project area can be determined as acoustic shadow which is an area through which sound waves fail to propagate due to topographical obstructions.



Figure 10-3: Background noise sampling locations

The measurement locations are described below:

- Location 1 is the nearest residential building.
- Location 2 is located in a residential area.
- Location 3 is located in an educational and cultural facility area.
- Location 4 is both residential and commercial area.

The distance of the measurement locations at the nearest receptors to the Project boundary at different directions are presented in Table 10-6. The results of the baseline measurements are provided in Table 10-7.

Table 10-6: Distance of measurement locations to the Project boundary

Measurement Location	Distance to Project area boundary (m)	Usage
1	190	Residential
2	475	Residential
3	460	Educational & Cultural
4	400	Residential & Commercial

Table 10-7: Results of baseline noise measurements at receptors

Measurement Location	Date	Noise					
		A Weighted					
		Leq dB(A)	L 10 dB(A)	L 90 dB(A)	Lday dB(A)	Leve dB(A)	Lnight dB(A)
1	01.11.2013 14:56	71.1	72.9	61.2	72.9	70.2	65.9
2	01.11.2013 14:29	58.4	61.1	49.0	60.5	55.4	53.5
3	01.11.2013 15:32	65.5	57.9	44.8	66.6	53.7	53.9
4	01.11.2013 15:58	56.8	58.5	46.5	58.4	55.4	53.6

The baseline measurements showed the following:

- Highest baseline noise level is observed at Location 1 which is mainly attributed to traffic noise and daily human activities.
- Location 3 which is a cultural and educational area, has the highest noise level difference between day and night which is attributed to the daily human activities during day time.
- Lowest baseline noise levels are observed at Location 4 for the day period. Noise levels during evening and night period at Location 4 are almost similar to the noise levels at Location 2. Density of population at Location 4 is relatively higher than at Location 2 resulting in higher day time noise levels at Location 4 as a result of daily human activities.

## 10.5 Noise Sources

This section provides information on the noise sources during construction and operation phases of the Project.

### 10.5.1 Construction Noise

Noise sources during construction will include land preparation, earthworks and main construction (Phase 1) and only main construction activities (Phase 2). The quantities of machines and equipment that will be required for Phase 1 and Phase 2 activities are given in Table 10-8. All equipment is assumed to work together to assess the worst scenario during each phase.

Table 10-8: Machine and equipment for earthworks and main construction activities

Machine/ Equipment	Quantity	
	Phase 1	Phase 2
Digger	17	-
Loader	3	-
Grader	4	3
Bulldozer	2	-
Truck	262	102
Crane	10	10
Mobile Crane	4	4
JCB	2	2
Bobcat	2	2
Roller	4	4
Sprinkler	2	2
Hiyap	2	2
Pick-Up Truck	25	25
Concrete Mixer	3	3
Compressor	2	2
Mobile Compactor	5	5
Concrete Pump	6	6
Mobile Concrete Pump	4	4
Generator	4	4
Batch Plant	2	2

Table 10-9 provides information on the sound power levels of the machines and equipment that were calculated based on the noise levels of each machine/equipment obtained from Roadway Construction Noise Model User's Guide (RCM) of the U.S. Federal Highway Administration. Table 10-9 also provides the quantities of the machines/equipment for Phase 1 and Phase 2, and the sound power levels for each type of machine/equipment and the total sound power level for each phase. Sound power levels in Table 10-9 were calculated using L<sub>Amax</sub> obtained from RCM. Usage factor (% operational time) accounts for the time that the machine/equipment is in use over a specified time period. The sound power levels were calculated by using the formula:  $L_w = L_{Amax} + 10 \log(U.F) + 20 * \log(15)$ .

112 of 262 trucks per hour were entered in to the model as a highway source according to XP S 31-133 with 40 km/h speed. Batch plants are also modelled as a separate area source from the other equipment.

Table 10-9: Sound Power Level Calculations of Construction Machines/Equipment and Total Sound Power Level for Earthworks (Phase 1) and Main Construction Phases (Phase 2)

Machine/Equipment	L(A) <sub>max</sub> @15 m.	Operation Time (%)	Construction Phase 1		Construction Phase 2	
			Quantity	L <sub>w</sub> (dBA)	Quantity	L <sub>w</sub> (dBA)
Digger	85	40	17	116.8	-	-
Loader	80	40	3	104.3	-	-
Grader	84	40	4	109.6	3	108.3
Bulldozer	84	40	2	106.6	-	-
Truck	84	40	262	124.4	102	123.6
Crane	85	20	10	111.5	10	111.5
Mobile Crane	85	20	4	107.6	4	107.6
JCB	84	15	2	102.3	2	102.3
Bobcat	84	15	2	102.3	2	102.3
Roller	84	40	4	109.6	4	109.6
Sprinkler	84	20	2	103.5	2	103.5
Hiyap	84	20	2	103.5	2	103.5
Pick-Up Truck	84	40	25	117.5	25	117.5
Concrete Mixer	85	20	3	106.3	3	106.3
Compressor	80	40	2	102.6	2	102.6
Mobile Compactor	83	20	5	106.5	5	106.5
Concrete Pump	82	20	6	106.3	6	106.3
Mobile Concrete Pump	82	20	4	104.6	4	104.6
Generator	82	20	4	104.6	4	104.6

As the construction activities will be distributed within the Project area and the machines/equipment except for batch plants (L<sub>w</sub>=101.3 dBA) will not stay in a fixed location, construction noise sources were defined as an area source in the noise modeling. The areas of sound sources and sound power level per area (L<sub>w</sub>'') area provided in Table 10-10.

Table 10-10: Sound power level per area (L<sub>w</sub>'')(dBA))

Phase 1		Phase 2		Batch Plants	
Area (m <sup>2</sup> )	L <sub>w</sub> ''(dBA)	Area (m <sup>2</sup> )	L <sub>w</sub> ''(dBA)	Area (m <sup>2</sup> )	L <sub>w</sub> ''(dBA)
789,031	69.9	789,031	66.5	14,000	59.8

### 10.5.2 Operational Noise

Noise sources during operation will be the equipment related to the cogeneration system. A schematic illustration of the cogeneration system is presented in Figure 10-4.

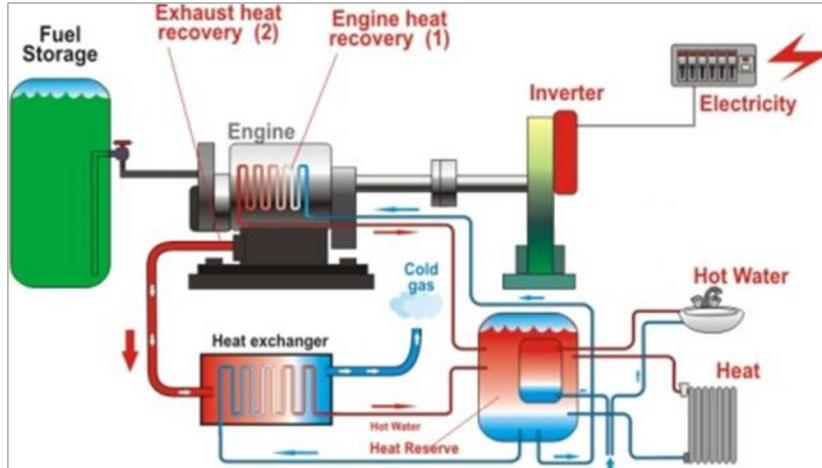


Figure 10-4: Schematic representation of the cogeneration system

The main noise sources of the cogeneration system are the gas turbine and generator which are together regarded as the engine unit. The estimated capacity of the cogeneration system is 16.75 MW which is planned to be generated by 5 engine units each with a capacity of 3.349 MW. Noise emission values of the 3.349 MW engine unit are supplied by the manufacturer and is presented in Table 10-10 and Table 10-11.

Table 10-11: Sound power levels of a 3.349 MW engine unit @ 1 meter

Engine Noise Level dB	Frequency									Sum Level
	31.5	63	125	250	500	1000	2000	4000	8000	
Exhaust Noise	112.0	121.0	131.0	119.0	117.0	118.0	117.0	112.0	98.0	132.2
Air-borne	88.0	95.0	101.0	99.0	94.0	93.0	92.0	94.0	95.0	105.5

The cogeneration system will use natural gas as fuel. The values in Table 10-10 and Table 10-11 are obtained from the manufacturer's test report which provides values for engines during operation at 100% capacity. In order to assess the worst case scenario, capacity of the 5 engines are taken as maximum. During modeling study, air-borne noise levels and exhaust noise levels given in Table 10-10 and Table 10-11 are entered into the model that are attributable to the engine enclosures and the chimney, respectively. The cogeneration unit building and engine locations for the model (shown with a blue circle line) are presented in Figure 10-5.



Figure 10-5: Cogeneration system, chimney location and sides of building

Considering the location of the cogeneration system inside the building, noise that will be reaching the walls on each side of the building (as shown with A, B, C and D in Figure 10-5) is calculated by using the following formula which gives sound levels in relation to the distance:  $L_2=L_1 - [20 \text{ Log}(r_1/r_2)]$  where;  $r_1$  is distance;  $r_2$  is the reference distance. Exhaust noise is calculated for 1.5 meter distance by using the same method. The calculated results are shown in Table 10-12.

Table 10-12: Engine noise level in dependence of distance

Engine Noise Level	Frequency									Sum Level
	31,5	63	125	250	500	1000	2000	4000	8000	
<b>Exhaust Noise</b>	<b>112.0</b>	<b>121.0</b>	<b>131.0</b>	<b>119.0</b>	<b>117.0</b>	<b>118.0</b>	<b>117.0</b>	<b>112.0</b>	<b>98.0</b>	<b>132.2</b>
@ 1.5 m	108.5	117.5	127.5	115.5	113.5	114.5	113.5	108.5	94.5	128.7
<b>Air-borne Noise</b>	<b>88.0</b>	<b>95.0</b>	<b>101.0</b>	<b>99.0</b>	<b>94.0</b>	<b>93.0</b>	<b>92.0</b>	<b>94.0</b>	<b>95.0</b>	<b>105.5</b>
Side A (23 m)	60.8	67.8	73.8	71.8	66.8	65.8	64.8	66.8	67.8	78.3
Side B (50 m)	54.0	61.0	67.0	65.0	60.0	59.0	58.0	60.0	61.0	71.6
Side C (60 m)	52.4	59.4	65.4	63.4	58.4	57.4	56.4	58.4	59.4	70.0
Side D (26 m)	59.7	66.7	72.7	70.7	65.7	64.7	63.7	65.7	66.7	59.7

## 10.6 Noise Mapping and Noise Modeling Results

Based on the implementation schedule of the Project and the construction and operation noise sources explained in the previous sections, noise modeling was conducted for the defined 3 phases. Noise maps were prepared in two different formats. First one is the horizontal grid maps which are prepared considering an elevation of 4 m above the ground level, and the second one is the vertical grid noise model. Vertical noise model helps to understand vertical noise impact on all the floors of the buildings concerned.

The axis of the noise propagation model maps represents the UTM coordinates in WGS84 coordinate system.

Related to the noise modeling for operation, additional parameters that include transmission loss and presence of a silencer in the exhaust system are also considered. Transmission Loss (TL) value of walls of the building (cogeneration unit building), where noise sources (cogeneration system) will be in, is provided from IMMI database. 1/1 Octave band TL values of the walls are presented in Table 10-13. It is assumed that the exhaust system will include a silencer. 1/1 Octave band TL values of the silencer (that provides minimum transmission loss by best fit materials) are presented in Table 10-14.

Table 10-13: Transmission loss value (wall)

f(Hz)	16	31.5	63	125	250	500	1000	2000	4000	8000
R'(dB)	20.0	30.0	42.0	43.0	46.0	51.0	57.0	63.0	66.0	66.0

Table 10-14: Transmission loss value (silencer)

f(Hz)	31.5	63	125	250	500	1000	2000	4000	8000
R'(dB)	8.0	12.0	16.0	21.0	30.0	37.0	37.0	35.0	27.0

It is considered in the noise modeling that the activities will not be changed by the time period (i.e. operation activities to continue 24 hours). For this reason, noise maps presented for the operation phase represent daytime, evening and nighttime levels.

### 10.6.1 Construction Phase

#### Horizontal Grid Maps

Horizontal grid map for noise propagation modeling of Phase 1: Preparation & Earthworks & Main Construction and Phase 2: Main Construction Activities are presented in Figure 10-6 and Figure 10-7, respectively. The detailed grid maps for these phases at and around the locations where baseline noise measurements were taken are presented in Annex I-2. Based on the results of the modeling, it is observed that the noise levels at the nearest residential building (Location 1) will vary between 58 dBA to 60 dBA during Phase 1 and 54 dBA to 56 dBA during Phase 2.

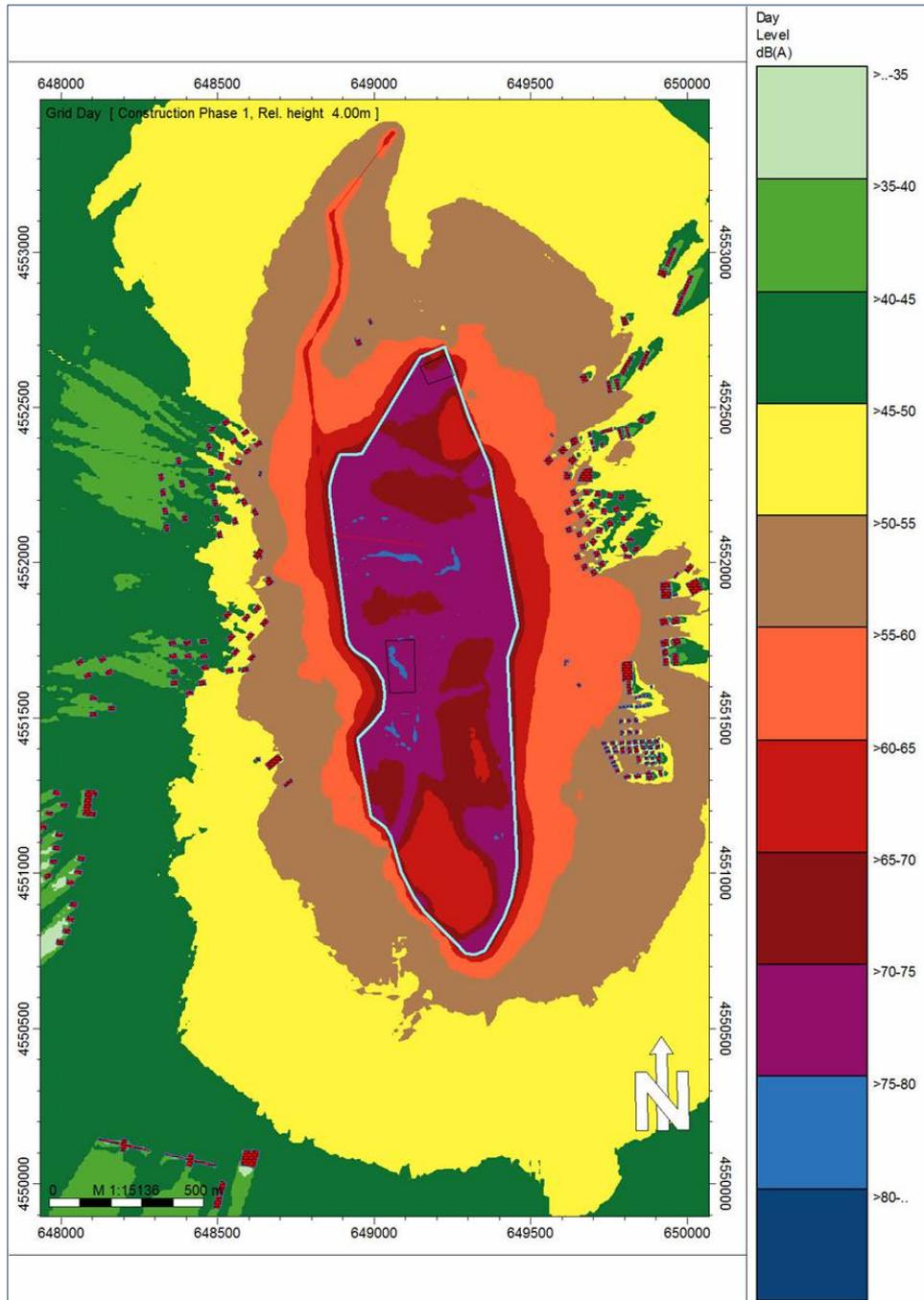


Figure 10-6: Noise propagation model for construction, Phase 1 (0-8 months)

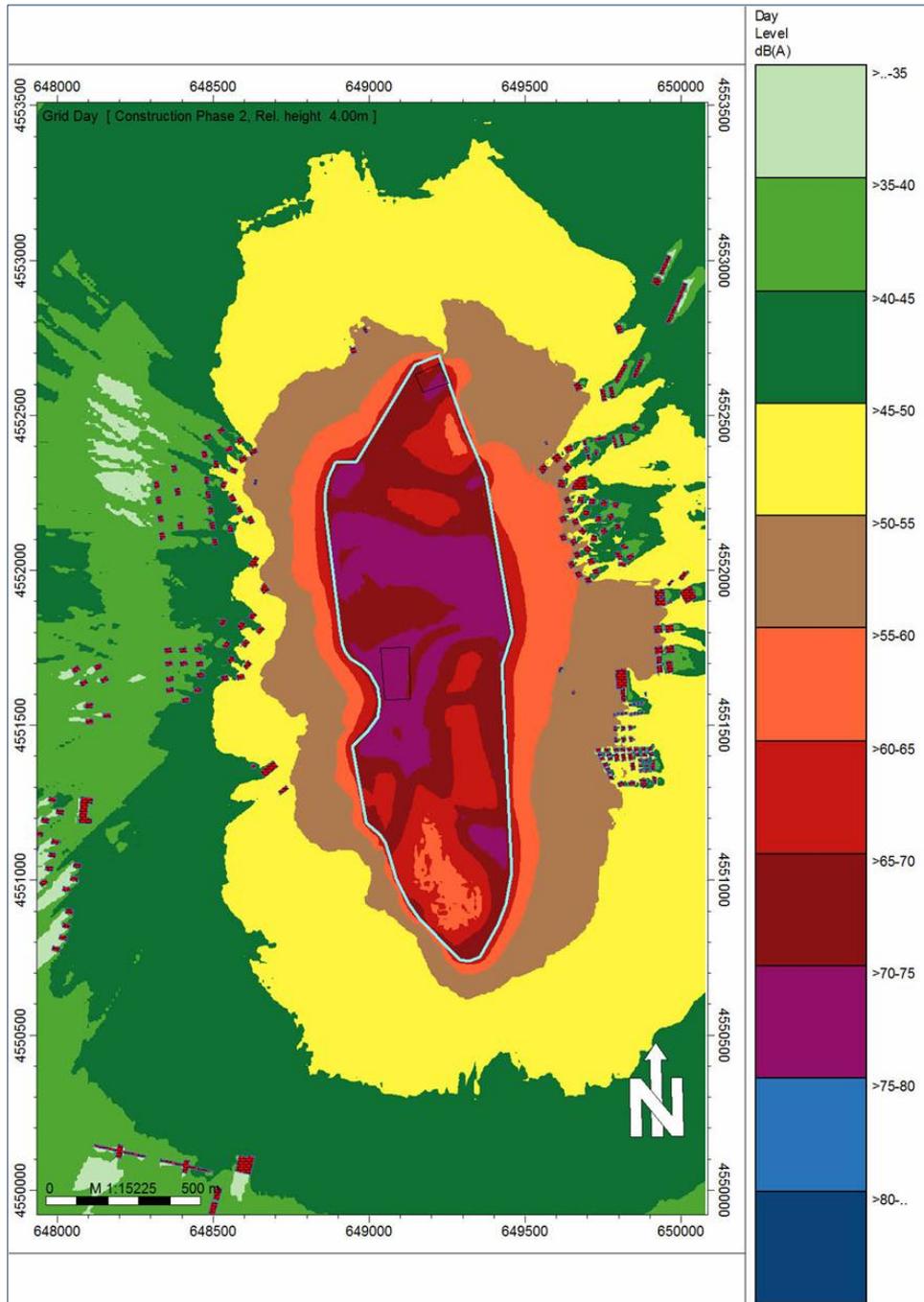


Figure 10-7: Noise Propagation Model for Construction, Phase 2 (9-36 months)

## 10.6.2 Operation Phase

### Horizontal Grid Maps

Horizontal grid map for noise propagation modeling of Phase 3: Operation Phase is presented in Figure 10-8.

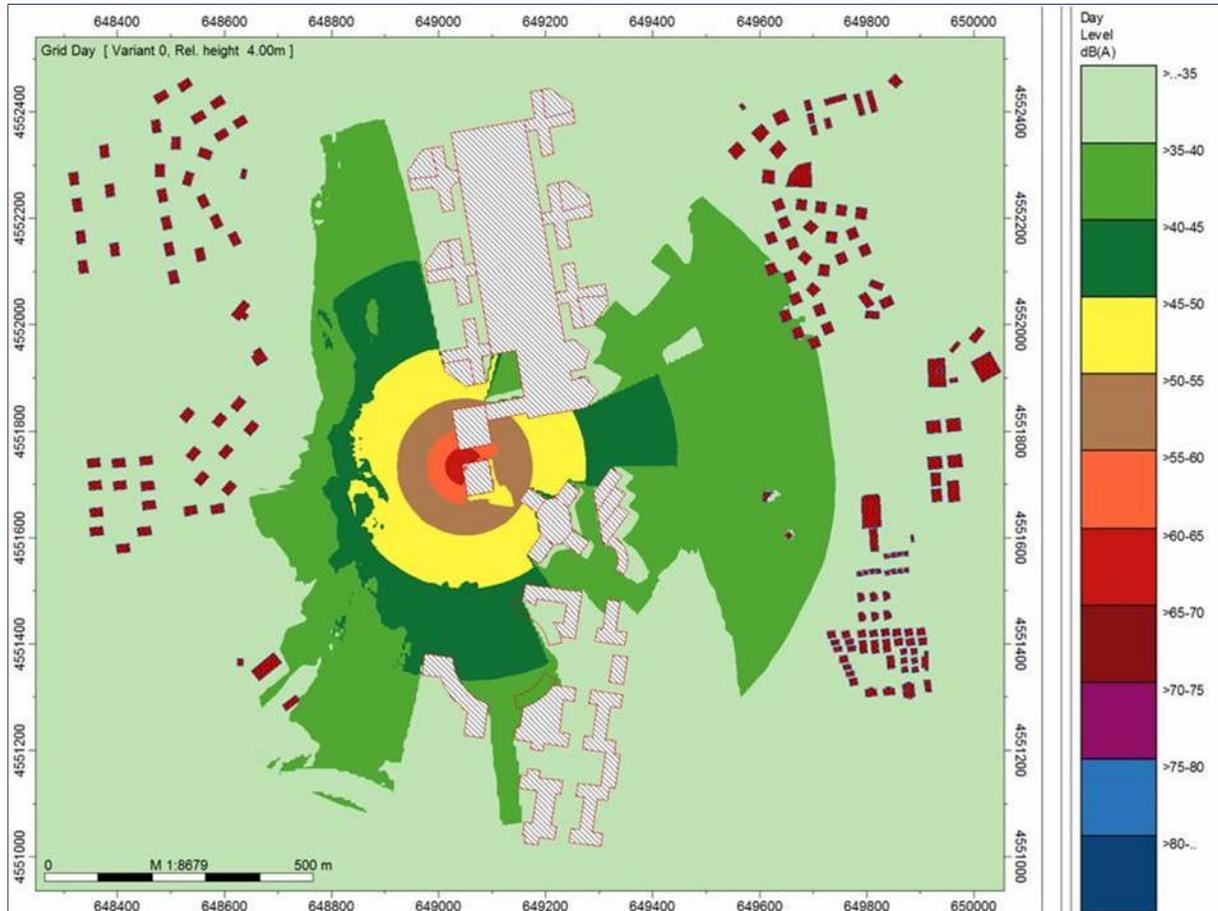


Figure 10-8: Noise Propagation Model for Operation Phase

As can be seen from Figure 10-8, the noise level at the receptors around the IHC will be less than 35-40 dBA during the operation phase. For this reason, focus has been given to the hospital buildings to determine the noise levels that reach the facade of these buildings that are close to the cogeneration unit building where the main noise source (cogeneration system) during operation phase will be located. One of the hospital buildings (Physical Therapy and Rehabilitation Hospital (RH)) is directly affected by the noise source. Figure 10-9 shows the locations of the RH and the cogeneration unit building with respect to each other. Noise levels that reach the facade of the RH are calculated. In addition, vertical grid noise map was also calculated to have more detailed information on noise emission values on the RH building. Noise levels that reach the facade of the RH and the relevant vertical grid map is given in Figure 10-10 and Figure 10-11, respectively. Noise levels on the facade of the RH are calculated as 50-51 dBA based on the vertical grid map. Recently, IHC has decided to revise the design of the RH building, changing its shape and moving it further away from the cogeneration building, which will help reduce the noise impact on the facade of the RH building. This will be reflected in the final design of the Project. The noise levels are discussed

below with regards to the indoor noise levels defined by the Turkish Regulation on the Assessment and Management of Environmental Noise.



Figure 10-9: Locations of RH and Cogeneration Unit Building in relation to each other



Figure 10-10: Noise Levels that reach the Facade of RH

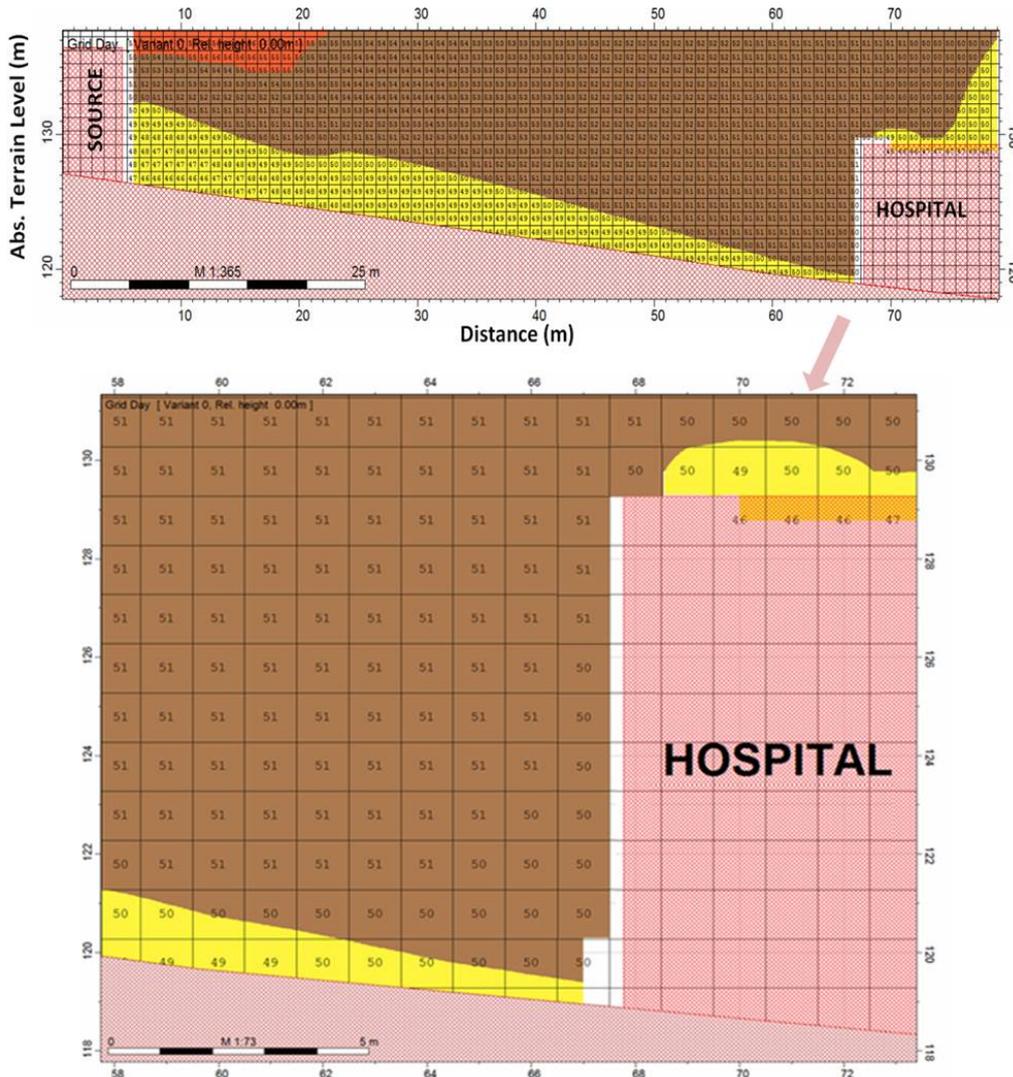


Figure 10-11: Vertical Grid Noise Map for RH

### 10.6.3 Noise Modeling Results

Table 10-15 presents the results of the noise modeling study for construction phase (Phase 1 and Phase 2) and for operation phase (Phase3) and compared the results with the Turkish standards and IFC guidelines.

Table 10-15: Noise modeling results (Leq, dBA)

Measurement			Noise Modeling Results				Turkish Standards			IFC Guidelines			
			Construction		Operation	Construction	Operation		Background Daytime +3 dB				
No	Background Noise Level			Phase 1			Phase 2	Operation	Construction	Day	Eve	Night	Day
	Day	Eve	Night										
1	72.9	70.2	65.9	53.3	50.5	33.2	70	65	60	55	75.9	73.2	68.9
2	60.5	55.4	53.5	61.2	58.4	35.6	70	65	60	55	63.5	58.4	56.5
3	66.6	53.7	53.9	53.4	50.6	33.6	70	65	60	55	69.6	56.7	56.9
4	58.4	55.4	53.5	56.5	53.7	34.7	70	65	60	55	61.4	58.4	56.5

## 10.7 Impacts

Main noise sources during construction activities include use of construction machinery and equipment during excavation works and main construction works; and construction traffic related to the transportation of excavated soils and construction materials. Increased noise levels during construction activities have the potential to result in negative impacts including disturbance and disruption as well as associated health problems at nearest sensitive receptors. The factual impact level due to construction activities will depend also on aspects such as the type of equipment to be used, time period and duration, and the perception of specific noise patterns (e.g. continuous, regular intervals, irregular). No piling or blasting, which are main sources of vibration, will be conducted at the Project site. For this reason, potential vibration impacts will be limited to the truck movements and use of construction machinery at the Project Site. Increase in vibration may result in disturbance to the occupiers of dwellings that are close to the west boundary of the Project site. The transfer of excavated materials off-site for disposal may cause disturbance particularly to the residents at the west boundary of the Project area as a result of frequent truck movements.

Main noise sources during operation phase include the road traffic which will mainly be limited to day time hours when background noise levels are higher leading to less disturbance at the receptors, and operation of the cogeneration system and generators at the Project site. In addition, there will be helicopter movements causing occasional noise.

In view of the above, in order to predict the impacts of the Project on environmental noise, baseline noise measurements and a sound propagation modeling study was conducted as described in detail in above sections. As explained previously, the construction activities are separated into two phases: land preparation, earthworks and main construction are considered as one phase and only main construction activities is considered as a second phase. The construction working hours for the Project will be between 08:00 to 18:00. Construction activities will also continue throughout the night time as necessary. During excavation works, the working hours of the trucks will be between 10:00 to 16:00 and 22.00 to 06.00. Excavation works are also likely to be undertaken during the time period 22:00 to 06:00. Operational activities (operation of the cogeneration system considered in operational noise modeling) are considered to continue 24 hours, however it must be noted that the only one of the turbines of the cogeneration system will be operated during night time when the energy need is the lowest. The results of the noise modeling revealed the following:

- Baseline noise levels (daytime levels) are not exceeded at all locations during Phase 1 and Phase 2, except for a slight increase at Location 2 during Phase 1 (0.7 dBA).
- Baseline noise levels (evening and night time levels) during Phase 1 are exceeded at Location 2 by 5.8 dBA and 7.7 dBA; and at Location 4 by 1.1 dBA and 3 dBA during evening and night time, respectively.
- Limits set in Turkish Regulation on the Assessment and Management of Environmental Noise are met during the construction and operation phases at all locations.
- Noise levels do not result in an increase in baseline noise levels by 3 dBA (IFC Guidelines require a maximum 3 dBA increase in the baseline noise levels at the nearest receptor location off-site) during construction and operation phases, except for Location 2 for evening and night time during Phase 1.

- Operational noise levels related to the cogeneration system are very low and meet the Turkish and IFC criteria for all time periods.
- Findings above focused on Phase 1 as there will be truck movements and likely excavation activities during evening and night time periods. As mentioned previously, the noise propagation modeling considered operation of all types of equipment and machinery at the same time to assess the worst conditions. Based on this, the exceedance of baseline noise levels given above are expected to be lower than the mentioned values and the associated impacts are expected to be of minor significance.

Based on the results of the modeling study and comparison with limit values set in Turkish regulations and IFC guidelines, no significant impacts are expected associated with noise, except minor impacts related to increase in background noise levels, however these will be observed only during the construction period and will be temporary.

In addition to the ambient noise levels, indoor noise is an important criterion for hospital buildings and assessed in this chapter by referring to the noise levels reaching the facade of the hospital buildings from the cogeneration unit building. The highest noise level is calculated for the facade of the Physical Therapy and Rehabilitation Hospital as 50-51 dBA. According to the Turkish regulation, the allowable indoor limit value when the window is open is 45 dBA, which can be met with the suitable design of the hospital and the cogeneration unit building. Moreover, it is important to note that the existing background noise levels that will be reaching the facade of the hospitals are expected to be higher than the noise generated by the cogeneration system.

## 10.8 Mitigation Measures

The following mitigation measures will be taken during the construction and operation phases in order to ensure that the standard values set in the regulations are met:

- ‘Low-noise’ equipment will be used during construction and operational phases, as far as possible. Where construction equipment is provided with sealed acoustic covers or enclosures, these will be kept closed whenever the machines are in use.
- Machines will be shut down or throttled down to a minimum when not in operation.
- Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize extraneous noise caused by poor performance.
- Construction activities will be carried out during daytime and will continue throughout the night time as necessary.
- Necessary consent from Istanbul Provincial Directorate of Environment and Urban Planning and other relevant authorities (i.e. municipalities) as needed, will be obtained for night time activities.
- Noise related to daytime traffic during construction will be properly managed.
- On site structures such as containers, offices, hoardings will be used to screen sensitive receptors from noise sources as far as possible.
- Awareness among construction workers will be increased regarding noise mitigation.
- A Noise Control and Monitoring Plan will be set up during the construction phase to measure noise levels at the closest sensitive receptors. If levels at receptors exceed the standards, measures will be taken to reduce emissions so that the limit values are met.

- 
- Vibration levels will be monitored upon a grievance being made by the nearby residents and if the standards are exceeded, measures will be taken to reduce vibration.
  - All noise generating equipment and machinery during operation that may result in exceeding allowable noise limits will be placed in buildings with isolated walls, and the design of the technical unit building and selection of silencers are made such that the indoor noise levels at the hospitals do not exceed the regulatory standards.

### **10.9 Residual Impacts**

Construction phase noise impacts will be temporary and can be mitigated with the implementation of measures mentioned above. Therefore, the residual impact is estimated to be negligible.

No residual impact is expected on nearest receptors by the operation of the cogeneration system during the operation phase.

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## 11.0 TRAFFIC ASSESSMENT

### 11.1 Scope

This chapter describes the potential traffic conditions that may develop during the operation phase of the Project. The conditions are based on the results of a comprehensive study undertaken by Boğaziçi Proje Mühendislik Ltd. which was commissioned by the IHIC. The study was finalized in January 2014 and included the following topics:

- Existing traffic conditions and transportation infrastructure
- Traffic demand assessment
- Future transportation planning for the region and site vicinity
- Proposed traffic site plan for the project

The traffic study report is provided in Annex J. The study has identified potential traffic impacts in terms of congestion following the development of the future road infrastructure in the immediate vicinity of the Project area; the study has made detailed recommendations for the development of roads within the Project area in order to alleviate potential adverse traffic conditions. The study has therefore identified mitigation measures which are described later on in this section.

### 11.2 Baseline Conditions

The IHC is located in the Basaksehir District of Istanbul Province on the Olimpiyat Boulevard. The site lies north of the TEM (E-80) Motorway, Ataturk Olympic Stadium and ISKI Fatih Sultan Mehmet Drinking Water Treatment Plant (Figure 11-1 and Figure 11-2). The land use and surroundings are described in detail in *Chapter 5: Land Use and Zoning*.

The urban development of Istanbul Province is in a linear form extending from the city center to east and west. The City has developed along the main transportation system D-100 (formerly E-5) Highway and TEM (E-80) Motorway which provides intercity and international connections. The project area has strong transportation connections due to its vicinity to the TEM Motorway. The site is easily accessible in terms of private transport, however the public transportation is weaker because the Project area region is under development.

Public transportation access from city center is presently provided by using Basaksehir bus lines and Basaksehir M3 Metro Line in the existing situation (Figure 11-3). To improve public transit access to the Project area, the current bus and metro systems mentioned above will be developed in the future by the Istanbul Metropolitan Municipality. The existing M3 Metro Line and proposed 3<sup>rd</sup> Airport metro line are planned to be connected in 2019. The Saglik Kent Station on this M3 Metro Line will be located within the Project area (Figure 11-4).



Figure 11-1: Project location in the Istanbul Province

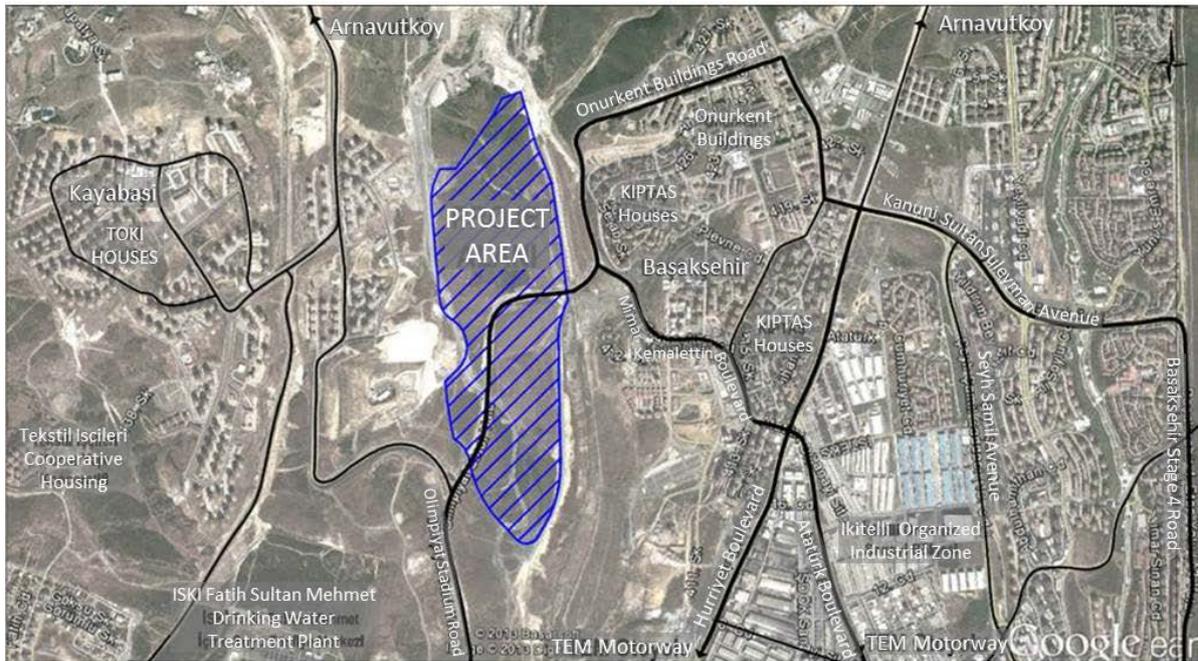


Figure 11-2: Vicinity of Project site

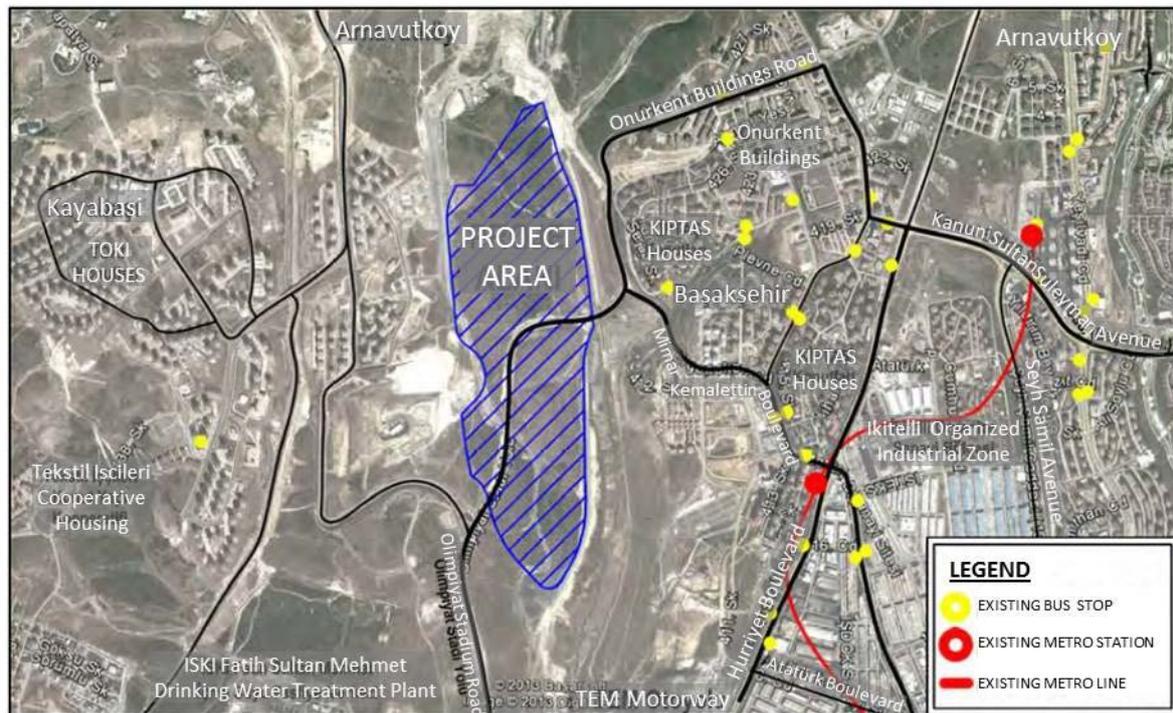


Figure 11-3: Bus stops around Project area

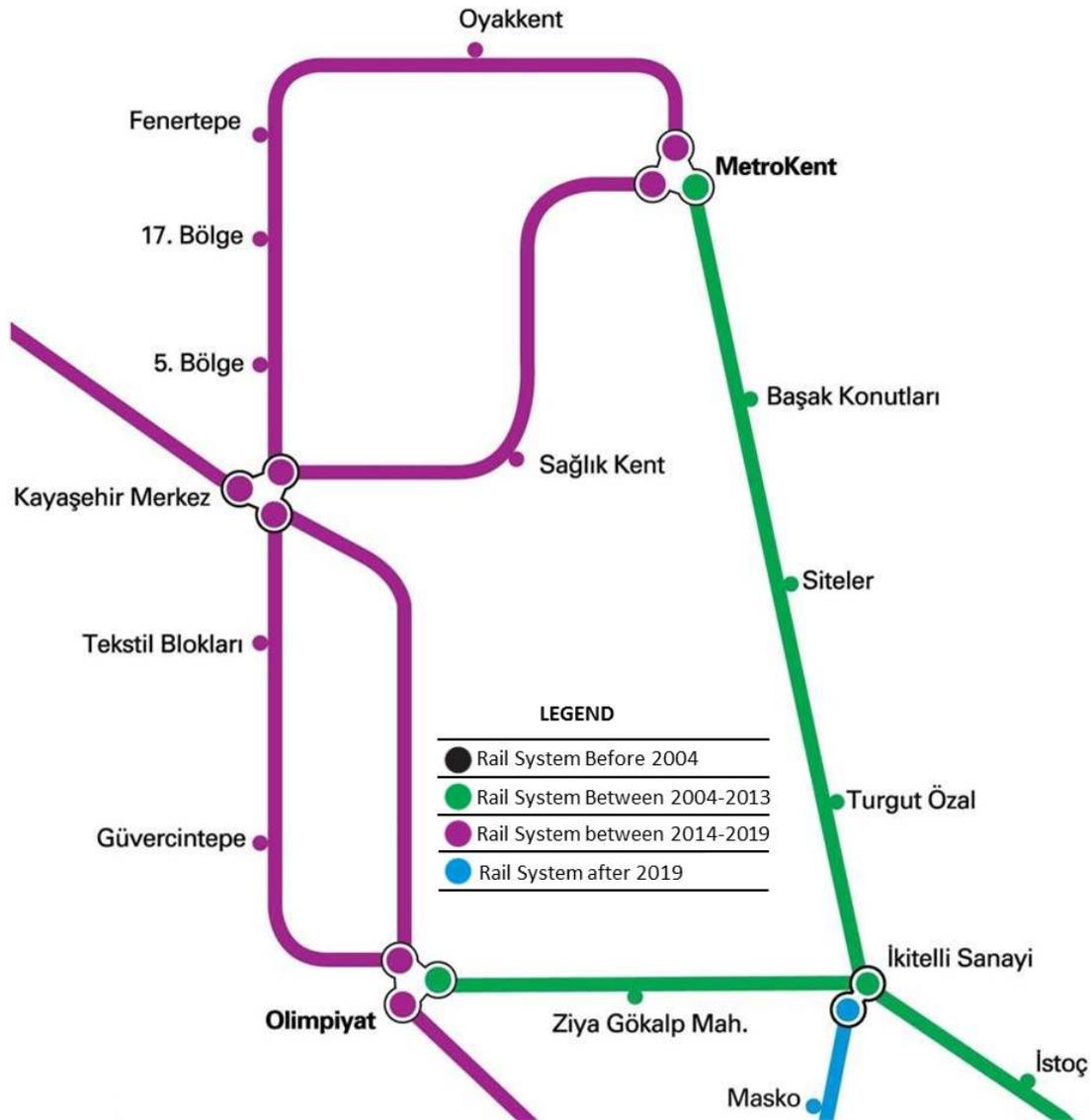


Figure 11-4: Future development of the Metro Line near the Project area

The existing road crossing the site, the approach roads and the intersections are shown in Figure 11-5. The following information was provided in the traffic study:

- The Olimpiyat Boulevard is a 22 m wide, 2 x 2 cross-sectioned, centre stripped road that passes through the Project area. This road continue east through the Basaksehir Intersection. It is connected to the Mimar Kemalettin and Ataturk Boulevards. The Boulevard connects directly to TEM (E-80) Motorway or Kayasehir through the Kayasehir Intersection
- The Mimar Kemalettin Boulevard is a continuation of Ergenekon Street and is approximately 12 m wide and reversible line road. After the Basaksehir Intersection, it becomes a 2 x 2 cross-sectioned, centre stripped road and continues in the Onurkent direction.
- The Olimpiyat Boulevard and Mimar Kemalettin Boulevard make an intersection 150 m east of the project area. The Basaksehir Intersection is an uncontrolled, 3 armed intersection that, connects the line from the Olimpiyat Boulevard to the Atatürk Boulevard through the Mimar Kemalettin Boulevard

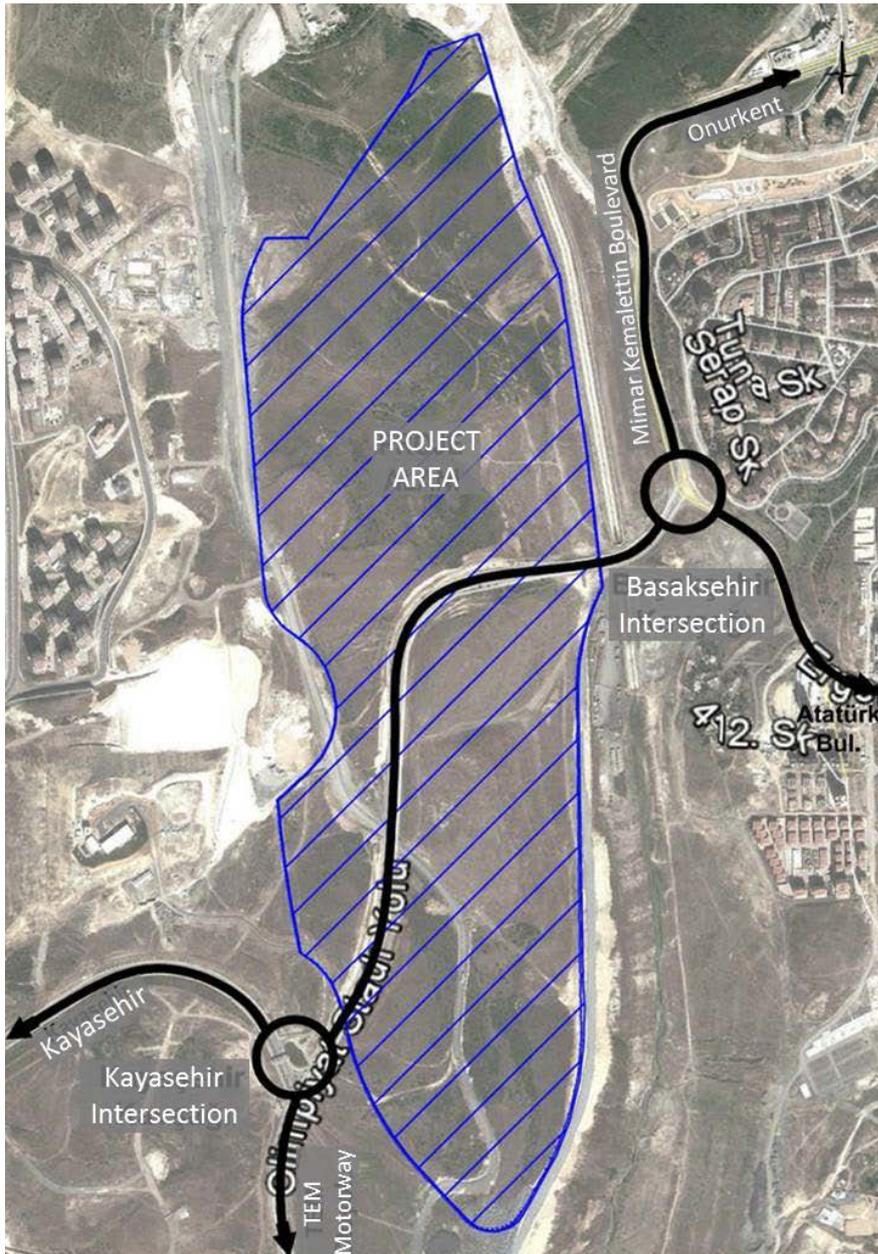


Figure 11-5: Existing roads and intersections near the Project area

A traffic count was conducted on 22.11.2013 to assess peak hour car units (CU<sup>1</sup>) during the morning, afternoon and evening hours in the traffic study. The following results were obtained for the Basaksehir Intersection:

- morning peak hour occurs between the hours of 07:30 and 08:30 am. Total traffic volume of the intersection is 2,524 CU.
- afternoon peak hour occurs between the hours of 12:30 and 13:30. Total traffic volume of the intersection is 1,221 CU.
- evening peak hour occurs between the hours of 18:00 to 19:00. Total traffic volume of the intersection is 2,068 CU.

<sup>1</sup> Measures are converted to per car unit by using coefficient as 1.5 for SUV and minibus, 2.5 for bus, 3 for trucks and excavation trucks.

The results of the Kayasehir Intersection counts indicate that

- morning peak hour occurs between the hours of 07:30 and 08:30 am. Total traffic volume of the intersection is 3,142 CU.
- afternoon peak hour occurs between the hours of 12:30 and 13:30. Total traffic volume of the intersection is 1,540 CU.
- evening peak hour occurs between the hours of 18:00 to 19:00. Total traffic volume of the intersection is 2,622 CU.

According to the all day counts, both intersections have the highest volume of cars in the morning peak hour. In the morning and afternoon, the main movement is from Kayasehir to Basaksehir. On the other hand, main movement during evening hours is from Basaksehir to Kayasehir (Figure 11-6, Figure 11-7 and Figure 11-8).

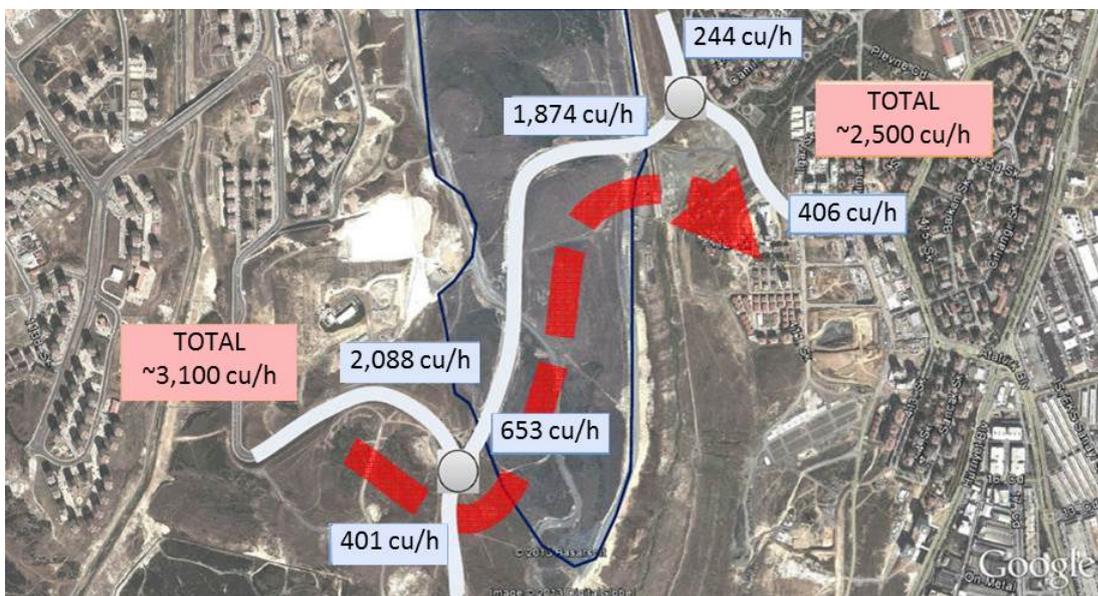


Figure 11-6: Morning peak hour common trip directions

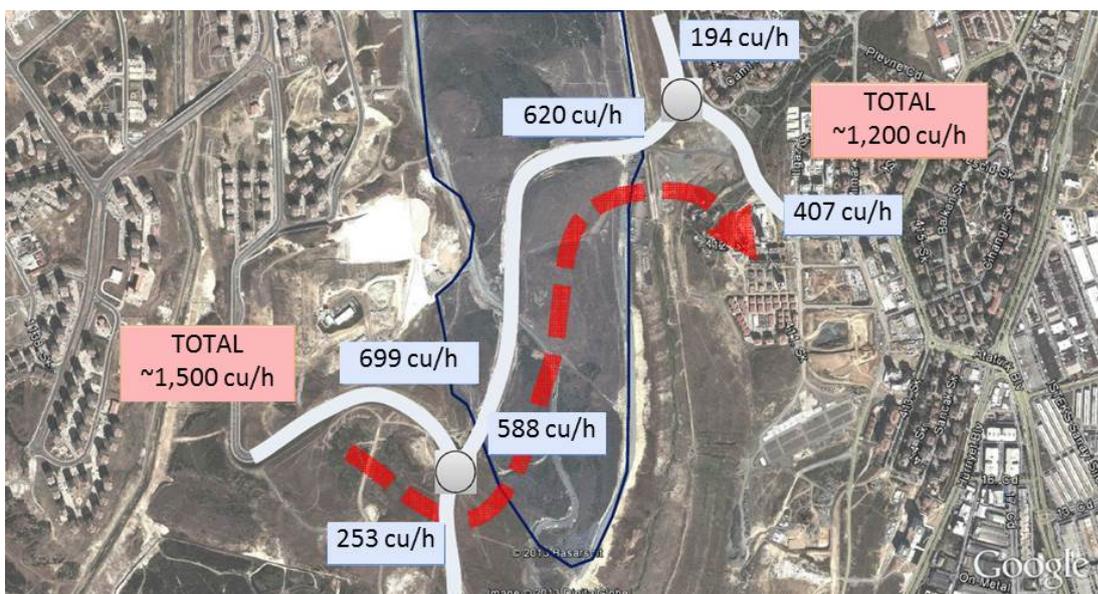


Figure 11-7: Afternoon peak hour common trip directions

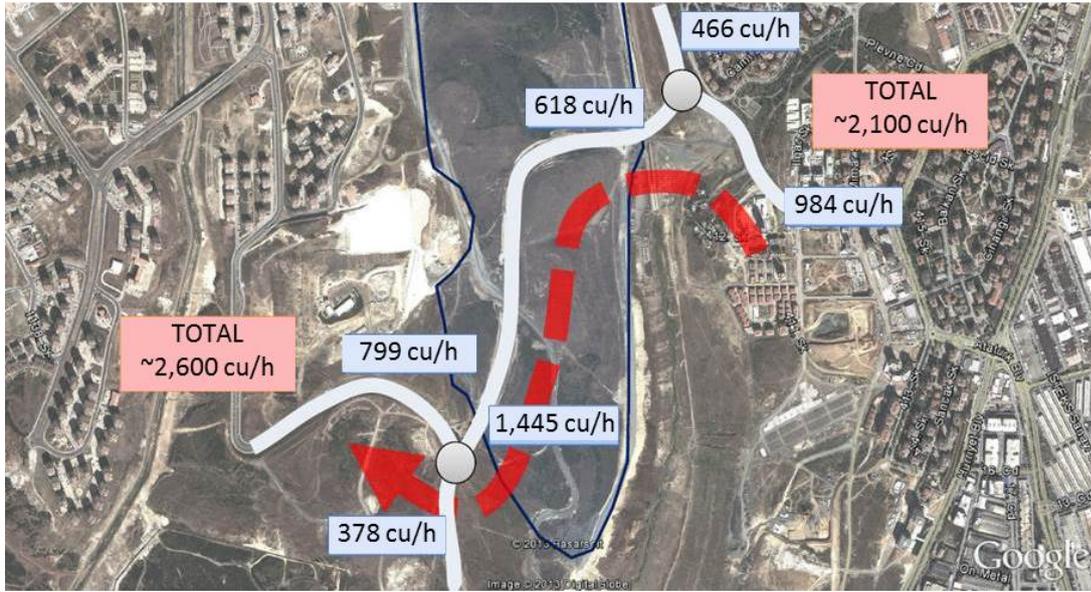


Figure 11-8: Afternoon peak hour common trip directions

### 11.3 Future Developments

The project area usage is defined in the 1/1.000 Zoning Plan in accordance with the 1/5.000 scaled Zoning Plan as a "Health Facility Area - Health Complex" area. According to the zoning plan, the north and western boundaries of the Project area are reserved for 40 m and 26 m wide road constructions, respectively. These roads are to be connected to larger intersections. Clover intersections are planned at the south and north of the area, a trumpet intersection is planned west of the area, T-intersections and a roundabout intersection are planned east of the area. The new system and significant intersections in zoning plans have been planned by General Directorate of Highways and Istanbul Metropolitan Municipality.

The 10 m wide road presently passing through the project area has been removed in the zoning plan. According to the plan, the Project area will be linked by the roads from the south using the 40 m wide intersection link road and from the east using the 26 m wide road. Therefore, the existing intersections are removed from the zoning plan and a new intersection system has been planned (Figure 11-9).

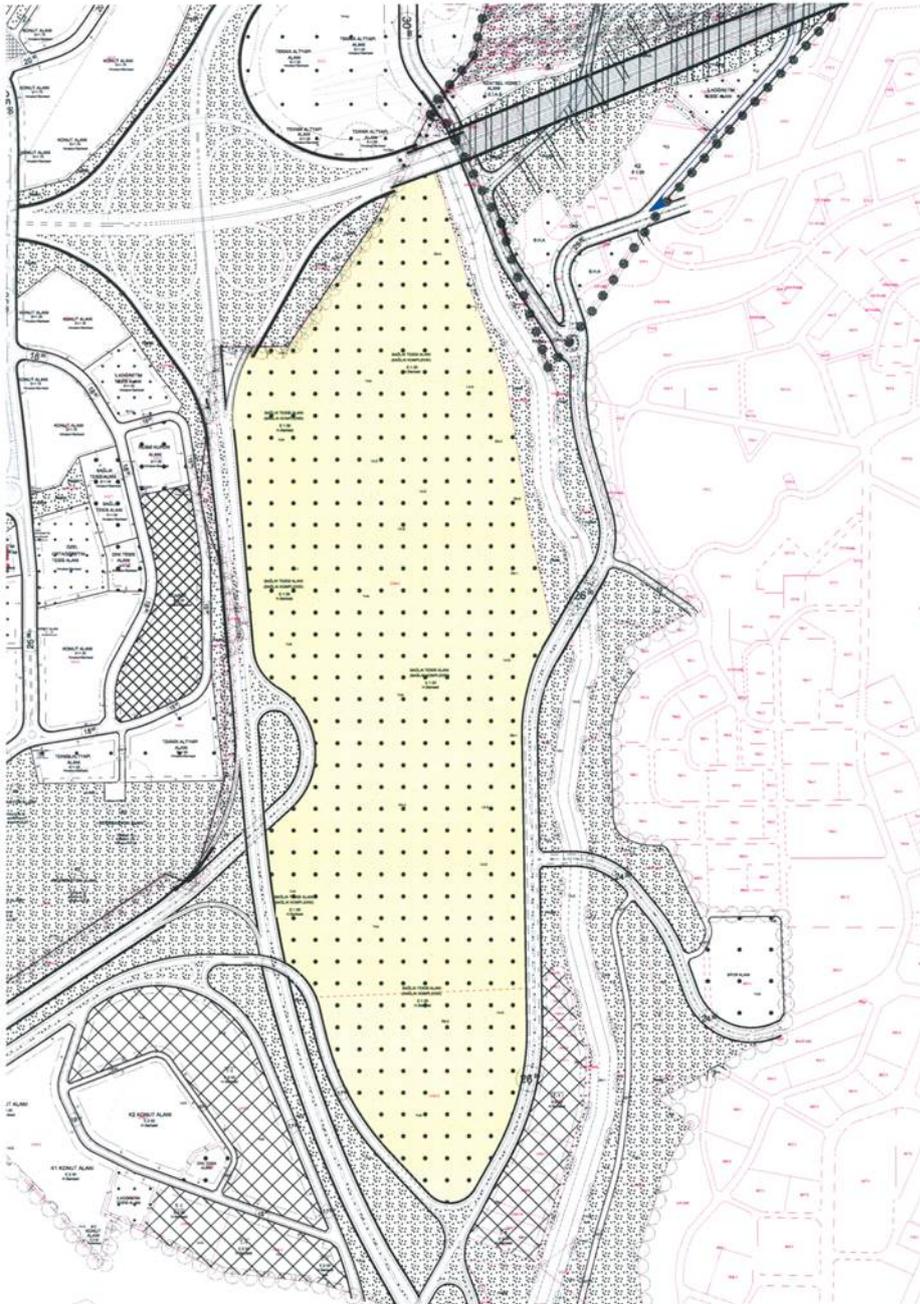


Figure 11-9: Future road system near the Project area

The intersections have been evaluated in the traffic study as follows:

- The Olimpiyat Intersection, located on north of the project area, is planned as a semi directional intersection. This intersection is located on the North Marmara Motorway link to provide connection to TEM (E-80). The intersection of two main roads, allows passing in all four directions. The separation arms of Ankara road are planned as directional roads, because, traffic volume from Ankara to TEM (E-80) Motorway direction is estimated as high. (Figure 11-10).
- Health Campus Intersection, located south of the project area, is planned as a half cloverleaf intersection. This intersection is located on the North Marmara Motorway – TEM (E-80) Motorway link and make a connection to Olimpiyat Boulevard direction. The

intersection is not planned as a four-armed full clover intersection, two north arms don't work as a regular clover intersection. The distance between south separation arms and north arms is too short for the vehicle movements and weaving will be generated (Figure 11-11).

- ISKI Intersection, located south of the project area, is planned as a trumpet intersection. This intersection is located on the TEM (E-80) Motorway - North Marmara Motorway link and it provides connection to Kayasehir direction. However, insufficient turning arm length, may cause congestion problems in this area (Figure 11-12).

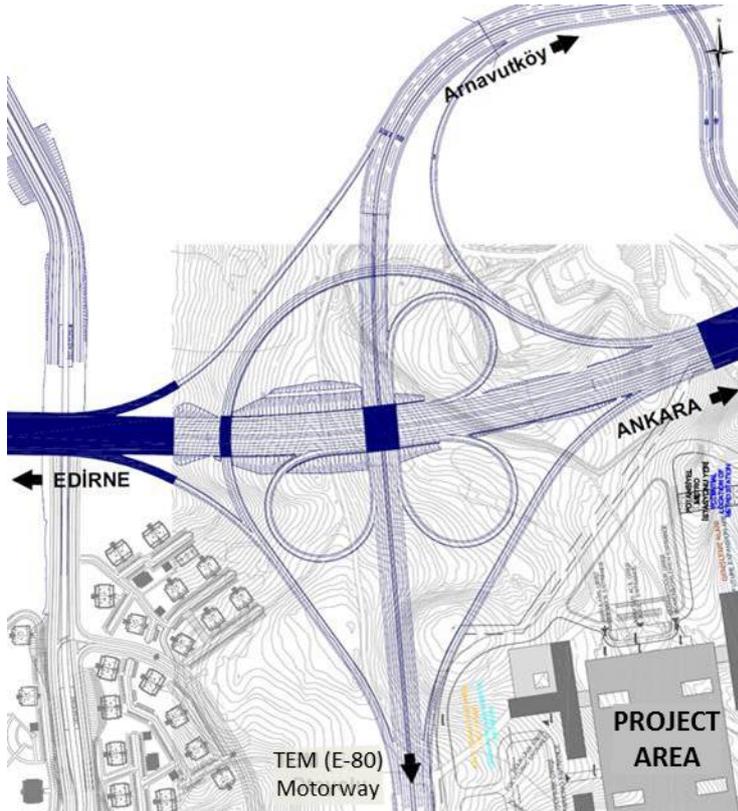


Figure 11-10: Planned Olimpiyat intersection

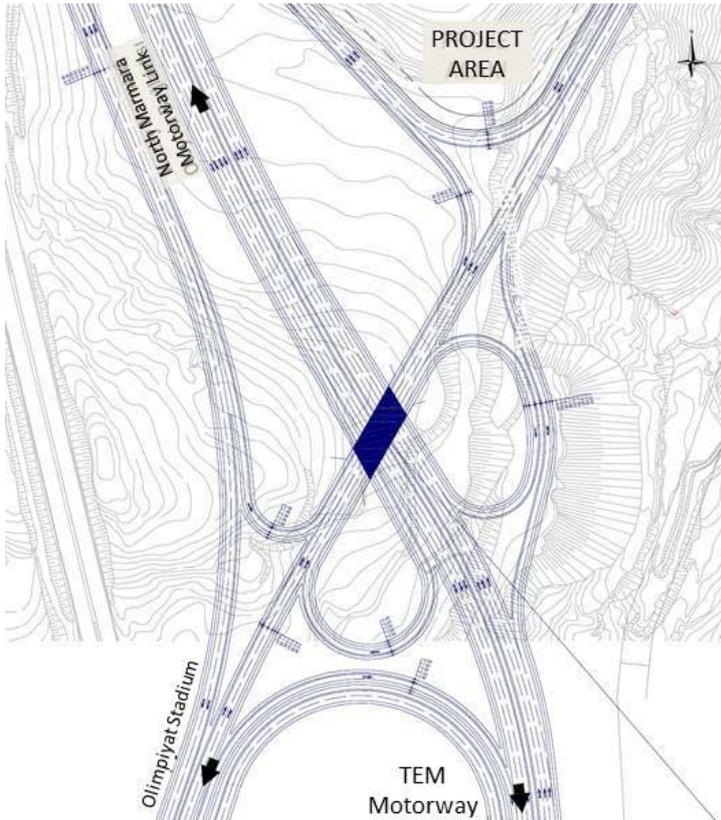


Figure 11-11: Planned Healthcare intersection

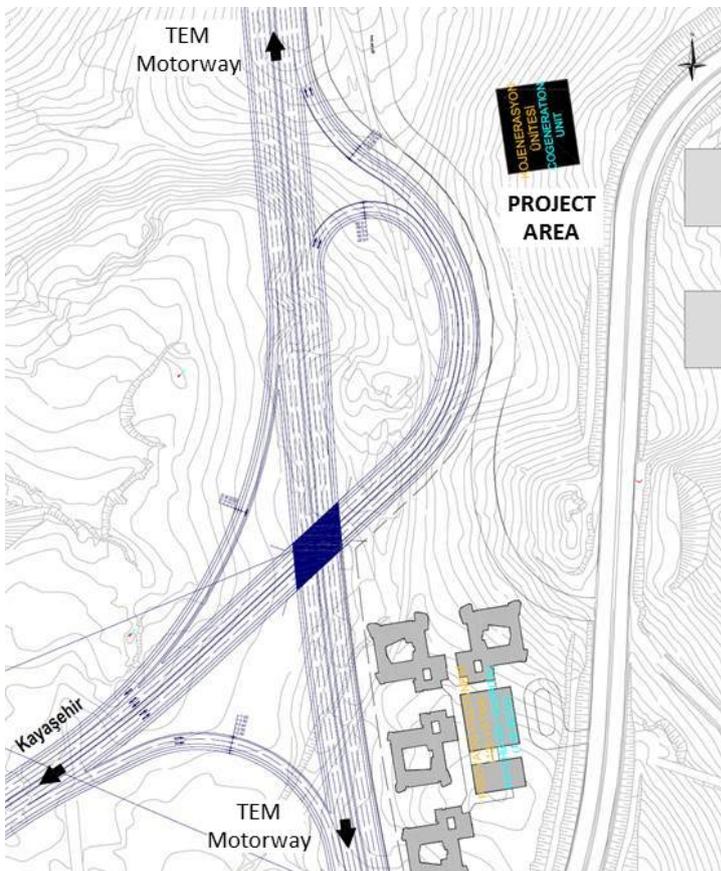


Figure 11-12: Planned ISKI intersection

## 11.4 Traffic Generation and Proposed traffic site plan for the Istanbul IHC project

### 11.4.1 Traffic Load Estimation

The number of daily trips to the IHC once it becomes operational has been estimated in the traffic study as shown in Table 11-1. These values are based on the hospital characteristics as well as the commercial area to be operational in the future.

Table 11-1: Health Campus daily trip volume

Description	Volume
1 Bed Capacity	2,682
2 Days Stayed in the Hospital	4
3 Hospitalized and Released Patients	671
4 Inpatient Referral	4,291
5 Daily Referral for Each Bed	2
6 Daily Visitor for Inpatients	5,364
<b>Total Daily Inpatient Trips (3+4+6 - Person)</b>	<b>10,326</b>
7 Doctors	775
8 Exam Rooms in the Polyclinic Area	722
9 Doctor Rooms in the Polyclinic Area	380
10 Outpatients Examined by One Doctor Daily (16 min. per Examine)	40
11 Outpatient Come to Polyclinics	28,880
12 Outpatient Referral Come to Polyclinics	28,880
13 Total People Come to Polyclinics	57,760
14 Patients Come to Emergency	14,440
<b>Total Daily Outpatient Trips (13+14 - Person)</b>	<b>72,200</b>
15 Staff Work for Administration	4,300
16 Staff Work for SPV	3,011
<b>Total Staff (15+16)</b>	<b>7,311</b>
<b>Maximum (Friday) Religious Building Trips</b>	<b>1,500</b>
<b>Total Daily Commercial Area Trips</b>	<b>15,125</b>
<b>TOTAL DAILY TRIPS (People)</b>	<b>106,462</b>

A total of 106,462 daily trips (people) are envisioned to occur to a functional IHC site. To calculate the demand distribution of traffic, the trips were examined in five main groups. The groups as follows:

- *Staff and doctors are working in the hospital:* These group trips are intensive in the morning hours and a part of the group trips will take place based on the work shift hours.
- *The daily outpatients and their visitors:* This group will mostly come early to the hospital in the morning for medical testing. The outpatients will leave the hospital after the examination, treatment, rehabilitation or therapy. Because of the hospital appointment system, the daily demand is expected to be evenly distributed, except the intensive morning hours.
- *Inpatients, referrals and their visitors:* This group will mostly come to the hospital early in the morning for treatment. Inpatients are likely to stay an average of 4 days in the hospital. They are likely to be released from the hospital in the afternoon.
- *Commercial area and hotel total staff and visitor trips:* It is assumed that 7% of the total trips to the commercial area trips will be by private car and 70% of these trips will occur using public transport during the morning peak hours.
- *Religious building usage:* The Religious building is designed to meet the needs for doctors, patients, referral, visitors and people around the IHC. During the week, evening hours are expected to have intensive usage and maximum volume is seen on Friday during the noon prayer time.

The peak hour potential demand distribution estimates are shown in Table 11-2.

Table 11-2: Peak hour potential demand distribution of functions\*

Functions	Total Trips		Peak Hour (08:00-09:00)		Private Car – Public Transit					
	%	Trips	%	Trips	PC	PT	Trips	Trips		
Hospitals	Staff	7%	7,311	30%	2,193	PC	50%	1,097		
						PT	50%	1,097		
	Outpatient Trips	68%	72,200	17%	12,274	PC	40%	2,592		
						PT	60%	3,888		
Inpatient Trips	10%	10,326	10%	1,033	PC	50%	516			
					PT	50%	516			
Commercial Area	14%	15,125	7%	1,059	PC	30%	318			
					PT	70%	741			
Religious Building	1%	1,500	2%	30	PC	30%	9			
					PT	70%	21			
TOTAL	100%	106,462	16%	16,589	PC	41%	6,849	1.6	4,281	
					PT	59%	9,739	Metro	40%	3,896
								Metrobus, Bus	50%	4,870
								Shuttle	10%	974
<b>Number of Private Cars expected to Come to the Health Campus at Peak Hour</b>									<b>4,281</b>	

\*Peak hour range is determined the hours between 8:00-9:00 a.m. and this range is used for calculations.

The study indicates that in total 16,589 people will come to the Project area on weekdays out of which 6,849 people will use private car, 9,739 people will use public transit during the morning peak hours. Assuming the private vehicle occupancy rate will be 1.6, the number of private cars coming to the hospital during peak hours will be 4,281 to the hospital, commercial area, hotel and religious building. The 9,740 people using the public transport is assumed to be divided into the following ratios: 40% metro, 50% bus and 10% by shuttles (Table 11-2).

The parking needs or functions in the project area were provided in the traffic study for different standards and are shown in Table 11-3.

Table 11-3: Calculated parking needs according to different standards

	Area (m <sup>2</sup> )	Number of Bed	Parking Needs According to Istanbul Building Bylaw*		Parking Needs According to Ankara Building Bylaw		Parking Needs According to England Standards		Parking Needs According to Hong Kong Standards		Project Parking Area (m <sup>2</sup> )	Project Parking Unit
Main Hospitals	464,835	2,354	1 PA per 125m <sup>2</sup>	3,719	1 PA per 75m <sup>2</sup>	6,198	0,4 PA per bed	942	1.5 PA per bed	3,531	241,878	7,318
Rehabilitation Hospital	38,681	200	1 PA per 125m <sup>2</sup>	309	1 PA per 75m <sup>2</sup>	516	0,4 PA per bed	80	1.5 PA per bed	300	21,120	640
Psychiatry Hospital	17,551	128	1 PA per 125m <sup>2</sup>	140	1 PA per 75m <sup>2</sup>	234	0,4 PA per bed	51	1.5 PA per bed	192	3,840	128
Technical Center	25,017	-	1 PA per 125m <sup>2</sup>	200	1 PA per 75m <sup>2</sup>	334	0,4 PA per bed	-	1.5 PA per bed	-	4,455	135
Commercial Area	175,840	-	1 PA per 50m <sup>2</sup>	3,517	1 PA per 25m <sup>2</sup>	7,034	1 PA per 100m <sup>2</sup>	1,758	1 PA per 150m <sup>2</sup>	1,172	106,800	3,560
Religious Facility	7,895	-	1 PA per 200m <sup>2</sup>	39	1 PA per 100m <sup>2</sup>	79	-	-	1 PA per 16 units	-	1,200	40
<b>TOPLAM</b>	<b>729,819</b>	<b>2,782</b>		<b>7,925</b>		<b>14,394</b>		<b>2,881</b>		<b>5,205</b>	<b>379,293</b>	<b>11,821</b>

\*IMM: Hospitals, Health Institutions - 125 m<sup>2</sup> construction area

The distribution of traffic vehicles during peak hours (08:00-09:00) is expected to be distributed in the future road development as shown in Figure 11-13.

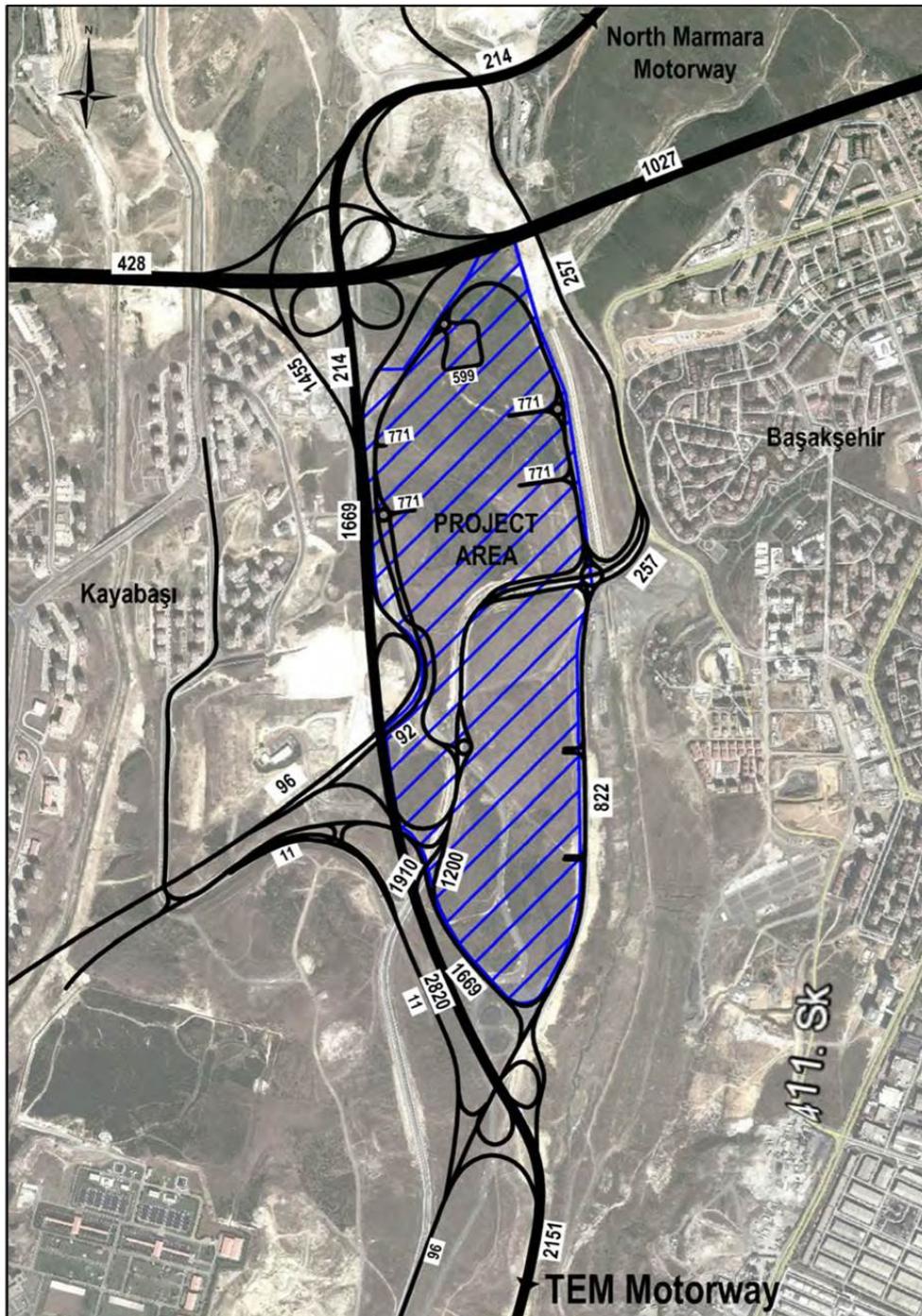


Figure 11-13: Estimated distribution of traffic vehicles during peak hour

#### 11.4.2 Proposed Site Traffic Plan and Upgrades

A preliminary plan has been developed and presented in the traffic study which included a traffic road plan within the IHC and changes in the newly proposed intersection geometry linking the outside roads to the entrances to the IHC. These changes were proposed to ease the entrance and exit from the facility of the vehicles and public transport.

A ring road system within the IHC area which connects the main roads through intersections was deemed appropriate to minimize traffic impacts. A main circulation road was developed and junctions were proposed to be used to link to the higher road system; the road widths were planned wide enough at all areas within the site for vehicles to maneuver easily. Traffic problems such as queuing delay and traffic safety was solved by avoiding the intersections being too close to each other. Traffic planning around the Project area and integration to environmental area can be seen in Figure 11-14. Further details of the inner traffic roads are discussed in the traffic study report. A large part of the main circulation road was designed as a 2 x 2 cross section. The section, where connections are provided from the East Intersection to the North hospital units, starts with a 3 lane section in order to meet the peak demand of the ring road. A safety island has been designed on the road and division of the island has not been allowed except intersections (Figure 11-15).

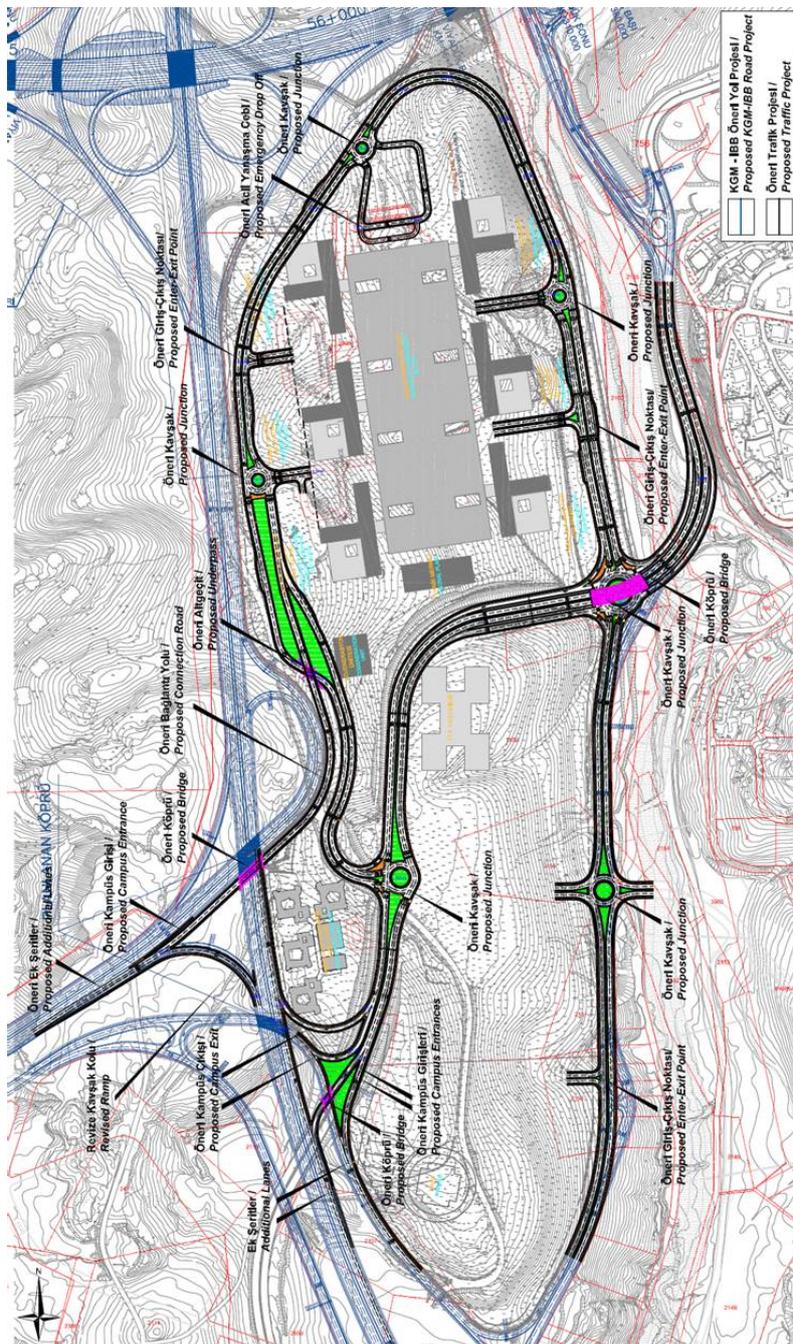


Figure 11-14: Proposed Site traffic plan-internal ring road

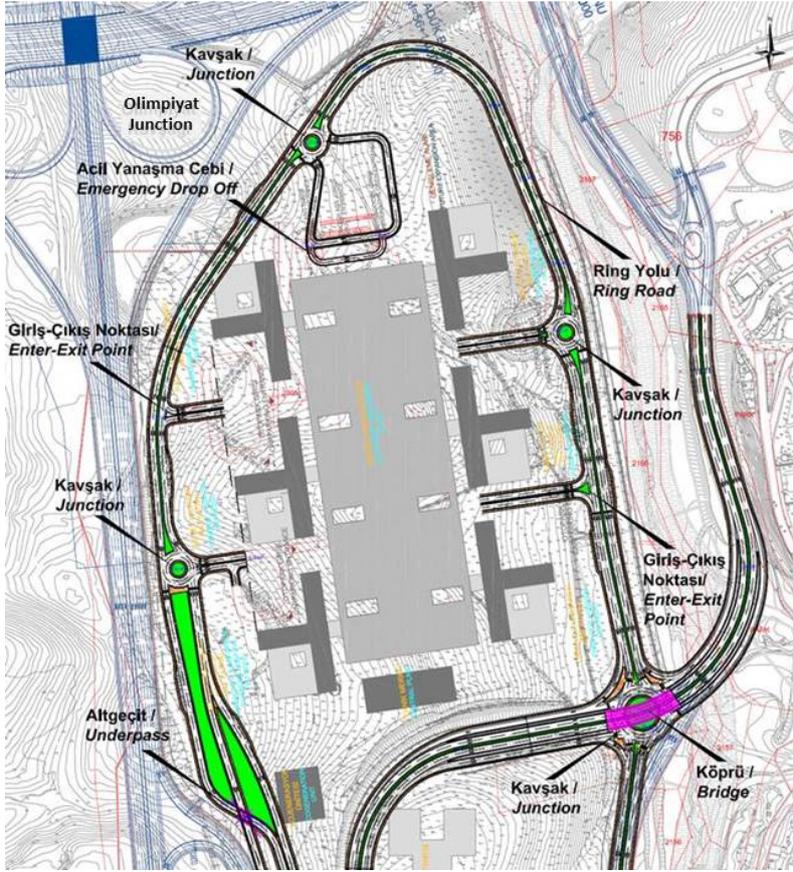


Figure 11-15: Proposed Site traffic plan-internal ring road

The health campus will be accessed by public transportation systems and on foot, as well as by private cars. Regarding this access model for various systems, stop points for each have been proposed in the Project area. Existing and suggested stop points within and surrounding of the Project site is given below. (Figure 11-16).

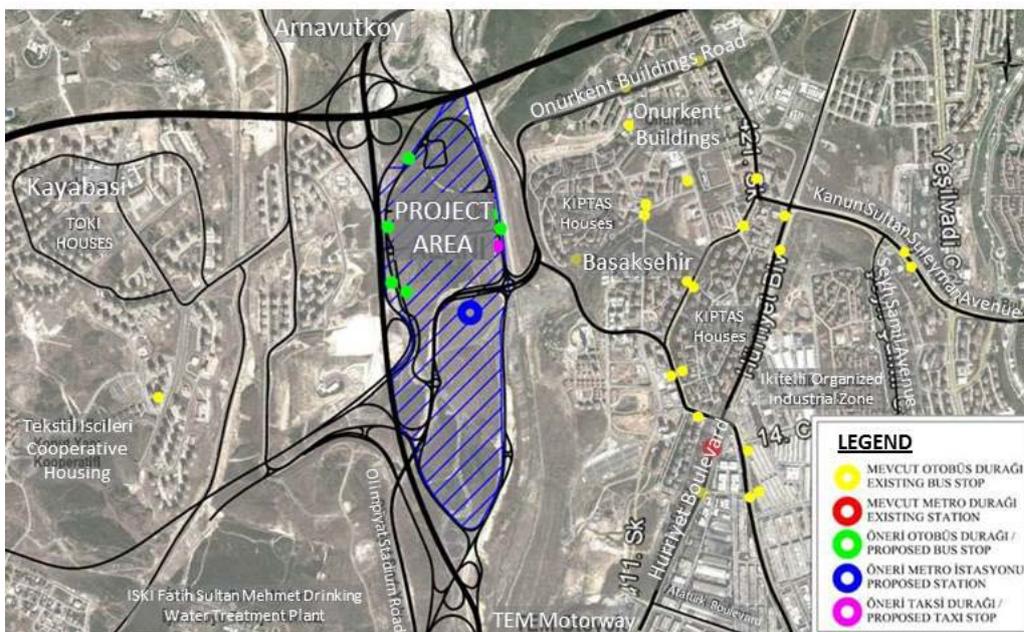


Figure 11-16: Proposed Project stops

One of the main entrances to the Project area that has been planned is the ISKI Intersection. The intersection will take place to the west of the Project area as a trumpet intersection. It is located between the North Marmara Motorway connection link road and TEM (E-80) Motorway. The ISKI Intersection makes a connection from the Kayasehir direction to the Project area. To provide an entry from this intersection and to solve the traffic problems that is envisioned to at the roundabout intersection, new arrangements have been proposed in the traffic study. Two additional lanes and a single lane bridge has been proposed as a remedial measure as shown in Figure 11-17.

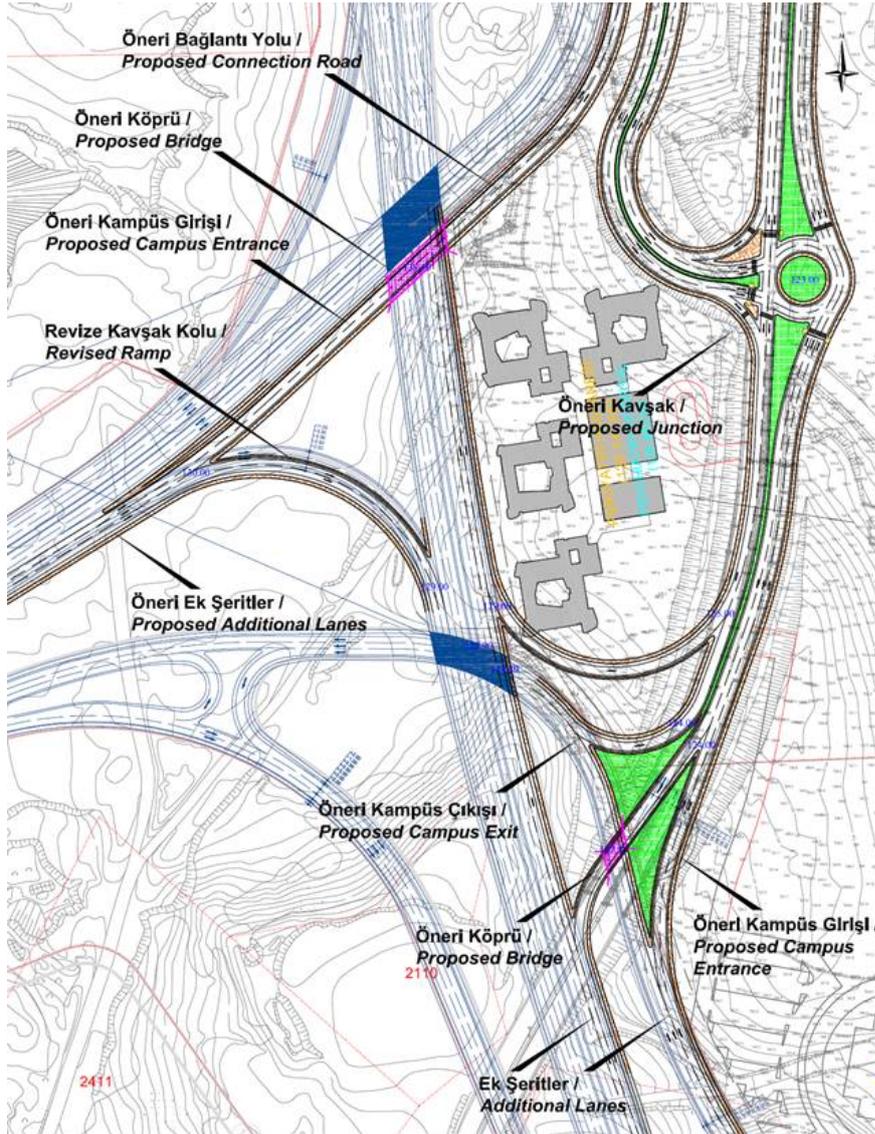


Figure 11-17: Proposed ISKI intersection upgrades

The East Intersection is planned close to the existing Basaksehir Intersection. It is planned as a cross over for east-west traffic and provides a directional pass through two lanes without affecting hospital traffic (Figure 11-18).

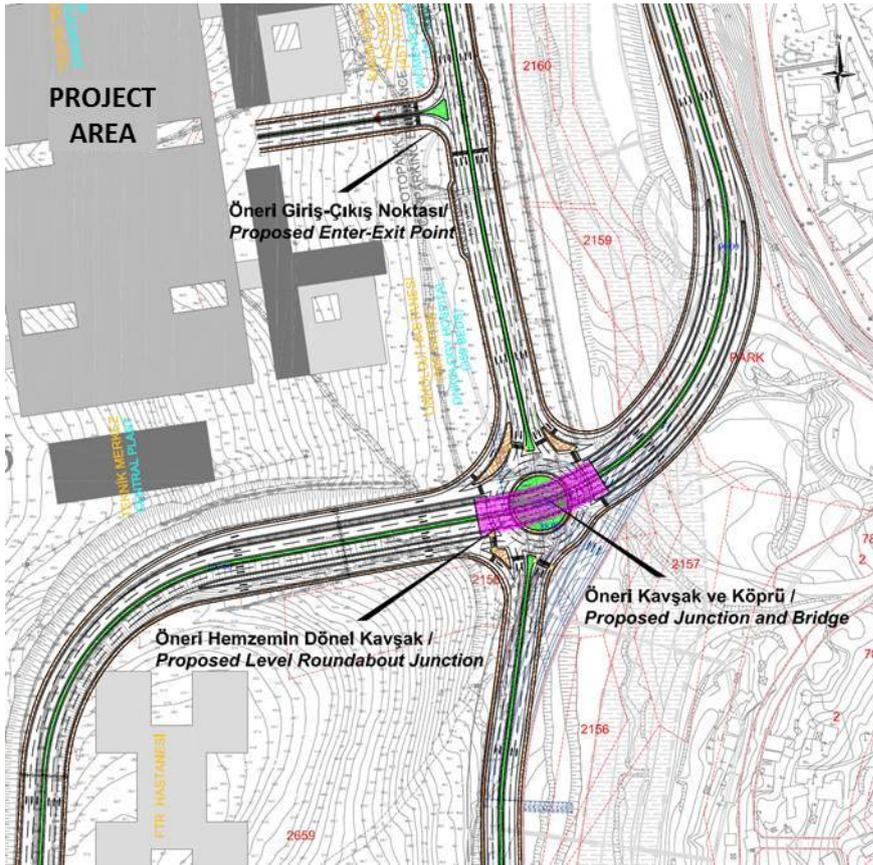


Figure 11-18: Proposed East intersection upgrades

### 11.5 Potential Impacts

It can be concluded that the additional traffic loads during the operation of the IHC will have an impact due to an increased congestion in the future traffic conditions near the IHC site. The magnitude of the impact cannot be quantified at this point since the potential

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## 11.6 Potential Mitigation Measures

The following actions will need to be conducted to minimize the impacts created by the increased traffic during the operation phase of the IHC:

- Develop an IHC Traffic Management Plan: develop and implement a management plan within the campus that will take into account vehicular traffic, emergency conditions, pedestrian traffic entering, exiting and internal traffic.
- Address potential noise and air pollutant loads that may be generated from the traffic loads predicted by the traffic study.

## 12.0 ECOLOGY

### 12.1 Introduction

This chapter presents an assessment of the potential impacts of the Project on terrestrial ecology and resources of nature conservation interest. Baseline information on terrestrial ecology has been collected through an ecological walkover survey conducted on 12.10.2013 by flora and fauna experts. Information collected during the site visit was supported by desktop studies.

Data obtained from the field surveys were evaluated according to the national legislation and international conventions that Turkey is a party on different aspects of ecology. The Turkish regulations and international conventions that are relevant to the Project include the following:

- Environmental Law (Law No: 2872) (Official Gazette-OG- Date/Number: 16.08.1983/18132)
- Regulation on Wildlife Protection and Wildlife Development Areas (OG Date/Number: 08.11.2004/25637)
- Law on Terrestrial Hunting (Law No:4915) (OG Date/Number: 11.07.2003/25165)
- 2013-2014 Decisions of Central Game Commission (MAK) of the General Directorate of Nature Conservation and National Parks of the Turkish Ministry of Forest and Water Affairs
- Bern Convention on Protection of Europe's Wild Life and Living Environment-BERN (acceded by the Decision of the Council of Ministers dated 9 January 1984 and published in the Turkish Official Gazette dated 20 February 1984 and no. 18318);
- Convention on International Trade in Endangered Species of Wild Flora and Fauna-CITES (acceded by Law no. 4041 and published in the Official Gazette dated 20 June 1996 and no. 22672)
- European Union (EU) Bird Directive

Moreover, the standards of the International Union for the Conservation of Nature (IUCN) were considered. IUCN maintains a List of Threatened Species (the IUCN Red List) which is a widely recognized, global approach for evaluating the conservation status of plant and animal species. It provides taxonomic, conservation status and distribution information on taxa that are facing a high risk of global extinction.

The approach to the assessment of impacts on ecology has followed the methodology described in section 1.4.5 of *Chapter 1: Introduction*.

## 12.2 Terrestrial Flora

### 12.2.1 Methodology

Terrestrial flora studies covered a field study conducted in October 2013 and literature review in order to identify the local habitat characteristics and vegetation cover within the Project site, as well as to make an inventory of flora species. The endemism and threat/protection status of species were taken as a basis for the evaluation. The outcome of terrestrial flora studies is mostly based on the field study. Although the timing of field study was a little late in terms of vegetation, it was quite suitable to identify plant species inhabiting the Project site.

Flora list was prepared in accordance with the phylogenetic order in Turkish flora; ferns, open seed plants (Gymnospermae) and closed-seeded plants (Angiospermae). Families under each group are

also listed according to the phylogenetic order in the Turkish flora. Species are listed with their author names, English names (if available), phytogeographic regions, endemism, threat categories for endemic and rare species, and their relative abundance in the area. Samples collected at the Project site were transformed into herbarium material and identified by using “Flora of Turkey and the East Aegean Islands” by Davis, 1965-1988. In evaluating the threat/protection status of species; CITES and Bern classifications, and the Red Data Book of Turkish Plants (Ekim *et al.*, 2000) which was prepared in accordance with 1994 IUCN Red List classifications, were used.

Species covered in CITES are given under three different appendices according to their conservation status as below:

- Appendix-1 List includes species that are threatened with extinction and thus international trade in specimens of these species is prohibited, except when the purpose of the import is not commercial.
- Appendix-2 List includes species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled.
- Appendix-3 List includes species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation.

BERN Convention aims at conserving and promoting biodiversity, developing national policies for the conservation of wild flora and fauna and their natural habitats, protection of the wild flora and fauna from the planned development and pollution, developing trainings for protection practices, promoting and coordinating the researches made regarding this subject. It has been signed by 26 member states of the European Council (as well as Turkey) with the aim of conserving the wild life in Europe. Species that are protected under the Bern Convention are classified according to the following categories:

- Appendix I: Strictly protected flora species
- Appendix II: Strictly protected fauna species
- Appendix III: Protected fauna species

The IUCN Red List intends to draw attention to species whose populations are at risk or under threat. The 1994 (ver.2.3) and 2001 (ver.3.1) categories and criteria of the IUCN Red List are presented in Table 12-1.

Table 12-1: IUCN Red List categories and criteria

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

### 12.2.2 Overview of baseline conditions

The flora of the Marmara Region of Turkey, especially Istanbul and its surroundings are quite well-studied. Since the area around the Project site has been declared as a settlement zone, there is dense housing surrounding the Project site. Natural areas within and around the Project site are limited. The Project site is subject to anthropogenic impacts due to increasing residential developments around the Project site and also road traffic. Grazing activity was also observed during the site visit. The general view of the Project site is shown in Photo 1. The Project site has shrub vegetation that can be named as maquis-garig. However, since due to anthropogenic impacts garig (Photo 2) and maquis (Photo 3) vegetation is partially degraded, there is also quite well-developed steppe-meadow vegetation (Photo 4) of herbaceous species at garig openings. There is also a small area of plantation to the northwest of the site. There are species of *Pinus pinea* (Stone pine), *Pinus nigra* (Black pine) and *Cedrus libani* (Lebanon cedar) found at this plantations site. Although the site is surrounded by settlements almost all around, it has conserved its natural state to a great extent.

Despite all, maquis-garig habitats, as well as meadow habitats that have been formed at their openings bear a number of natural plant species.

Flora field surveys were carried out to cover all habitats within the Project site and its surroundings including the maquis, garig, steppe-meadow and plantation site, and for each habitat sample areas were studied depending on the size of the habitat.

Despite the fact that the project site is composed of plantations, as well as other cosmopolitan and widespread flora species, studies on plant diversity were carried out to identify the elements of the existing system, and determine potential impacts that the project might cause, as well as any mitigation measures to minimize such impacts.



Photo 1. General overview of the Project site



Photo 2. General overview of the garig vegetation at the Project site



Photo 3. General overview of the maquis vegetation at the Project site



Photo 4. General overview of the steppe-meadow vegetation at the Project site

### 12.2.3 Terrestrial Flora Inventory of the Project Site

During field studies in October 2013, a total of 225 flora taxa that belong to 57 families were identified as listed in Annex K-1. The flora list is composed of species, whose samples were collected at the site and those that were identified through direct observation without sampling as they are well-known by the flora expert. In general, species identified at the site, except for plantation trees are natural species which are mostly widespread and cosmopolitan species. Although the site surroundings are under the pressure of settlements and there are ongoing anthropogenic impacts inside the Project site (i.e. grazing), the fact that two local endemic species known from Istanbul were identified at the site indicates the importance of the Project site in terms of its floral composition.

### 12.2.4 Threat Status and Endemism of Flora Species

Among the 225 plant taxa identified at the site, two species are endemic; namely *Cirsium polycephalum* (Photo 5) and *Cephalaria tuteliana* (Photo 6), which are local endemic species that are found within Istanbul provincial borders. Of these species, *Cirsium polycephalum* was also identified in Kirklareli and Bursa provinces of Turkey in August of 2010, by Prof. Bayram Yildiz *et al.* during a project titled "Turkish Cirsium Genera Revision Project". However, since distribution of the species is limited to Marmara Region and its habitat is under pressure, it is listed under the IUCN Red List category of "CR: Critically Endangered". The other endemic species; *Cephalaria tuteliana* was identified around Bahcesehir, Istanbul in 2005. Distribution of this species is even narrower and its IUCN Red List category is also "CR: Critically Endangered".



Photo 5. *Cirsium polycephalum*

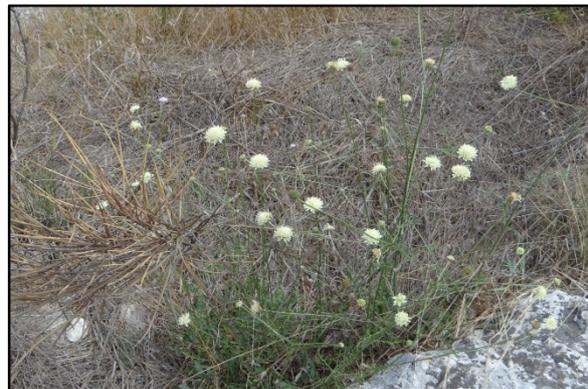


Photo 6. *Cephalaria tuteliana*

### 12.2.5 Vegetation Characteristics

There are three main types of vegetation types within the Project site, which can be listed as maquis, garig and steppe-meadow vegetation. Plant communities and characteristic species of these communities distributed within the Project site are as follows:

#### Maquis Vegetation:

This vegetation type is the most common vegetation type within the Project site. However, it is highly destroyed due to anthropogenic impacts. Dominant shrubs of the vegetation are *Erica manipuliflora*, *Cistus creticus*, *Lavandula stoechas*, *Spartium junceum*, *Quercus infectoria*, *Quercus coccifera*, *Arbutus unedo*, *Cistus salviifolius*, *Phillyrea latifolia*, *Anthyllis hermanniae*, and *Pistacia terebinthus*. The sub-flora and openings of the maquis vegetation include distribution of species like *Asphodelus aestivus*, *Asparagus acutifolius*, *Satureja hortensis* and *Lagoecia cuminioides*.

#### Garig Vegetation:

This vegetation grows where maquis is extremely degraded. Dominant species of this vegetation can be listed as *Cistus creticus*, *Sarcopoterium spinosus*, *Thymbra spicata*, *Asparagus acutifolius*, *Inula viscosa*, *Anthyllis hermanniae*, *Quercus coccifera*, *Calicotome villosa* and *Lavandula stoechas*. Among these shrubs there are also species like *Teucrium polium*, *Teucrium chamaedrys*, *Dactylis glomerata* and *Osyris alba*.

#### Steppe-Meadow Vegetation:

This vegetation of mostly herbaceous plants is found on open land around maquis and garig vegetation. This is the most widespread vegetation type within the Project site in terms of the surface area it covers. Dominant species of this vegetation are *Anthemis tinctoria*, *Siybum marianum*, *Cirsium vulgare*, *Conium maculatum*, *Centaurea solstitialis*, *Daucus carota*, *Colchicum chalcedonicum* (Photo 7), *Iris suaveolens*, *Spiranthes spiralis* (Photo 8), *Trifolium purpureum*, *Lagoecia cuminioides*, *Piptatherum coerulescens*, *Dactylis glomerata*, *Stipa bromoide*, and *Poa bulbosa*. The two local endemic species; *Cephalaria tuteliana* and *Cirsium polycephalum*'da are also found within this habitat.



Photo 7. *Colchicum chalcedonicum*



Photo 8. *Spiranthes spiralis*

#### Pinus pinea-Pinus nigra Plantation:

The north of the proposed Project site has a small plantation area. Plantation species are *Pinus pinea*, *Pinus nigra* and *Cedrus libani*.

### 12.2.6 Impacts and Mitigation Measures

Potential impacts during construction include loss of habitat, damage or loss of individuals and communities of endemic species during site clearance and excavation activities, as well as establishment of construction areas, accommodation areas and other areas such as temporary laydown areas. As a result of terrestrial flora studies, 225 taxa of 57 plant families found at the site were identified to be mostly widespread and cosmopolitan species. There are two naturally occurring local endemic species; *Cephalaria tuteliana* and *Cirsium polycephalum* observed at the site, both of which are listed under IUCN Red List category of “CR: Critically Endangered”.

The presence of Critically Endangered species in an area is one of the criteria of Critical Habitat according to IFC Performance Standard 6 (IFC PS 6) as mentioned below. Critical habitats are areas of high biodiversity value that may include at least one or more of the five values specified in IFC PS 6. Critical habitat criteria are as follows and should form the basis of any critical habitat assessment:

- I. Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species
- II. Criterion 2: Endemic and/or restricted-range species
- III. Criterion 3: Migratory and/or congregatory species
- IV. Criterion 4: Highly threatened and/or unique ecosystems
- V. Criterion 5: Key evolutionary processes

As stated, Criterion 1 is considered for the evaluation of the Project site. IFC PS 6 further defines numerical thresholds for critical habitat assessment, through a tiered approach (Tier 1 or Tier 2) and requires determining whether the Project site is located in a Tier 1 or Tier 2 critical habitat. The summary of Tier 1 and Tier 2 with respect to the threshold for Criterion 1 is provided in Table 12-2.

Table 12-2: Quantitative thresholds for Tiers 1 and 2 of critical habitat criterion 1

Criteria	Tier 1	Tier 2
1. Critically Endangered (CR)/ Endangered (EN) Species	<p>(a) Habitat required to sustain <math>\geq 10</math> percent of the global population of a CR or EN species/subspecies where there are known, regular occurrences of the species and where that habitat could be considered a discrete management unit for that species.</p> <p>(b) Habitat with known, regular occurrences of CR or EN species where that habitat is one of 10 or fewer discrete management sites globally for that species.</p>	<p>(c) Habitat that supports the regular occurrence of a single individual of a CR species and/or habitat containing regionally-important concentrations of a Red-listed EN species where that habitat could be considered a discrete management unit for that species/ subspecies.</p> <p>(d) Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species.</p> <p>(e) As appropriate, habitat containing nationally/regionally important concentrations of an EN, CR or equivalent national/regional listing.</p>

Based on the flora and vegetation studies carried out for the Project, it was concluded that the Project site is a Tier 2 habitat due to the fact that the site fails to sustain more than 10% of the global populations of either of the critically endangered species identified at the site. Information on the exact locations of *Cirsium polycephalum* and *Cephalaria tuteliana*, and sites of other population distribution outside the site, as well as mitigation measures to be taken in order to achieve no net loss species populations over time are summarized in Table 12-3.

As stated in Table 12-3, no adverse impacts on the identified endemic species are expected in terms of their population as 90% of their population is present outside the Project area. Moreover, the Project site is located on a large area and it is likely to be possible to protect some of the habitats within the site. If the maquis habitat to the north of the Project site and its openings are preserved, not only species like *Erica manipuliflora*, *Cistus creticus*, *Lavandula stoechas*, *Spartium junceum*, *Quercus infectoria*, *Quercus coccifera*, *Arbutus unedo*, *Cistus salviifolius*, *Phillyrea latifolia*, *Anthyllis hermannia* and *Pistacia terebinthus*, but also the two local endemic species of *Cephalaria tuteliana* and *Cirsium polycephalum* located in the steppe habitats at the openings of the mentioned shrubs can be preserved.

It is recommended that at least one of the approaches described below are adopted as mitigation so that populations of the two critically endangered local endemic species are preserved and results in no net loss of their populations over time. These approaches are as follows:

- to preserve the two species *Cirsium polycephalum* and *Cephalaria tuteliana* in-situ within the specific areas they grow at the Project site by preserving these areas,
- to plant the seeds of *Cephalaria tuteliana* and *Cirsium polycephalum* in pre-determined natural habitat and to monitor their status as the Project proceeds through the upcoming seasons,
- to collect seeds of both species during September-October and to transfer them to the Gene Bank for further conservation.

Further mitigation measures include implementing a monitoring program to include biological monitoring of populations of the two endemic species at the preservation areas within the project site, and using native species during landscaping activities. The most suitable species for landscaping can be listed as *Arbutus unedo*, *Erica manipuliflora*, *Cistus creticus*, *Cistus salviifolius*, *Quercus infectoria* and *Spartium junceum*.

Table 12-3: Distribution localities of *Cirsium polycephalum* and *Cephalaria tuteliana*

Local Endemic Species	IUCN Red List Category	Habitat	Coordinates within the Project Site and Date of Observation	Population Status within the Project Site	Distribution Areas outside the Project Site	Mitigation Measure	Degree of Projected Impacts
<i>Cirsium polycephalum</i>	CR	Garig openings, meadows	35 T 0649210 E 4551314 N October 12, 2013	Quite good	A1 Oak opening Kirklareli; Saray, between Beyceler-Sinekli ai, oak opening, B Yildiz & T. Dirmenci (BY16530) A2 Istanbul; Kilyos, Rechinger 32977; Istanbul; south of Kilyos, A. Baytop (ISTE 18543); Istanbul; Buyukcekmece, Davis 39227 (E); Istanbul; Fistiksuyu-Hunkarsuyu, Azn.; Istanbul; Silivri, K. Alpinar (ISTE57251); Istanbul; Catalca, Dursunkoy-Boyalik, D. Genc (ISTE 82265); Istanbul; Beykoz, Akbaba, Poyrazkoy, N.& E. Ozhatay (ISTE 70931); A2 Bursa; Uludag Road, B yildiz & T. Arabacı (BY16582)	The seeds should be collected and transferred to the Gene Bank.  An area where the species grows within the project site must be preserved in-situ.	No adverse impact for now since 90% of the population is outside the project site.
<i>Cephalaria tuteliana</i>	CR	Garig openings	35 T 0649210 E 4551314 N October 12, 2013	Weak	A2 Istanbul; Bahcesehir, Ispartakule, E Uzen (ISTF 36874)	The seeds should be collected and transferred to the Gene Bank.  An area where the species grows within the project site must be preserved in-situ.	No adverse impact for now since 90% of the population is outside the project site.

## 12.3 Fauna

### 12.3.1 Methodology

A field survey was conducted in October 2013 to identify the fauna species within the Project area. Although the timing of field studies was a little late in terms of fauna (especially for migratory birds), it was quite suitable to identify animal species inhabiting the Project site. Therefore, the findings of terrestrial fauna studies depend on on-site observations made at the Project site which is supported by literature data. Fauna field surveys were carried out to cover all habitats within the site and its surroundings including the maquis, garig, steppe-meadow and plantation site, and for each habitat sample areas were studied depending on the size of the habitat. The area was walked as shown in Figure 12-1 and faunal elements were recorded. Direct observations, burrows, footprints, droppings etc. were used to record animals in the area. The photos of bird species seen in the area were taken. The fauna list was prepared combining the fauna species that are distributed within the sample areas and literature data. The endemism and threat/protection status of species were taken as basis for evaluation.

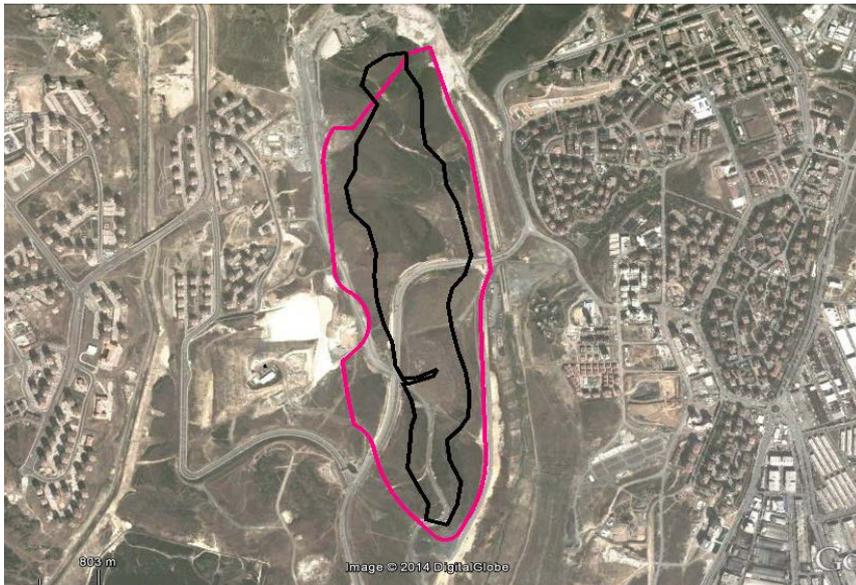


Figure 12-1: The border of Project site (pink line) and GPS track record of the line walked (black line)

While determining threat statuses of endemic and rare fauna species the IUCN Red List of Threatened Species website, BERN convention annexes, CITES annexes, 2013-2014 Decrees of Central Game Commission (MAK) of the General Directorate of Nature Conservation and National Parks of the Turkish Ministry of Forest and Water Affairs and European Union (EU) Bird Directive were utilized.

#### 2013-2014 Central Game Commission (MAK) Decrees

- Appendix-I: List of wild animals protected by the Ministry of Forestry and Water Works.
- Appendix-II: List of game animals protected by MAK.
- Appendix-III: List of game animals whose hunting is allowed for certain periods for 2013-2014 season.

### Species under EU Bird Directive

The birds in the scope of EU list are listed as Annex I, Annex II (Part A, Part B) as defined below:

- Annex I: The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution
- Annex IIA: The species referred to in Annex II, Part A may be hunted in the geographical sea and land area where this Directive applies
- Annex IIB: The species referred to in Annex II, Part B may be hunted only in the Member States in respect of which they are indicated.

### **12.3.2 Overview of Baseline Conditions**

The fauna of the Marmara Region of Turkey, especially Istanbul and its surroundings are quite well-studied. As explained previously in the flora section, the area around the Project site has been declared as a settlement zone, there is dense housing around the Project site, natural areas within the Project site are limited and anthropogenic impacts within the Project site like excavation and grazing are still continuing. Because the Project site is limited in terms of its surface area and affected by anthropogenic effects, faunal elements were low.

As a result of the field study carried out in October of 2013, a total of 61 faunal taxa that belong to 3 vertebrate classes were identified, of which 11 were reptiles, 46 were birds and 4 were mammals. These species are listed in Annex K-2. None of the identified species is endemic. According to IUCN criteria, *Testudo graeca* (Spur-thighed Tortoise) is listed in risk categories as vulnerable (VU) and *Falco vespertinus* (Red-Footed Falcon) is listed as Near Threatened (NT). All the other species are listed as Least Concern (LC), Data Deficient (DD) or Not Evaluated (NE) by IUCN.

Because the Project site surroundings are under the pressure of settlements, and inside the site are ongoing anthropogenic impacts, no endemic species for Thrace and/or species listed under threatened categories by IUCN, except for Spur-thighed Tortoise were identified within the Project site indicates the ordinariness of the Project site in terms of its faunal composition. The size of the Project site is not suitable for large or medium sized mammals such as fox, jackal, marten etc. Only some small mammals such as mice, shrews and moles can inhabit the area. Some snakes and lizards may also inhabit the area. Additionally, some song birds can use the area for feeding and reproduction.

### **12.3.3 Threat Status and Endemism of Fauna Species**

Among the 61 vertebrate taxa identified at the site, no species is endemic. According to IUCN criteria, only one species is being listed under risk categories as vulnerable. This species is *Testudo graeca* (Spur-thighed Tortoise) and one single Tortoise was seen during field trip (Photo 9). However, more animals are likely to occur in the field as some parts of the field were walked and the habitat in the area seems to be suitable for this animal.

The other species that is listed as Near Threatened category is *Falco vespertinus* (Red-Footed Falcon). In the field, only one female individual flying over the project site was seen (Photo 10).



Photo 9. *Testudo graeca*



Photo 10. *Falco vespertinus* (Red-footed Falcon)

#### 12.3.4 Impacts and Mitigation Measures

As a result of terrestrial fauna (vertebrates) studies, 61 vertebrate species found at the site were identified to be mostly widespread and cosmopolitan species. The Project area does not contain endemic or endangered vertebrate species. The Project area is under dense anthropogenic effect as a result of increasing residential developments around the Project area and also road traffic, and has a small size for a natural habitat. One Vulnerable species is observed at the Project site that can be affected during the construction activities (*Testudo graeca* (Spur-thighed Tortoise)). Considering that necessary mitigation measures as described in Section 12.3.5 are taken, no significant impacts on this species are expected.

The Project area contains 11 reptile species and some amount of population will be lost during the construction of the Project as their habitats will be affected by construction activities. The Project area contains four mammal species. Mole burrow, blind mole rat burrow, porcupine faces were observed in the field. According to the habitat type and distribution, wood mouse is also likely to be present in the area. The impacts on the mentioned species during the construction activities are expected to be of minor significance.

The Project area contains possibly 46 bird species. During the field trip, 13 species were observed directly (directly observed bird species are indicated by a star (\*) in Annex K-2). The other 33 species are expected to occur in the area based on the habitat type and the location of the Project area. Because of its semi natural habitat type, birds around the Project area are using the area for feeding, sheltering and possibly for breeding. Due to the fact that the construction activities will

result in habitat loss, it is likely that the bird species will leave the site. Considering the IFC PS6 and the criteria for critical habitat, Criterion 3: Migratory and/or congregatory species is considered for the evaluation of the Project area. Similar to Criterion 1 as explained in the flora section, numerical thresholds through a tiered approach (Tier 1 and Tier 2) are defined by IFC PS6 as given in Table 12-4.

Table 12-4: Quantitative thresholds for Tiers 1 and 2 of critical habitat criterion 3

Criteria	Tier 1	Tier 2
3. Migratory/ Congregatory Species	(a) Habitat known to sustain, on a cyclical or otherwise regular basis, $\geq 95$ percent of the global population of a migratory or congregatory species at any point of the species' lifecycle where that habitat could be considered a discrete management unit for that species	(b) Habitat known to sustain, on a cyclical or otherwise regular basis, $\geq 1$ percent but $< 95$ percent of the global population of a migratory or congregatory species at any point of the species' lifecycle and where that habitat could be considered a discrete management unit for that species, where adequate data are available and/or based on expert judgment. (c) For birds, habitat that meets BirdLife International's Criterion A4 for congregations and/or Ramsar Criteria 5 or 6 for Identifying Wetlands of International Importance. (d) For species with large but clumped distributions, a provisional threshold is set at $\geq 5$ percent of the global population for both terrestrial and marine species. (e) Source sites that contribute $\geq 1$ percent of the global population of recruits.

Based on the thresholds in Table 12-4, it was concluded that the Project site is neither Tier 1 nor Tier 2 habitat for faunal aspect. It is also important to note that the Project area is not on the main migration route of birds (as shown in Figure 12-2) and because of the dense anthropogenic pressure around the Project area, the area does not seem to have a big importance for birds. It is expected that the birds will come back to the site and continue to use the site after the completion of landscaping activities. For this reason, significant impacts are not expected on birds. On the other hand, since Istanbul is on one of the most important migration route of birds in Turkey, some migratory birds may be observed in every part of Thrace and even city center.

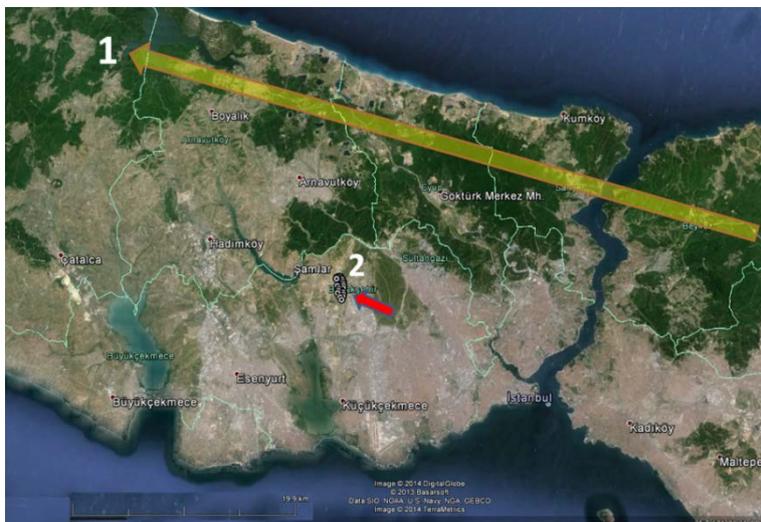


Figure 12-2: Main migration route for migratory birds around Istanbul (yellow arrow, no: 1) and the location of the Project site (red arrow, no: 2)

Among reptile species in the area, the most important species related to IUCN criteria is *Testudo graeca* (Spur-thighed Tortoise). The main mitigation measure for this species would be either to protect "in-situ" in the Project area or to transfer to suitable natural habitats that are found especially in the north of the Project area. It is suggested that tortoise specimens are collected and transferred to safe places prior to the start of construction activities. To protect this species in the Project area, some semi natural parts need to be left in the area which is also useful for other species in the field. During operation of the hospital, tortoise may survive in gardens and continue to reproduce in such habitats.

In addition, measures can be taken to mitigate potential impacts on birds that may include leaving semi natural areas inside the Project area to the extent possible, implanting plants with fruit and/or seed as food sources for birds, creating water sources such as small lakes or ponds in the project area.

#### 12.4 Legally Protected Sites

In order to identify the protected sites in the vicinity of the Project area which are under protection by the relevant national legislation, maps and documents from Ministry of Forest and Water Affairs (MFWA), General Directorate of Nature Conservation and National Parks have been utilized along with the information collected from the references:

- Geodata (Geographical Information System) of MFWA
- General Directorate of Nature Conservation and National Parks of MFWA
- <http://www.milliparklar.gov.tr/belge/yhgs.pdf>
- Önemli Doğa Alanları Kitabı (Key Biodiversity Areas Book) – Doğa Derneği (Nature Society)
- World Database on Protected Areas <http://protectedplanet.net>
- Official Website of Basaksehir Municipality
- Provincial Environmental Status Report of Istanbul by the Ministry of Environment and Urban Planning (MEUP), 2010-2011
- Provincial Environmental Status Report of Istanbul by Chamber of Environmental Engineers, 2012
- Basaksehir Municipality Strategic Plan for 2010-2014
- Website of Bird Life International  
<http://www.birdlife.org/datazone/geomap.php?r=i&bbox=-150%20-50%20150%2080>

The nearest protected site to the project site is Samlar Natural Park (obtained from GIS Database of MFWW) located approximately at a distance of 2,850 m to the north of the project site (shown in Figure 12-3). The Natural Park is one of the largest recreational areas of Istanbul with a land of 337.05 ha dominated by coniferous species and registered as a protected area on 11.07.2011 by the Ministry of Forest and Water Affairs. The target with the declaration of this protected area is to conserve the population of particularly the various plant and tree species. The area is also used as a scouting camp. The view from the Samlar Natural Park is given in Figure 12-4.

Kucukcekmece Lake wetland is another protected land close to the project site (approximately at a distance of 5.3 km) as a bird resting and breeding area in the scope of Ramsar Convention and archaeologically important area according the provincial environmental status report of the MEUP. Kucukcekmece Lake is a brackish (lightly salted) reed-bed lagoon with 179 km<sup>2</sup> of catchment area and 15 km<sup>2</sup> of total surface area. The marsh area formed by the tides of the lake provides a

breeding and wintering habitat on the migration route of bird species. The lake is registered as one of the 97 important bird areas of Turkey by Society for Protection of Nature and Bird Life International as it provides shelter for a considerable amount of birds in winter, including kingfisher, cormorant and black backed gull. The location of Kucukcekmece Lake wetland is also shown in Figure 12-3. The view from the Kucukcekmece Lake is given in Figure 12-5.



Figure 12-3: Samlar Natural Park and Kucukcekmece Lake Wetland (Source: Geodata of MFWA)



Figure 12-4: View from Samlar Natural Park

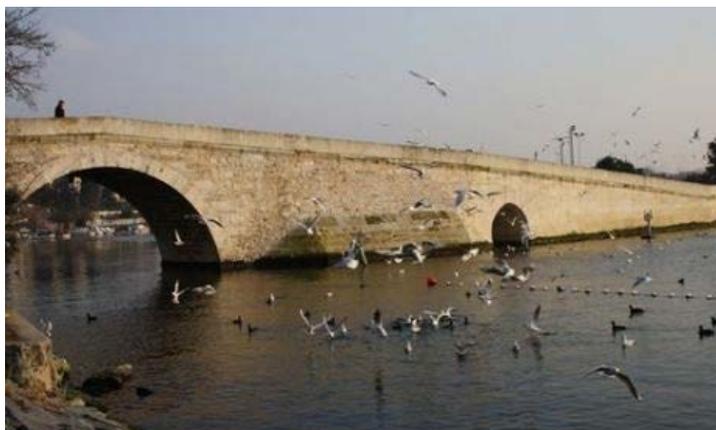


Figure 12-5: View from Kucukcekmece Lake

In addition, degraded coppice and high forest areas are existing in the vicinity as shown on the map in Figure 12-6.



Figure 12-6: Wooded areas close to the Project area

No impacts on the Samlar Natural Park and Kucukcekmece Lake Wetland are foreseen as a result of the Project activities due to the fact that there will be no direct contact with these areas.

Moreover, as shown in Figure 12-6, the project area is located in degraded coppice area according to the Geodata (Geographical Information System) of MFWA. It is important to note that there is already an intense urbanization in large part of those areas shown by light yellow and no existing forest area is in question in the close proximity of the project area.

### 12.5 Key Biodiversity Areas, Important Bird Areas and Important Plant Areas

Key Biodiversity Areas (KBAs) have been identified in Turkey, but there are no regulatory provisions for the identified KBAs except for those that have a legal protected status. The book entitled 'Key Biodiversity Areas of Turkey' published by Doga Dernegi (Nature Society) in cooperation with the Turkish Ministry of Environment and Forest (former ministry, now Ministry of Environment and Urban Planning) and several conservationists and academics, is the most outstanding source for KBAs in Turkey. According to the book, the closest KBAs to the Project area are Kucukcekmece Basin (approximately 2.5 to 3 km), West Istanbul Meadows (approximately 2.5 km to the east) and Bogazici (Bosphorus), Buyukcekmece Lake, Agacli Dune, Terkos Basin and Kilyos Dune with distances between 15 km and 25 km to the Project area. Kucukcekmece Basin, Kilyos Dune, Terkos Basin and Bogazici are also under protection by other protection statuses such as natural protected area (Kucukcekmece Lake, Terkos Basin and Kilyos Dune), protection forest (Kilyos), wildlife development area (Kilyos and Bogazici), nature reserve area (Bogazici), natural park (Bogazici); whereas West Istanbul Meadow, Buyukcekmece Lake and Agacli Dune has no legal protection status.

The location of the Project site with respect to Kucukcekmece Basin KBA and West Istanbul Meadow KBA is shown in Figure 12-7. The Kucukcekmece Basin KBA covers Lake Kucukcekmece in the south and Sazlidere Reservoir to the north together with the streams and reed beds between

them. Synthetic sand and mud flats of Ikitelli Drinking Water Treatment Plant, lagoons and reed beds in the north of the lake provide a breeding and wintering habitat especially for bird species, such as *Phalacrocorax pygmeus*, *Ciconia ciconia*, *Phalacrocorax carbo* and globally endangered *Oxyura leucocephala*. The KBA is also a shelter for globally endangered *Nannospalax leucodon* and a rare turtle species (*Emys orbicularis*) and a distribution area for some plant (*Veronica turrilliana*) and butterfly species (*Pseudophilotes bavius* and *Archon apollinus nikodemusi*).

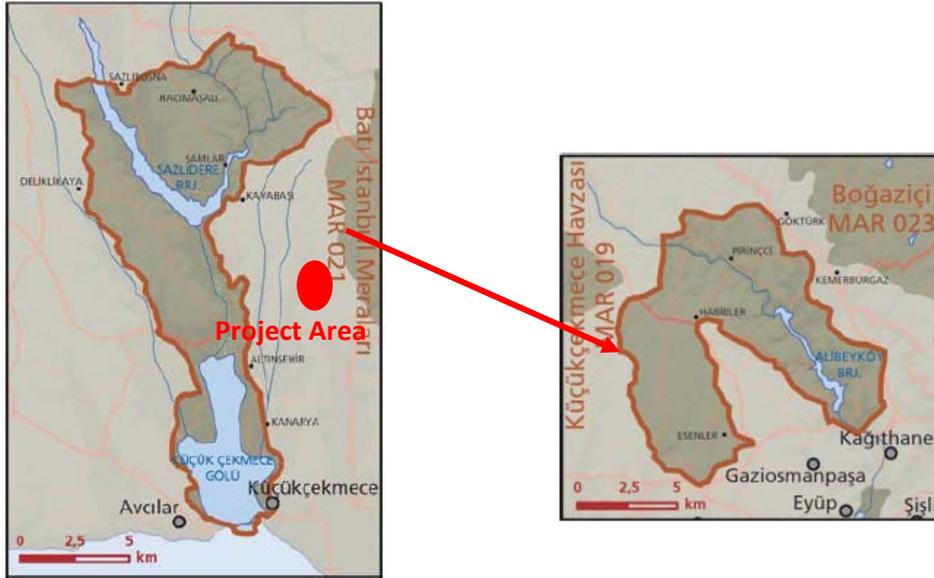


Figure 12-7: Boundaries of Kucukcekmece Basin KBA and West Istanbul Meadow KBA

In addition to the KBAs, Important Bird Areas (IBAs) and Important Plant Areas (IPAs) were also identified by Nature Society and WWF Turkey, respectively. According to the available documentation, closest IBAs to the Project area are Kucukcekmece Basin, Buyukcekmece Lake, Bosphorus and Terkos Lake (see Figure 12-8). Kucukcekmece Basin as an IBA is described as a natural brackish lagoon (20 m deep) situated west of Istanbul with 11,690 ha area. Fringe vegetation is confined to an area of reed bed (Phragmites) in the north of the lagoon. Unplanned buildings surround the site. A motorway passes to the north. The area is a Ramsar area, which is a standing freshwater and water fringe vegetation habitat hosting Pygmy Cormorant *Phalacrocorax pygmeus* (passage), Great Cormorant *Phalacrocorax carbo* (wintering) and many other species.



Figure 12-8: Boundaries of IBAs around the Project area (Bird Life International)

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The closest IPAs to the Project area are West Istanbul Meadow, Terkos Basin, Agacli Dune and North Bosphorus. West Istanbul Meadow is the undisturbed calcareous meadow with surface rocks and acidic dry heathland on the western hills of Istanbul City center. Plant communities offshore and marshy areas of Kucukcekmece Lake are also included in this IPA. The IPA is an attraction center for numerous botanists around the world in virtue of having rich vegetation and rare species that are grown on lime. Five plant species within the IPA (*Amsonia orientalis*, *Cyclamen coum*, *Onosma proponticum*, *Thymus aznavourii* ve *Veronica turrilliana*) are on the Annex I list of Bern Convention. Furthermore, there are also globally endangered and/or endemic species such as; *Bupleurum pendikum*, *Cirsium polycephalum*, *Gypsophila glomerata*, *Heptaptera triquetra* ve *Linum tauricum* ssp. *Bosphori*. A large part of the IPA is not legally protected and under pressure of rapidly expanding urbanization of Istanbul City. The major threat for the IPA was conversion of fertile clay meadows into agricultural lands until recent past, but urbanization is presently a threat to completely destroy the area.

No impacts will occur on the mentioned KBAs, IBAs and IPAs as a result of Project activities as these areas are located far away from the Project area and there will be no direct contact with these areas.

## 13.0 ARCHAEOLOGY

### 13.1 Scope

This chapter addresses the potential cultural heritage and archaeological impacts associated with the Project and defines the mitigation measures to be taken against the potential impacts, particularly prior to and during the construction phase of the Project.

The following Project-specific studies have been conducted for the identification of existing and potential archaeological assets within the Project area and its surroundings:

- İstanbul İkitelli Integrated Health Campus Project Cultural Heritage Assessment conducted during the ESIA scoping study (report dated 26 November 2013)
- İstanbul İkitelli Integrated Health Campus Archaeo-geophysics Research conducted in December 2013

### 13.2 Baseline Studies

The baseline studies conducted to date cover two main phases. The aim of the baseline studies were (i) to review the archeological history/background of the Project site and surroundings (ii) to identify cultural heritage and archaeological assets located within the Project site (if any) and (iii) to assess the potential of the Project site containing undiscovered assets.

The phases of baseline studies are explained below:

*Initial assessment:* This phase included desk research and field visits. Field visits were conducted within the Project site boundaries on 3<sup>rd</sup> and 7<sup>th</sup> of October 2013. The assessment study was conducted by an archaeological expert team. The team members were Assoc. Prof. Ferudun Özgümüş, Assoc. Prof. Şevket Dönmez and Art Historian Ayşe Didem Ozger-Bayvas. As a result of the studies, *İkitelli Integrated Health Campus Project Cultural Heritage Assessment Report* was prepared (dated 26 November 2013) and presented in Annex L. Details and findings of the study are provided in *Section 13.4.2*.

*Archaeogeophysical Research:* Based on the findings of the initial assessment, an archaeogeophysical research was conducted in the Project area by Geometrik Mühendislik Müşavirlik Yeraltı Araştırmaları. As a result of the studies, *İkitelli Integrated Health Campus Archaeogeophysics Research Report* was prepared (dated December 2013). The aim of the archaeogeophysical research was to identify whether there are remains in the Project area that dates back to ancient times. For this purpose, geophysical methods that include Geo-radar (Ground Penetrating-GPR), Multi-Electrode Electrical Tomography (2D) and Self Potential (SP) methods of Geophysics have been used. Geo-radar measurements were carried out at 190 profiles with 1.0 m interval in 9 regions within the Project site. Multi-Electrode Electrical Tomography measurements were carried out at 28 profiles and the Self-Potential measurements were carried out in 5 regions within the Project site. As a result of geophysical studies, two and three dimensional Geo-radar, Electrical Tomography and Self-Potential maps and underground images were obtained. Brief findings of the research are given in *Section 13.4.3*.

### 13.3 Regulatory Framework

Movable and immovable cultural and natural assets in Turkey are protected and preserved by the Law on Preservation of Cultural and Natural Assets (Law No. 2863) published in the Official Gazette dated 23.07.1983 and numbered 18113. The law defines the movable and immovable cultural and natural assets to be protected, arranges the related actions to be taken, determines the establishment and duties of the relevant organizations that will take implementation decisions. The definitions made in the law are given below:

- Cultural Assets: All movable and immovable assets on the surface, underground or underwater regarding science, culture, religion and fine arts that belong to prehistoric and historic area or which have scientific or cultural genuine qualifications that belong to prehistoric and historic areas.
- Natural Assets: Valuables from geological, prehistoric and historic era, on surface, underground or under water, of which the preservation is essential due to their unique features and beauty.
- Archeological Site: ancient sites and city ruins that reflect the social, economic, architectural and other features of their era, locations of significant historic events and areas containing cultural assets that require preservation within/among their specified natural features; and
- Preservation Areas: buffer areas needed to preserve immovable cultural assets in their physical historical surrounding/context.

Law 2863 establishes legal protection for the following:

- all natural assets and immovable cultural assets constructed up until the end of the 19<sup>th</sup> century,
- any immovable cultural asset from after the end of the 19<sup>th</sup> century, identified by the Ministry of Culture and Tourism as an important asset worthy of preservation,
- all immovable cultural assets located within archeological sites,
- buildings/areas that have witnessed significant historical events during the National War and the foundation of the Turkish Republic and dwellings that have been used by Mustafa Kemal ATATÜRK, regardless of time and registration.

The Ministry of Culture and Tourism is the responsible body for protection of cultural heritage in Turkey at the national level. As part of the Ministry, the High Commission for the Protection of Cultural Assets is responsible for protecting and restoring the immovable cultural and natural assets. Related to natural assets, the responsible body is the Ministry of Environment and Urban Planning (General Directorate of Natural Assets Protection) for the works, processes, and decisions foreseen in Law 2863 about natural assets except movable ones, natural archeological sites, and the related protection areas.

There are also Cultural Assets Protection Regional Boards at regions defined by the Ministry of Culture and Tourism, which are responsible for the protection of cultural heritage within their respective jurisdictions. The relevant Regional Board for the Project is the "Istanbul 1<sup>st</sup> Cultural Assets Protection Regional Board Directorate" which is responsible for the following areas of Istanbul: Arnavutkoy, Avcilar, Bahcelievler, Bayrampasa, Bagcilar, Bakirkoy, Basaksehir, Beylikduzu, Buyukcekmece, Catalca, Esenyurt, Esenler, Gaziosmanpasa, Gungoren, Kucukcekmece, Sultangazi, and Silivri.

In addition to Law 2863, there are principle decisions related with the protection and preservation of cultural and natural assets, among which Principle Decision No.658 (dated 05.11.1999) defines the evaluation and classification criteria for archaeological sites in three levels as given below:

- 1<sup>st</sup> Degree Archaeological Sites: Highest level of protection. Areas to be preserved as they are, except for scientific studies with preservation purpose. In these areas any kind of excavation, other than scientific excavations, and construction are prohibited.
- 2<sup>nd</sup> Degree Archaeological Sites: Moderate level of protection. Areas to be preserved as they are, except for scientific studies with preservation purpose. The preservation and utilization requirements for these areas are set by Protection Boards. New constructions are not allowed in these areas but basic maintenance on existing structures may be carried out in accordance to standards set by the Protection Boards.
- 3<sup>rd</sup> Degree Archaeological Sites: Lowest level of protection. Archaeological Sites where new arrangements can be allowed according to the preservation and utilization decisions.

### 13.4 Baseline Conditions

#### 13.4.1 Brief Literature Survey

A literature review has been conducted to understand the archaeological background of the Project area. According to the review, there are no prehistoric or ancient remains reported in the vicinity of the Project area. The closest area is the **Yarimburgaz Cave** (located approximately 5.5 km south of the Project area) where Lower Paleolithic (40,000 BC), Neolithic (6th Millennium BC), Chalcolithic (5th Millenium BC) and Byzantine artifacts have been unearthed. The nearest ancient settlement to the Project site (approximately 10 km from the Project Site) is **Rhegium**. Although ruins of Rhegium have almost disappeared due to the excessive construction activities, its locations and some major remains of **Rhegium** were discovered on the western coast of Kucukcekmece Lake (approximately 10 km from the Project area). A large walled Byzantine complex was found at this ancient city. Another ancient settlement, **Bathonea** (approximately at a distance of 10 km from the Project area) is located near the eastern shore of Kucukcekmece Lake. Some late Byzantine and some other artifacts have been unearthed at this area. There are **cisterns** and **fountains** which belong to Byzantine and Ottoman period in Altinsehir (3 km from the Project area) and Kucukcekmece (10 km from the Project area).

#### 13.4.2 Field Study Results of Initial Assessment

Field visits to the Project area were conducted by Ayşe Didem Ozger-Bayvas on 3<sup>rd</sup> and 7<sup>th</sup> October 2013. This section presents the findings of the *İkitelli Integrated Health Campus Project Cultural Heritage Assessment Report* that is presented in Annex L-1. As the Project area is divided by a road that is connecting Kayasehir and Basaksehir, the Project area is divided into two parts as Southern Part and Northern Part for the survey.

Initially, the Southern Part was examined. At the western side of the Southern Part, some archaeological ruins were identified which consisted of some small artificially made circular hills and foundations of stone walls. These small hills are six in total and four of them are better preserved to date. At first glance, they seem like debris-hill *Cairn (Kurgan)* type graves. A photo of one these graves is shown below.

Photo 1. Potential *Kurgan* type graves



The Project area is part of the Ancient Thrace. According to the literature sources, *Thracians* had the burial traditions of *Tumuli* and *Cairns* since the beginning of Early Bronze Age (3500 BC). This type of burials is common in Bulgarian and Greek Thrace (Western Thrace). However, in the Turkish Thrace (Eastern Thrace) only one *Kurgan* was excavated in the Kırklareli Province. It was concluded that further archaeological and archaeological studies are needed in order to understand whether the identified remains are *Kurgans* and their dates.

Some long and smooth wall remains which are visible on the surface are observed on the Project area (Photo 2). One of these walls is extending 150 m north-south direction and has a width of approximately 2 m. The other wall is extending 100 m east-west direction and has a width of 1 m. The mentioned two walls meet at the south-east corner of the Project area and make a definite/perfect corner. These walls were made of pebble without mortar. Two opinions were put forward about these walls, one of them is that these walls may be a peribolos wall enclosing the graves, and second one is that they may have been built for defence purposes. It was concluded that further archaeological studies are needed in order to understand the functions of these walls.

Photo 2. Wall ruins in the Southern part of the Project area



In the eastern part of the Southern study area, some ruins and artifacts were identified with potential archaeological importance. One of these is a rectangular foundation of a structure made of pebble which is defined as the most attractive one among the other findings in the Project area. It was assessed that this structure may be part of a larger complex, i.e. one of the Late Roma and Byzantine Farm Houses which were previously mentioned by other experts in the region. About 50 m north of these remains, a marble Middle Byzantine Column Capital (12<sup>th</sup> Century) and also a flat stone paved road were found. Both were found to be destroyed. It was reported that the column capital has probably brought to the Project area from other parts of the city. The artifacts identified on the Southern part of the Project area are shown in Photo 3.

Photo 3. Identified artifacts in Southern part of the Project area

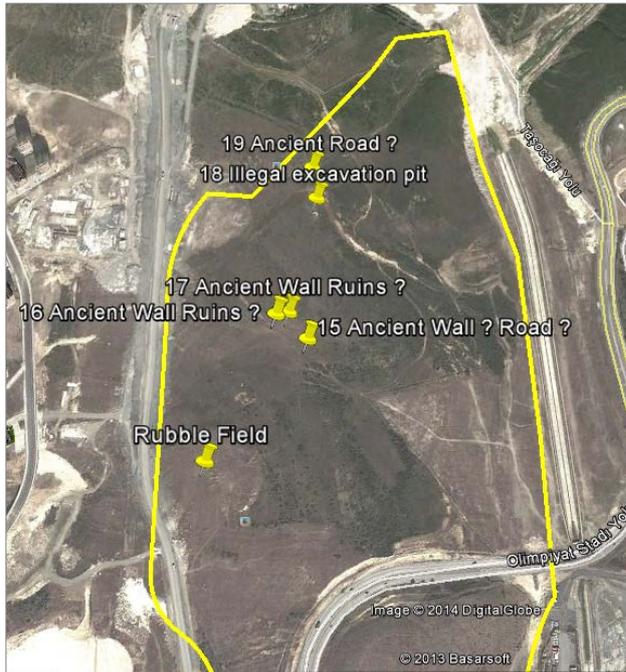


According to the report, Northern part of the Project site does not present as many archaeological findings as the Southern area does. There is a wall extending 120 m in the northwest-southeast direction which has a width of 1 m and was made of pebble (Photo 4). It is thought that the wall has been used for defence purposes. Approximately 200 m north of this wall two big holes were observed. They are thought to most likely have been excavated by illegal treasury hunters. The artifacts identified on the Southern part of the Project area are shown in Photo 5.

Photo 4. Wall ruins in the Northern part of the Project area



Photo 5. Identified artifacts in Northern part of the Project area



### 13.4.3 Brief Findings of the Archaeogeophysical Study

Based on the findings of the initial assessment, it was decided to undertake further archaeogeophysical research at the Project area. This section presents the brief findings of the *Ikitelli Integrated Health Campus Archaeogeophysics Research Report* that is presented in Annex L-2.

Within the scope of this research, a series of measurements were performed as explained in Section 13.2.1. According to the measurements, regular geometric distributed anomalies were determined in some of the regions in the Project area that can be considered as particular architectural form. No other anomalies of regular geometric distribution have been determined at other regions. When all the anomalies determined in the 1-9 regions were investigated, high amplitude, high resistivity, and polarizing anomalies were seen. It was concluded that these anomalies should be tested whether they belong to historical remains. When considering the stone wall which is estimated to be used as a defence wall during the Ottoman-Russian War, the locations with high amplitude anomalies, high resistivity anomalies, and S.P. anomalies should be tested with local archaeological drillings.

### 13.5 Communication with Relevant Authorities

Based on the results of the initial assessment and archaeogeophysical research, IHIC has appointed an Archaeological Committee to maintain liaison with the relevant Protection Board and the Museum Directorate. Ikitelli Integrated Health Campus Project Cultural Heritage Assessment Report has been submitted to the Istanbul 1<sup>st</sup> Cultural Assets Protection Regional Board Directorate.

In addition, opinions from two authorities have been obtained within the scope of ESIA stakeholder engagement activities. These opinions are summarized below:

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*Ministry of Environment and Urban Planning, General Directorate of Natural Assets Protection (date of opinion letter: 13.01.2014)*

- It is identified that the Project area is not located within a Special Environmental Protection Area.
- It is suggested to obtain an official letter from the Istanbul Governorship, Provincial Directorate of Environment and Urbanization related to whether a natural asset and natural protected area is located within the project area.
- In case there is a natural asset and natural protected area, Istanbul Natural Assets Protection Regional Commission needs to be notified in order to have the issue assessed in accordance with the effective legislation, and necessary action will then need to be taken according to the commission decision.

Ministry of Culture and Tourism, Istanbul 1<sup>st</sup> Cultural Assets Protection Regional Board Directorate (date of opinion letter: 16.01.2014)

- The letter forwards the decision (date/no: 09.01.2014/876) taken by the Istanbul 1<sup>st</sup> Cultural Assets Protection Regional Board Directorate. The decision states that the Regional Board Directorate is informed by IHIC about the archaeological artifacts that are mentioned in the “Cultural Heritage Assessment Report” prepared as part of the ESIA study for the IHC, and that the archaeological report has been submitted to the Regional Board Directorate and has been reviewed. The letter further states that the ownership of the site is understood to be the General Directorate of Health Investments of the MoH. It is mentioned that a comprehensive surface investigation needs to be undertaken by the Istanbul Archaeological Museums Directorate with the technical support by the ownership of the site, and the issue can only then be evaluated after the report and photographs of the surface investigation are submitted to the Regional Board Directorate.

As reported by IHIC, the surface investigation by the Museums Directorate has started on 11<sup>th</sup> Feb 2014 and is expected to be completed by 21<sup>st</sup> Feb 2014.

### **13.6 Potential Impacts and Mitigation Measures**

Based on the baseline studies conducted, it was deemed that there is a potential for archaeological importance at the Project area. The archaeogeophysical research suggested conducting local archaeological drillings to understand whether the identified artifacts date back to ancient times. As mentioned previously, contacts with the relevant authority has been initiated. Moreover, it was also required by the 1<sup>st</sup> Cultural Assets Protection Regional Board Directorate that comprehensive surface investigations need to be undertaken by the Istanbul Archaeological Museums Directorate in order to assess the importance of the site findings. As reported by IHIC, the Museums Directorate has started the surface investigation which is expected to be completed soon. Following the surface investigation, the Museums Directorate will prepare a report and submit it to the Regional Board. Prior to the construction phase, the official views of the relevant authorities should be obtained and necessary studies (if any additional study is requested) should be conducted based on these official views. No construction activity should start until decisions are obtained from the relevant authorities and studies are conducted as per the requirements of the relevant authorities.

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During the construction phase, there is a potential of encountering archaeological artifacts/assets which may be physically disturbed if mitigation measures are not taken. The main mitigation measure during the construction phase will be the implementation of a Chance Finds Management Plan that will be developed for the Project. The plan will include the following main measures:

- In case any chance find is encountered, the construction activity will cease immediately and the construction site responsible will be contacted immediately.
- The nearest Museum Directorate will be notified at the latest within three days after the chance find is encountered,
- The construction site responsible will fill up an “Archaeological Chance Find Report Form” that records the date and time of discovery, coordinates of the location of the chance find, description of the chance find, contacts made with the authorities and decisions taken, and the date of recommencement of work.
- Further steps to be followed and proper plan to be implemented for the management of the finds will be decided and reported in writing by the authorities in charge.

## 14.0 SOCIO-ECONOMY

### 14.1 Scope

This chapter presents an assessment of the potential socio-economic impacts of the Project. The issues that were included in Table 1 of the IFC "Good Practice Note: Addressing the Social Dimensions of Private Sector Projects" were considered in the assessment. The following potential socio-economic impacts of the Project were identified:

- Temporary and permanent changes in the study area's population and demographic characteristics due to the Project;
- Direct and indirect employment creation as a result of construction and operation;
- Direct and indirect loss of existing employment and business in other areas;
- Wider (regional) economic impacts; and
- Impact of the provision of temporary construction worker accommodation.

A number of other issues related to social factors are addressed in *Chapter 16: Labor and Working Conditions*.

The socio-economic assessment has involved:

- Gathering existing and available baseline data regarding current socio-economic conditions and how they may develop in the absence of the Project;
- Determining the direct and indirect socio-economic impacts of the project;
- Identifying measures which IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. will take to ensure compliance with international best practice in mitigation of social and socio-economic impacts.

The existing socio-economic data was obtained through the review of secondary sources of information from relevant government authorities and official statistics. Information on the Turkish health sector and the İstanbul region together with information on the PPP Hospital developments within the Turkish health sector was also obtained as part of the socio-economic baseline data gathering. National and regional data was obtained and assessed for the following aspects relevant to the Project:

- Population and Demographics
- Economy, Employment and Occupations
- Income Distribution
- Education
- Industrial Sector
- Recreation and Tourism
- Health Sector

Existing socio-economic data were obtained from the following sources and references:

- Turkish Statistical Institute (<http://www.turkstat.gov.tr/>).
- Ministry of Culture and Tourism (<http://www.kultur.gov.tr/>)

- Istanbul Provincial Directorate of Food, Agriculture and Livestock (<http://www.istanbultarim.gov.tr/>)
- Ministry of National Education (<http://istanbul.meb.gov.tr/>)
- Ministry of Health (<http://www.saglik.gov.tr/>)
- Istanbul Metropolitan Municipality (<http://www.ibb.gov.tr/>)
- Municipality of Basaksehir (<http://www.basaksehir.bel.tr/>)
- World Health Organization (<http://www.who.int/>)
- World Bank Open Data Website (<http://data.worldbank.org/>)

## 14.2 Existing Conditions

### 14.2.1 Population and Demographics

The total population of Turkey was 75,627,384 (50.2% male and 49.8% female) according to the “Population Census 2012” conducted by the Turkish Statistical Institute (TSI) (Figure 14-1). The population growth rate of Turkey was 2.0-2.5% between 1945 to 1990. After 1990, the growth rate decreased to 1.8% which was the first time the population growth rate dropped below the 2% level. The decreasing tendency in the population growth rate continued until 2012 where it was assessed at 1.2%. Despite the decrease in the population growth rate, the present rates are still above the developed countries population growth rate (0.34%)<sup>1</sup> according to the UN data (2009).

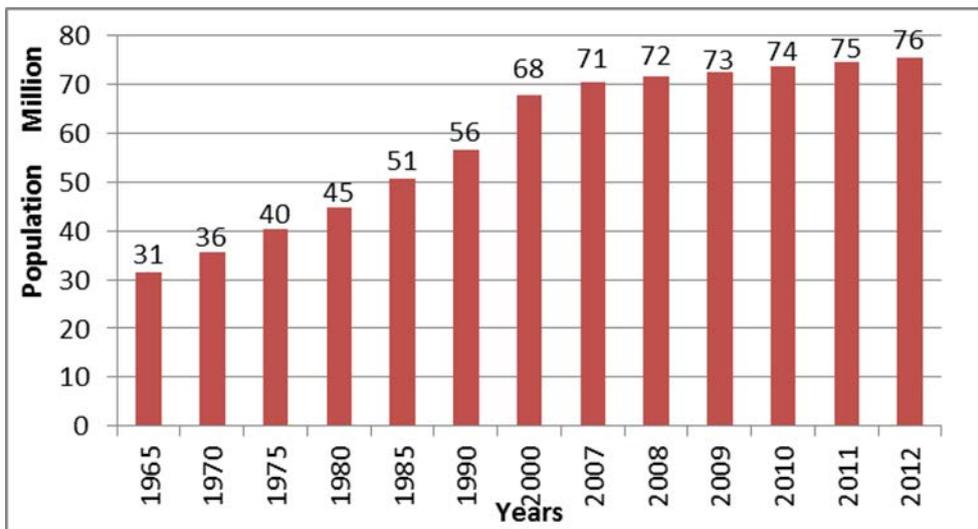


Figure 14-1: National population of Turkey between 1965-2012

Istanbul is the largest city in Turkey and is of great importance to Turkey in terms of economy, culture and history. The population and demographic structure of Istanbul has been significantly influenced by the population growth, rapid urbanization and internal migration in Turkey since the 1950s. When the demographics of Turkey and Istanbul are compared together, similar trends can be seen (Figure 14-2). The impact of migration on the population of Istanbul decreased after year 2000 compared to previous periods, but the Province continued to witness large proportions of

<sup>1</sup>Istanbul Development Agency, 2010-2013 Istanbul Regional Plan Appendices.

migration. The influx still continues in the region<sup>1</sup> (Table 14-2). Istanbul receives the highest migration from the Black Sea Region followed by the Eastern Anatolia and Central Anatolia regions. The main provinces with the largest migration to Istanbul are Sivas, Kastamonu, Ordu, Giresun, Tokat, Samsun and Trabzon<sup>2</sup>. The population growth in the Istanbul province and its districts is given in Table 14-1. The increase in population in the last twelve years is recorded as 3.8 million.

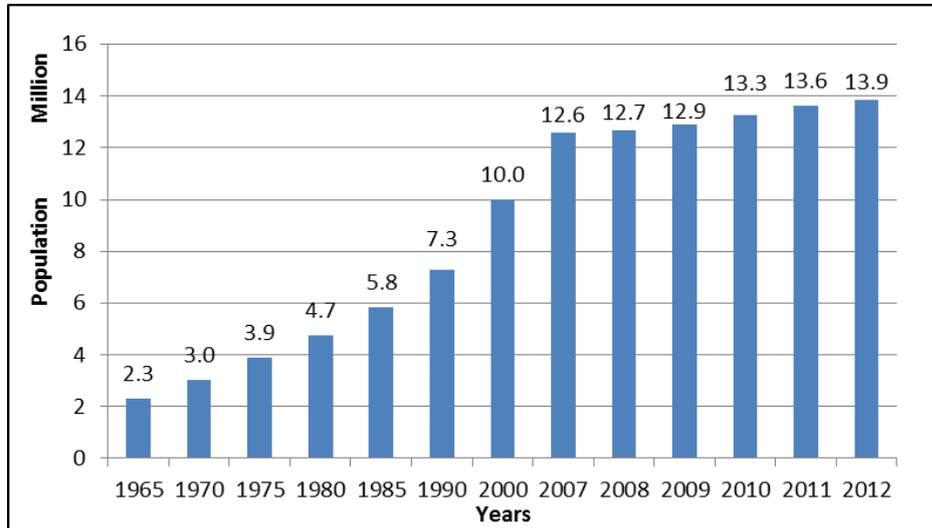


Figure 14-2: Population of Istanbul between 1965-2012

The most populated district among the thirty nine districts in Istanbul is Bagcilar with a population of 749,024 people. The subsequent most populous districts are Kucukcekmece, (721,911), Umraniye (645,238) and Pendik (625,797). Only ten districts, Bahcelievler, Besiktas, Beykoz, Beyoglu, Esenler, Fatih, Gungoren, Kadikoy, Sisli and Zeytinburnu, experienced a decrease in population in the period between 2011-2012. Currently, 8,963,431 people live on the European side, and 4,891,309 people live on the Asian side of Istanbul. The total female population of the city is 6,897,832, and the total male population is 6,956,908 in 2012.

Table 14-1: Population of Istanbul province and its districts between 2000-2012

Location	Population						
	2000	2007	2008	2009	2010	2011	2012
<b>Istanbul</b>	10,018,735	12,573,836	12,697,164	12,915,158	13,255,685	13,624,240	13,854,740
Adalar	17,760	10,460	14,072	14,341	14,221	13,883	14,552
Arnavutkoy*			163,510	175,871	219,145	198,230	206,299
Atasehir*			351,046	361,615	184,390	387,502	395,758
Avcilar	233,749	323,596	333,944	348,635	246,136	383,736	395,274
Bagcilar	556,519	719,267	720,819	724,268	248,084	746,650	749,024
Bahcelievler	478,623	571,711	571,683	576,799	62,001	600,900	600,162
Bakirkoy	208,398	214,821	214,810	218,352	338,329	220,663	221,336
<b>Basaksehir*</b>			207,542	226,387	431,147	284,488	316,176
Bayrampasa	246,006	272,196	268,276	269,425	474,259	269,709	269,774
Besiktas	190,813	191,513	185,373	185,054	532,835	187,053	186,067
Beykoz	210,832	241,833	243,454	244,137	432,199	247,284	246,352

<sup>1</sup> Istanbul Development Agency, 2010-2013 Istanbul Regional Plan.

<sup>2</sup> Istanbul Provincial Environmental Status Report, 2011.

Location	Population						
	2000	2007	2008	2009	2010	2011	2012
Beylikduzu			185,633	193,972	280,802	218,120	229,115
Beyoglu	231,900	247,256	245,064	244,516	138,797	248,206	246,152
Buyukcekmece	384,089	688,774	163,140	171,222	28,119	192,843	201,077
Catalca	81,589	89,158	62,339	63,277	317,337	63,379	63,467
Cekmekoy			147,352	154,103	526,947	183,013	193,182
Esenler	380,709	517,235	464,557	459,980	292,430	461,382	458,694
Esenyurt*			373,017	403,895	182,017	500,027	553,369
Eyup	255,912	325,532	323,038	331,548	416,515	345,790	356,512
Fatih	403,508	422,941	443,955	433,796	695,988	429,351	428,857
Gaziosmanpasa	752,389	1,013,048	460,675	461,230	585,196	482,553	488,258
Gungoren	272,950	318,545	314,271	311,672	603,431	309,135	307,573
Kadikoy	663,299	744,670	533,452	529,191	269,481	531,997	521,005
Kagithane	345,239	418,229	415,130	413,797	364,682	419,865	421,356
Kartal	407,865	541,209	426,748	426,680	738,809	440,887	443,293
Kucukcekmece	594,524	785,392	669,081	674,795	590,063	711,112	721,911
Maltepe	355,384	415,117	417,605	427,041	309,624	452,099	460,955
Pendik	389,657	520,486	541,619	562,122	438,257	609,535	625,797
Sancaktepe*			229,093	241,233	291,063	267,537	278,998
Sariyer	242,543	276,407	277,372	278,527	185,819	287,309	289,959
Silivri	108,155	125,364	124,601	134,660	461,072	144,781	150,183
Sultanbeyli	175,700	272,758	282,026	286,622	188,011	298,143	302,388
Sultangazi*			444,295	452,563	375,208	483,225	492,212
Sile	32,447	25,169	28,571	28,325	248,467	28,847	30,218
Sisli	270,674	314,684	312,666	316,058	204,873	320,763	318,217
Tuzla	123,225	165,239	170,453	181,658	168,438	197,230	197,657
Umraniye	605,855	897,260	553,935	573,265	446,777	631,603	645,238
Uskudar	495,118	582,666	524,889	524,379	256,442	532,182	535,916
Zeytinburnu	247,669	288,743	288,058	290,147	468,274	293,228	292,407

Source: TSI official Website; (<http://www.turkstat.gov.tr/>). \*These settlements became a district in 2008.

Table 14-2: Migration data of Istanbul province between 1975-2012

Time Period	In-migration	Out-migration	Rate of Net Migration
1975-1980	557,082	268,429	73.4
1980-1985	576,782	279,184	60.5
1985-1990	995,117	339,040	107.6
1995-2000	920,955	513,507	46.1
2007-2008	374,868	348,193	2.1
2008-2009	388,467	348,986	3.1
2009-2010	439,515	336,932	7.8
2010-2011	450,445	328,663	9.0
2011-2012	384,535	354,074	2.2

Source: TSI official Website; (<http://www.turkstat.gov.tr/>)

As mentioned above the population has increased annually in the Istanbul province mainly due to the migration process. In 1935, 56.9% of the total population was born in Istanbul. This ratio showed a significant decrease in 1945 but rose again in 1950. After 1950, there has been a continuous decline in the proportion of those born in Istanbul while remaining constant from 1980 to 2000. After 2000, this ratio increased to 37.8% and in 2012 this percentage started to decrease again to reach 15.8%<sup>1</sup>.

<sup>1</sup>Istanbul Provincial Environmental Status Report, 2011.

In 1980, the population of Istanbul province was 4,741,890 based on the 1980 census of which 2,909,455 (61.4%) lived in the central districts and 1,832,435 (38.6%) lived in rural areas. The majority of the population lived in the rural areas just outside of Istanbul until the 1980s; after 1980 the ratio of the rural population to the total population in the Istanbul province has decreased continuously. According to the 1990 census, 7.6% of the total population lived in rural areas and 92.4% of the population lived in urban areas; this figure has changed to 98.96% in urban areas 1.04% in rural areas in the 2012 census. Figure 14-3 show changes in the ratio of urban area and rural area population.

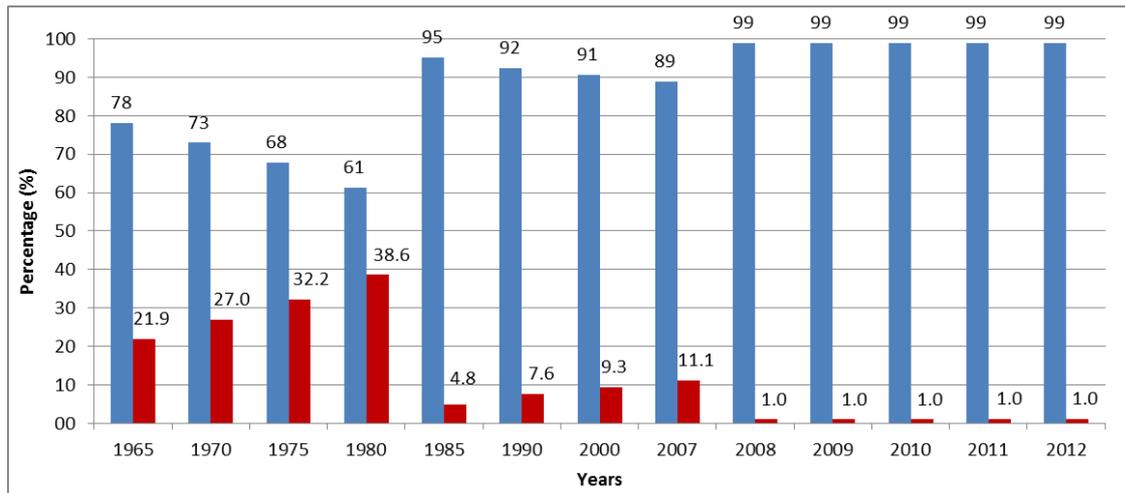


Figure 14-3: Urban and village population ratio of Istanbul province between 1965-2012 (Blue bars indicate ratio of urban population, red bars indicate ratio of rural population)

The Project will be developed in the Basaksehir District of Istanbul. Basaksehir became a district on the 22<sup>nd</sup> March 2008 in accordance with the Law No. 5747. Basaksehir District consists of the Altinsehir, Sahintepe, Kayabasi, Guvercintepe, Basaksehir, Basak, Ziya Gokalp, Bahcesehir 1. Stage, Bahcesehir 2<sup>nd</sup>Stage, Basaksehir neighborhoods and Samlar Village. The total area of the district is approximately 10,433 hectares. The district received migration from Western Black Sea region until the 1990s. After 1990, Basaksehir District has received migration from almost all regions of Anatolia. This migration wave has led to an urban sprawl and related infrastructure problems in the district<sup>1</sup>. The district population was 207,542 in 2008 and increased to 316,176 in 2012. The population growth and gender ratio in the Basaksehir District between 2008-2012 is given in Figure 14-4 and population distribution by age group and gender is given in Table 14-3.

Table 14-3: Population distribution by age group and gender

Age Group (2012)	Male	Female	Total
0-4	16,370	15,609	31,979
5-9	16,777	15,903	32,680
10-14	16,045	15,059	31,104
15-19	13,841	13,122	26,963
20-24	10,428	12,170	22,598
25-29	12,750	15,049	27,799
30-34	16,219	17,387	33,606

<sup>1</sup>Municipality of BasaksehirWebsite; (<http://www.basaksehir.bel.tr/>)

Age Group (2012)	Male	Female	Total
35-39	15,130	14,805	29,935
40-44	13,046	11,300	24,346
45-49	10,322	8,580	18,902
50-54	7,026	6,097	13,123
55-59	4,630	4,285	8,915
60-64	2,807	2,928	5,735
65-69	1,595	1,809	3,404
70-74	948	1,268	2,216
75-79	628	826	1,454
80-84	298	616	914
85-89	114	292	406
90+	18	79	97
<b>Total</b>	<b>158,992</b>	<b>157,184</b>	<b>316,176</b>

Source: TSI official Website; (<http://www.turkstat.gov.tr/>).

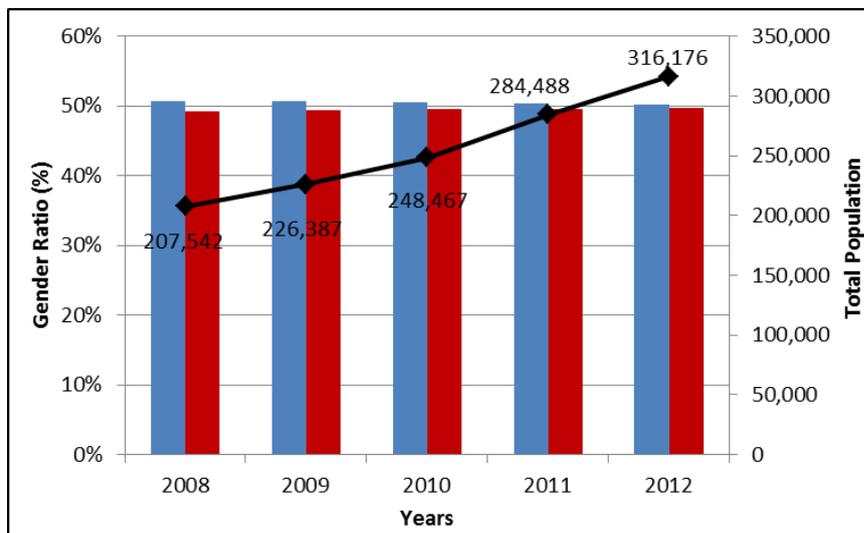


Figure 14-4: Population of Basaksehir District between 2008-2012 (Blue bars indicate the ratio of male population, red bars indicate the ratio of female population and the black line indicates the total population)

Comparisons of general demographic indicators in Turkey, Istanbul and Basaksehir District are shown in Table 14-4.

Table 14-4: General demographic indicators of Turkey, Istanbul and Basaksehir District

Indicators (2012)	Turkey	Istanbul	Basaksehir
Total Population	75,627,384	13,854,740	316,176
Rural Population (%)	22.72	1.04	1.61
Urban Population (%)	77.28	98.96	98.39
Population Density (people/ 1 km <sup>2</sup> )	98	2,666	3,031*
Average Number of Household	3.7	3.6	4
0-14 Age Group Population (%)	36.91	32.74	30.29
Age 65 and Over Population (%)	11.12	8.1	2.69
Age Dependency Ratio	48.03	40.84	32.97
Annual Population Growth (‰)	12.01	16.78	10.02
Crude Birth Rate (‰)	17.0	16.3	N.A.
Crude Mortality Rate (‰)	5.0	4.0	N.A.

Source: TSI official Website; (<http://www.turkstat.gov.tr/>). \*Municipality of Basaksehir Website; (<http://www.basaksehir.bel.tr/>)

There are a total of twelve neighborhoods and one village within a 5 km diameter from the Project area. These are the Basaksehir, Basak, Ziyagokalp, Kayabasi, Guvercintepe, Sahintepe, Altinsehir, Atakent, Ataturk, Mehmet Akif, Yarimburgaz, Habibler neighborhoods and Samlar Village. The Housing Development Administration of Turkey (TOKI) has 14 ongoing projects in Basaksehir District. These projects comprise of 2,376 houses, 4 schools (2 primary schools, 2 secondary schools), 1 hostel for schools, 2 trade centers, 1 health center, 1 mosque and infrastructure.

#### **14.2.2 Economy, Employment and Occupations**

Istanbul bears the characteristic of being the capital city of three Great Empires and is also one of the few cities which have been the center of the country's economic activity. Although the city did not become the political capital for the new Republic established in 1923, it has always been one of the country's economic centers and has never lost its status as the capital predestined for the country.

Istanbul generates about 23% of Turkey's Gross National Product (GNP). Its annual contribution to the state budget is about 40%. On the other hand, the city's share of government expenditures has remained roughly 7-8%. The headquarters of all private banks, and 21% of the total number of bank branches in Turkey, are located in Istanbul.

Istanbul has a central importance in both domestic and international trade. The added value created in Istanbul, reaches 26.5% of provincial total added value, and trade is the second most important sector in Istanbul after the industrial sector. In Turkey, 27% of the general added value created in the commercial sector is created in Istanbul. Istanbul is at the same time the most important export and import gate of Turkey. Exports from Istanbul make up 46% of Turkey's total, imports into Istanbul make up 40% of Turkey's total. Istanbul is also the center of the country's air transport industry. Furthermore, 14 of the 153 museums in Turkey are located in Istanbul, and 34% of the two million four hundred thousand pieces on display are exhibited in Istanbul.

New sectors in the city, such as finance, tourism, service, banking as well as head offices have supplemented the industry sector in recent years. Today, 35% of collected deposits and 33% of credit used in Turkey originate in Istanbul. In addition, almost all of the insurance companies operating in the country are located in Istanbul. The Istanbul International Stock Exchange Free Zone has experienced a large growth among the globally known Stock Markets in the world. The City continues ahead in becoming a financial center, especially in the domains of leasing, factoring companies, private financial institution.

Based on a study dated 2012 by the Turkish Statistical Institute (TSI) employment in the agricultural, industrial and service sectors in Istanbul is 1%, 37% and 63%, respectively. The socio economic indicators of the Istanbul province are given in Table 14-5.

Table 14-5: The socio-economic indicators of Istanbul

<b>Indicators</b>	<b>Value</b>
Population	13,854,740
Urbanization (%)	99
Population Growth (‰)	16.78
Population Density (Person/km <sup>2</sup> )	2,666

Indicators	Value
Population Dependency Ratio (%)	40.84
Employment in Agricultural Sector (%)	1
Employment in Industry (%)	37
Employment in Service Sector (%)	63
Unemployment (%)	8.4
Literate (%)	93.11
Infant Mortality (‰)	8.6
GDP* (Billion USD)	301.1

Source: TSI official Website; (<http://www.turkstat.gov.tr/>). \* The Brookings Institution, Global Metro Monitor; (<http://www.brookings.edu/research/interactives/global-metro-monitor-3>).

There are 11,566 industrial establishments registered in the Istanbul Chamber of Industry and 595,771 people were reported to be employed in these establishments in 2010. Small and medium sized enterprises (SME) made up 97.1% of these organizations. According to the 2010 Istanbul Chamber of Industry data the most important economic sector in the Province is textile products manufacturing. Clothing and manufacturing of textile products industry (33%), metal goods (10%), machinery and spare parts industry (8%), manufacturing of chemical products (8%), electrical and electronics industry (6%), land and sea vehicles manufacturing industry (6%) represent the various sectors of the industrial production. Industrial facilities are mostly gathered in small industrial plants and organized industrial zones but due to unplanned urbanization these industrial areas have remained within the population settlement areas in Istanbul. The majority of the industry is located on Tuzla and Dudullu in the Asian side and Kucukcekmece and Ikitelli in European side of Istanbul. In total 74% of the industry is located in Europe, and 26% is located in the Anatolian side. The main industrial zones in Istanbul are the Tuzla Organized Leather Industry Zone, Ikitelli Organized Industry Zone, Dudullu Organized Industrial Zone. Apart from the organized industrial zones, small industrial zones show different distributions according to district. According to the 2010 Istanbul Chamber of Industry data 210 industrial facilities are located in the Basaksehir District<sup>1</sup>.

The industrial sector has an important place in the economic structure of the Basaksehir district. Ikitelli Organized Industrial Zone (IOIZ) is one of the biggest economical projects of Turkey and is located in the boundaries of Basaksehir District. The IOIZ was built on 700 hectares area. There are now 37 industry cooperatives specializing in various sectors. The IOIZ has 27,301 establishments and present job opportunities for up to 300,000 people. The distribution of businesses by sector in the the OIZ is as follows: 25% leather products, footwear and leather goods, 12% car repair, 5% metal goods, 8% machinery spare parts, 8% furniture, 7% socks, knitwear and garment, 6% textile, weaving. The number of people traveling daily for trading purposes are 227,600 people and total daily goods movement are 50,000 tons in the IOIZ. The added value produced by IOIZ is estimated to be USD 6 billion.

The total land area of the Istanbul province is 552,829 hectares with 142,015 hectares being suitable for agriculture of which 7,936 hectares is grassland and meadow, 273,931.254 hectares is forest and heathland and the remainder of the land area (128,945 hectares) are defined as

<sup>1</sup>Istanbul Provincial Environmental Status Report, 2011.

industrial and residential areas. Agricultural activities are carried out mostly in Arnavutkoy, Buyukcekmece, Catalca and Silivri Districts. The most important agricultural crops in Istanbul are corn, wheat and barley. In 2012, 63,471 tons of corn, 138,046 tons of wheat and 31,819 tons of barley were harvested from 40,473 hectares of agricultural land. Istanbul is a very important agricultural products market for other regions of Turkey because agricultural products are not sufficient for the people of Istanbul. A summary of the agricultural crops produced in the Istanbul province in 2012 are given in Table 14-6.

Table 14-6: Overview of some agriculture activities in Istanbul province

Greenhouse									
Low Tunnel				High Tunnel				Plastic Greenhouse	
Area (ha)		Production (ton)		Area (ha)		Production (ton)		Area (ha)	Production (ton)
10.8		176		107.6		4,326		30.6	790
Important Agricultural Products									
Corn		Wheat		Barley		Tomato		Watermelon	
Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)
2,149.7	63,471	32,348.4	138,046	5,975	31,819	5,364	20,690	836.8	31,655
Cooperatives and Agricultural Dealers *									
Fertilizer		Pesticide		Equipment		Plantation			
65		91		98		56			

Source: Turkish Statistical Institute (<http://www.turkstat.gov.tr/>, 2012). \*Source: Istanbul Provincial Directorate of Food, Agriculture and Livestock (<http://www.istanbultarim.gov.tr/>).

Corn, wheat and barley are grown in the Basaksehir District in line with the Istanbul province agricultural production. Also oat and lettuce are other important agricultural products cultivated in the Basaksehir District. An overview of the agricultural crop production in the Basaksehir District in 2012 are given in Table 14-7.

Table 14-7: Overview of some agriculture activities in Basaksehir District

Important Agricultural Products									
Oat		Corn		Wheat		Barley		Lettuce	
Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)	Area (ha)	Quantity (ton)
585.9	2,203	21.2	1,060	205.8	778	155	608	6	149
Cooperatives and Agricultural Dealers *									
Fertilizer		Pesticide		Equipment		Plantation			
3		1		-		-			

Source: Turkish Statistical Institute (<http://www.turkstat.gov.tr/>, 2012). \*Source: Istanbul Provincial Directorate of Food, Agriculture and Livestock (<http://www.istanbultarim.gov.tr/>).

Stockbreeding is not an important source of income in the city. Livestock activities are carried out mostly in the Silivri, Kartal and Umraniye Districts<sup>1</sup>. In general, productions for the city's daily consumption are concentrated on cattle fattening, poultry and fisheries in ranch, dairy and sheep-fold. There is also a limited amount of apiculture, sericulture in the Province. A part of the daily milk

<sup>1</sup>Istanbul Provincial Environmental Status Report, 2011.

and egg requirements are met by the livestock sector in Istanbul. However, the Province purchases a larger amount from outside the city than it produces in the city. Since fisherman from the surroundings cities bring their catch from outside to the Istanbul market, share of fishing in the field of livestock appears to be higher than it actually is. Poultry farming is carried out with chicken, turkey, goose and duck production. An overview of the husbandry activities including the number of the animals and some animal products in the Istanbul province in 2012 are shown in Table 14-8.

Table 14-8: Some animal products in Istanbul province

Cattle			
Pure Culture Cattle	Hybrid Culture Cattle	Domestic Cattle + Buffalo	
14,571	49,023	14,877	
Small Cattle			
Sheep		Goat	
72,623		5,834	
Poultry			
Broiler	Layer Chicken	Other Fowls	
622,000	834,853	73,231	
Apiculture			
Old Style Bee Hive	New Style Bee Hive	Honey (ton)	Bee wax (ton)
812	55,843	791,009	29,746
Aquaculture *			
Sea Products (ton)	Freshwater Production (ton)	Aquaculture Production (ton)	Other Sea Products (ton)
37,460.3514	622.425	100	565.014

Source: TSI official Website; (<http://www.turkstat.gov.tr/>). \* These data belong to 2008.

Livestocks are not common in the Basaksehir District. An overview of the husbandry activities including the number of the animals and some animal products in the Basaksehir District in 2012 are shown in Table 14-9.

Table 14-9: Some animal products in Basaksehir District

Cattle			
Pure Culture Cattle	Hybrid Culture Cattle	Domestic Cattle + Buffalo	
1,940	166	269	
Small Cattle			
Sheep		Goat	
3,104		910	
Poultry			
Broiler	Layer Chicken	Other Fowls	
-	1,800	220	
Apiculture			
Old Style Bee Hive	New Style Bee Hive	Honey (ton)	Bee wax (ton)
-	1,410	21.150	0.9

### 14.2.3 Income Distribution

The average annual income data for Turkey and the Istanbul province are given in the Table 14-10.

Table 14-10: Average annual income data for 2012

Income type	Turkey			Istanbul
Gross Domestic Product (GDP) (million TL)	1,415,786			660.6 (USD 301,1*)
Average household income, TL	Total	Urban	Rural	Total
	11,859	13,496	8,304	16,126

Source: TSI official Website; (<http://www.turkstat.gov.tr/>). \*The Brookings Institution, Global Metro Monitor; (<http://www.brookings.edu/research/interactives/global-metro-monitor-3>).

The available statistics indicate that 16.2% of the population lives under the relative poverty threshold (4,477 TL per month) in 2012 in Turkey and the number of poor people is estimated to be 8,784,000. According to the 2009 Poverty Study<sup>1</sup> results, 19% of female and 17.1% of the male population is poor and also 24% of the people younger than 6 years old live under the poverty threshold. According to the number of poor people and regional poverty rates by relative poverty thresholds based on income, 9.6% of the population is living under the relative poverty threshold (6,016 TL per month) in 2012 in Istanbul and the number of poor people calculated as 1,249,000. Istanbul poverty data details are given in Table 14-11.

Table 14-11:Poverty details of Istanbul province

Years	Poverty Threshold (TL)	Number of Poor (Thousand)	Poverty Rate (%)
2006	3,479	1,622	13.3
2007	4,487	887	7.2
2008	4,574	1,224	9.9
2009	4,922	1,199	9.5
2010	5,161	1,454	11.5
2011	5,741	1,499	11.7
2012	6,016	1,247	9.6

#### 14.2.4 Employment

Table 14-12 presents the employment data for Turkey and the Istanbul province for 2011. Specific data on Basaksehir was not available.

Table 14-12: Employment data for Turkey and Istanbul province

	Total Population (Age +15)	Employed	Unemployed	Not in labor force*	Unemployment Rate	
Turkey	55,639,000	24,320,000	2,100,000	29,219,000	7.9	
<b>Istanbul</b>						
Age Group	Employed		Unemployed		Not in labor force**	
	Male	Female	Male	Female	Male	Female
15-29	133,000	68,000	31,000	17,000	344,000	391,000
20-24	289,000	185,000	63,000	58,000	126,000	294,000
25-34	1,243,000	465,000	110,000	78,000	51,000	763,000
35-54	1,449,000	468,000	149,000	47,000	229,000	1,241,000
55+	165,000	26,000	14,000	3,000	564,000	849,000
Sub-Total	3,281,000	1,212,000	367,000	203,000	1,314,000	3,537,000
Total	4,493,000		570,000		4,851,000	

Source: Population and Housing Census, 2 October 2011, TSI official Website; (<http://www.turkstat.gov.tr/>). \*Covers those who do not want to work or do not have the ability to work.

<sup>1</sup>Results of 2009 Poverty Study, Turkish Statistical Institute.

Based on the 2011 TSI data, the unemployment rate in the Istanbul province is 8.4%, which is higher than the overall Turkish unemployment rate of 7.9%. The labor force participation rate for the population aged 15 and above is 48% and shows significant differences according to gender in the Istanbul province. The labor force participation rate for male population is 73% and for the female population is 27%. The majority of the unemployed population falls within the 35-54 age group.

The TSI official information regarding the distribution of population based on business branch in Turkey and the Istanbul province in 2012 is given in Table 14-13.

Table 14-13: Population distribution by work sector in overall Turkey and Istanbul province

Occupational Group	Turkey	Istanbul
Legislators, senior officials and managers	1,911	526
Professionals	1,931	443
Technicians and associate professionals	1,575	483
Clerks	1,736	481
Service workers and shop and market sales workers	3,181	642
Skilled agricultural and fishery workers	4,868	30
Craft and related trade workers	3,208	635
Plant and machine operators and assemblers	2,539	694
Elementary occupations	3,872	558

#### 14.2.5 Education

The educational services are provided in 2,626 pre-schools, 1,556 primary schools, 1,537 secondary schools, 624 general high schools and 693 vocational and technical high schools representing a total of 7,036 educational facilities in Istanbul. The education system employed 120,922 teachers and serviced 2,997,547 students in Istanbul in 2012<sup>1</sup>. The information on the educational status for the Istanbul province based on the 2012 population census is given in Table 14-14.

Table 14-14: Educational status of Istanbul province

Age	Gender	Illiterate	Literate but not graduated	Primary School	Elementary School	Secondary School	High School	Academy Faculty Degree	Master Degree	Post Graduate Degree	Unknown	Total
06-13	Male	65	862,145		2,731						1,774	866,715
	Female	147	811,024		3,362						1,932	816,465
14-17	Male	311	38,664		399,104		1,790				1,800	441,669
	Female	471	40,388		367,566		2,960				2,164	413,549
18-21	Male	1,350	21,055		188,123		174,897	10,863			6,190	402,478
	Female	3,757	33,028		160,080		193,025	13,813			9,706	413,409
22-24	Male	1,955	18,177		99,160		157,227	60,534	156	3	16,129	353,341
	Female	5,952	26,768		88,430		137,219	75,251	294	3	16,880	350,797
25-29	Male	3,365	20,901	65,032	130,333	7,650	224,073	141,515	6,207	77	63,627	662,780
	Female	10,372	24,426	132,814	103,234	6,496	191,583	144,408	9,206	117	26,428	649,084
30-34	Male	3,472	12,366	129,092	116,347	54,029	216,718	128,646	17,137	1,329	45,468	724,604
	Female	9,616	16,977	204,070	77,773	42,221	177,940	122,677	17,342	1,526	26,366	696,508
35-39	Male	2,176	5,866	137,965	102,300	56,189	166,842	99,052	14,773	2,721	29,453	617,337

<sup>1</sup>Istanbul with Selected Indicators 2012, Turkish Statistical Institute.

Age	Gender	Illiterate	Literate but not graduated	Primary School	Elementary School	Secondary School	High School	Academy Faculty Degree	Master Degree	Post Graduate Degree	Unknown	Total
40-44	Female	7,553	12,210	206,163	71,616	44,724	129,119	88,234	11,789	2,636	19,945	593,989
	Male	1,784	4,073	123,327	97,111	62,580	125,698	74,303	12,339	3,151	19,449	523,815
45-49	Female	10,139	13,753	186,386	62,854	43,568	95,190	58,859	8,776	2,698	16,909	499,132
	Male	2,273	4,543	127,424	82,142	54,920	98,632	54,453	9,057	3,383	17,554	454,381
50-54	Female	17,207	18,929	187,327	43,446	35,817	71,052	38,638	5,296	2,185	19,867	439,764
	Male	2,959	5,710	136,070	39,775	38,830	77,800	40,204	5,999	2,535	20,003	369,885
55-59	Female	23,308	22,143	161,697	21,568	24,472	55,346	25,579	2,990	1,607	20,239	358,949
	Male	4,419	7,529	127,957	17,440	28,853	43,760	36,532	4,289	1,821	20,301	292,901
60-64	Female	32,604	27,051	131,831	9,040	19,170	33,955	20,346	1,958	950	20,969	297,874
	Male	4,653	8,321	96,509	5,586	18,125	24,247	26,640	3,338	1,509	16,131	205,059
65 +	Female	34,658	23,818	88,338	2,796	13,964	21,595	13,938	1,278	683	17,676	218,744
	Male	21,284	28,319	145,507	2,431	24,401	33,578	39,735	5,162	2,913	29,962	333,292
<b>Total</b>		326,470	2,164,026	2,535,405	2,295,795	604,768	2,494,781	1,332,877	139,001	33,001	531,405	12,457,529

Source: 2012 Census of Population, TSI Website; (<http://www.turkstat.gov.tr/>).

A total of 5 pre-schools, 18 primary schools, 17 secondary schools, 5 high schools and 8 vocational and technical secondary schools (total 56 educational facilities) provided education services in the Basaksehir District. The information on the educational status of the Basaksehir District based on the 2012 population census is given Table 14-15.

Table 14-15: Educational status of the Basaksehir District

Age	Gender	Illiterate	Literate but not graduated	Primary School	Elementary School	Secondary School	High School	Academy Faculty Degree	Master Degree	Post Graduate Degree	Unknown	Total
06-13	Male	3	25,916		80						46	26,045
	Female	5	24,516		106						61	24,688
14-17	Male	13	1,180		10,399		44				50	11,686
	Female	14	1,421		9,413		80				86	11,014
18-21	Male	38	533		3,975		3,616	166			180	8,508
	Female	101	1,175		3,662		3,957	225			376	9,496
22-24	Male	56	532		1,918		2,754	1,152	2		495	6,909
	Female	141	871		1,877		2,573	1,425	4		519	7,410
25-29	Male	88	583	1,384	2,401	95	3,721	2,635	130	3	1,607	12,647
	Female	305	724	3,290	2,299	125	4,028	3,024	168	3	823	14,789
30-34	Male	91	293	2,955	2,485	995	4,361	3,285	410	37	1,202	16,114
	Female	317	490	4,985	1,945	951	4,292	3,081	340	28	711	17,140
35-39	Male	65	179	3,185	2,202	1,090	3,812	3,285	438	67	705	15,028
	Female	238	343	4,612	1,662	961	3,360	2,597	268	59	496	14,596
40-44	Male	41	121	2,610	1,908	1,201	3,152	2,864	526	133	381	12,937
	Female	322	364	3,635	1,211	849	2,365	1,766	216	67	368	11,163
45-49	Male	76	104	2,415	1,478	900	2,378	2,076	328	125	375	10,255
	Female	411	402	3,022	726	626	1,615	1,063	113	43	448	8,469
50-54	Male	64	139	2,114	670	565	1,494	1,243	174	80	435	6,978
	Female	477	399	2,321	330	376	1,052	552	51	25	447	6,030
55-59	Male	93	147	1,565	286	359	709	917	89	46	396	4,607
	Female	563	402	1,565	125	236	481	360	21	15	469	4,237
60-64	Male	81	155	1,019	87	214	347	492	54	30	306	2,785
	Female	554	317	969	41	139	271	191	10	10	390	2,892
65 +	Male	326	382	1,310	36	245	309	459	41	33	433	3,574
	Female	1,497	623	1,275	18	244	282	124	17	8	764	4,852
<b>Total</b>		5,980	62,311	44,231	51,340	10,171	51,053	32,982	3,400	812	12,569	274,849

Source: 2012 Census of Population, TSI Website; (<http://www.turkstat.gov.tr/>).

The Province of Istanbul has 20 private and 7 state universities. State universities provide education with 65 faculties, 34 higher education vocational schools, 44 Institutes in total. The State Universities employ 10,760 academic staff and provide teaching to 179,105 students as of 2010. The private universities had 105 faculties, 27 higher education vocational school, 44 Institutes and employed 6,843 academic staff to educate 108,943 students in 2010<sup>1</sup>. There is one private university construction ongoing in the Basaksehir District. The university will have 3 faculties, 2 institutes and 5,000 students when completed<sup>2</sup>.

The number of Public Education Center courses and the number of enrollment in Istanbul province and the Basaksehir District is given in Table 14-16.

Table 14-16: Courses and enrollment in 2012 in Istanbul province and the Basaksehir District

Type of Course	Istanbul	Basaksehir
	Number of courses	Number of courses
Vocational courses*	195	7
Public education center	41***	3**

\*Istanbul Metropolitan Municipality Art and Vocational Training Courses Website:

(<http://ismek.ibb.gov.tr/ismEng/index.asp>) \*\*Source: Municipality of Basaksehir: (<http://www.basaksehir.bel.tr/>).

\*\*\*Istanbul Development Agency, 2010-2013 Istanbul Regional Plan Appendices.

#### 14.2.6 Health

The healthcare system in Turkey is being developed under the 2003-2013 Health Transformation Program. The purpose of this program is to increase the quality and efficiency of the healthcare system and enhance access to healthcare facilities with the introduction of a number of reforms. Turkey's total expenditure on health per capita in 2011 was USD 1,160 representing 6.7% of total GDP (Table 14-17); this value is still at a low level relative to more developed countries. However it is expected to grow in line with the gradual introduction of universal healthcare insurance scheme, increase in annual income per head, growing health awareness, a steady rise in life expectancy and the size of the elderly population. Moreover, population in Turkey is growing faster than in the EU. Total healthcare spending is forecasted to rise to about USD 63 billion in 2014, but could be substantially higher if the government fails to restrain public spending on health<sup>3</sup>.

Table 14-17: Health statistics of Turkey

Characteristics	Figure
Total Population	73,997,000
Gross national income per capita (PPP international USD)*	18,190
Life expectancy at birth male/female (years)	73/78
Probability of dying under five (per 1,000 live births)	14
Probability of dying between 15 and 60 years m/f (per 1,000 population)	123/68
Total expenditure on health per capita (Intl USD, 2011)	1,160
Total expenditure on health as % of GDP (2011)	6.7

Source: World Health Organization Website; (<http://www.who.int/>). \*World Bank Open Data Website; (<http://data.worldbank.org/>)

<sup>1</sup>Istanbul Provincial Environmental Status Report, 2011.

<sup>2</sup>Municipality of Basaksehir: (<http://www.basaksehir.bel.tr/>)

<sup>3</sup>Republic of Turkey Prime Ministry Investment Support and Promotion Agency, Turkish Healthcare Industry Report.

The need for health services in the Istanbul province is increasing in parallel to the growing population. Due to its centralized location and high migration numbers into the city, the Istanbul province is currently providing health services to both people living in Istanbul and people coming from the surrounding and further provinces.

The number of beds per ten thousand people is 23.3 in Istanbul in 2012 while this is 26.5 for across Turkey in 2012 and 55.4 for European Union (Table 14-18).

Table 14-18: General health statistic

World Health Organization Data (2010) (10,000 People/Bed)			
World	European Union	Turkey (2012)*	Istanbul (2012)*
30	55.4	26.5	23.3

Source: WHO, 2010 Data. \*Ministry of Health, Annual Health Statistics, 2012.

There are 23 state hospitals, 15 education and research hospitals (ERH), 3 maternity and gynecology hospitals, 2 physical therapy and rehabilitation hospitals, 2 thoracic diseases and thoracic surgery hospitals, 2 cardiovascular surgery hospitals, 1 ophthalmological hospital, 2 dermatological-venereal diseases hospitals, 1 dental hospital, 2 psychiatry hospitals, 1 occupational diseases hospital and 1 osteopathic hospital in Istanbul that are affiliated with the MoH. There are also 12 university hospitals and 159 private hospitals in the Istanbul province. Bed capacity, occupation rate and average length of stay in these hospitals are presented in Table 14-19. There is only one state hospital (Istanbul Basaksehir State Hospital) which is located in Basaksehir District and it has a capacity of 100 beds. The list of hospitals is given in Annex M.

Table 14-19: Inpatient treatment institutions information for Istanbul

	Number of Institutions	Number of Beds	Occupation Rate %*	Average Length of Stay*
Hospitals Affiliated with Ministry of Health	55	15,621		
University	12	4,239		
Private Hospital	159	11,903	65.1	4.0
Hospitals Affiliated with Ministry of Defense	3	1,236		
Total	229	32,999		

Source: Corporation index provided by IHIC. \*Ministry of Health, Annual Health Statistics, 2012.

The human resources utilized in all of these hospitals are summarized in Table 14-20.

Table 14-20: Number of health service personnel per 10,000 people in Turkey and Istanbul

2012	Practicing Physician	Specialist	Dentist	Pharmacist	Nurse and Midwife
Turkey	5.1	9.3	2.8	3.5	24.9
Istanbul	4.1	11.3	4.1	3.8	19.1

\* Ministry of Health, Annual Health Statistics, 2012.

## 14.3 Impact Assessment for Construction Phase

### 14.3.1 Direct and Indirect Employment Creation

It is estimated that a total of approximately 3,000 workers during the peak labor force requirement will be employed for construction of the IHC Project. Employment of these workers over the 36 month construction and commissioning period will provide a positive employment. It is the intention that the large majority of the workforce will be sourced locally and the provision of temporary employment will provide a significant benefit to the economy. According to TSI 2012 data, there are 58,825 registered construction companies in Istanbul province with a work force of 107,431<sup>1</sup>. Hiring at this level is not expected to affect the availability of construction workers for other projects and businesses in the city given the size of the sector in Istanbul. Workers are likely to be found within the Province and the scale of permanent employment is not expected to result in any significant long term changes in residential or working population once the project is finalized.

All construction workers will be employed and remunerated in accordance with the provisions of Turkish law and IFC Performance Standard (PS) 2: Labor and Working Conditions.

In addition to the direct employment benefits of the Project, indirect and induced employment benefits will also arise. Indirect employment is that created in providing goods and services to the construction project; induced employment is that created by the expenditure of direct and indirect employees' earnings in the economy. Input-output data for Turkey are not available to allow direct estimation of these effects but using available data from various sources suggests that indirect and induced employment could amount to the order of 90% of Project jobs<sup>2</sup>; that is every person year of direct employment will generate an additional 0.9 person years of indirect and induced employment in the economy.

### 14.3.2 Impact of the Provision of Temporary Workforce Accommodation

The Project team intends to employ as many Istanbul based construction workers as is realistically possible (and thus have their individual accommodation in the city). However, there will be on-site worker accommodations. The camp site will be equipped with the necessary utilities and infrastructure to support their operations including power generation, water supply, sewage treatment and waste management. The specific design of the temporary work force accommodations has yet to be decided but it will be developed and managed in accordance with the provisions of IFC PS 2: Labor and Working Conditions and the IFC/EBRD guidance on workers accommodation. Relevant information is provided in *Chapter 16: Labor and Working Conditions*.

<sup>1</sup>TurkeyEmploymentAgency: (<http://www.iskur.gov.tr/>)

<sup>2</sup>Data developed by the Scottish Government provide employment multipliers for the Construction sector in 2004 of 1.58 for indirect jobs and 1.93 for direct jobs. See <http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Input-Output/Downloads>

### 14.3.3 Impact on Population and Demographics

The introduction of the imported workforce into the city during construction and the creation of a small number of permanent jobs during operation will have no impact on the population of the Basaksehir District which is 316,176.

### 14.3.4 Impact on Social Environment and Infrastructure

Location of camps near the existing communities may present risks to local people. Intrusion in local communities can lead to breakdown in existing community structures and livelihoods. A key objective will be to avoid any impact on the adjacent community or on local services, community facilities and businesses. Unnecessary interactions by the workforce with the local community will be minimized. Movement of non-local workers will be strictly controlled to prevent inappropriate interaction with local people and a strict Code of Conduct governing activities and behavior will apply to all Project personnel. All personnel will receive training in these requirements. Local goods and services will be used where possible, but onsite utilities, catering and recreational facilities will be provided so that camps do not place unsustainable demands on local resources, facilities or amenities.

There are also sufficient health facilities in the Province to cater for any demands for health facilities for the workers during the construction phase.

## 14.4 Impact Assessment for Operation Phase

### 14.4.1 Overall Social and Economic Impact Opinion for PPP Health Care Policy

Tekin and Celik (2010) conducted a political mapping to identify the understanding of PPP Policy in Turkish health care infrastructure investment, the position, the interests and influence of the main policy actors. The stakeholders of this study consisted of public, private sector representatives who worked in public private partnerships policy as a financing method in Turkey health care infrastructure and other people and groups who are related to the policy. The stakeholders, their position and their power are given in Table 14-21.

Table 14-21: Stakeholders in the study of Tekin and Celik (2010)

Stakeholder Name	Level	Sector	Position	Power
Republican People's Party (CHP)	National	Political	High Opposition	High
Hacettepe University Department of Public Health	National	Academic	High Opposition	Medium
The Turkish Society of Public Health Specialists (Hasuder)	National	NGO	High Opposition	Medium
Nationalist Movement Party (MHP)	National	Political	High Opposition	High
Medical Organization	National	NGO	High Opposition	Medium
Turkish Medical Association	National	NGO	High Opposition	High
Physicians	Local	Public	High Support	Medium
Citizen	Local	Society	High Support	Low
Justice and Development Party (AKP)	National	Political	High Support	High
Deniz Bank	National	Private	High Support	High
World Bank	National	International	High Support	High
UK Embassy	National	International	High Support	High
Association of Public-Private Partnerships	National	NGO	High Support	Medium

Stakeholder Name	Level	Sector	Position	Power
The Ministry of Finance	National	Public	High Support	High
Turkish Contractors Association	National	NGO	High Support	High
NKY Architectural Company	National	Private	High Support	High
International PPP Platform Turkey	National	NGO	High Support	High
Recep Akdag (Minister of Health)	National	Public	High Support	High
The Ministry of Health	National	Public	High Support	High
Bureaucrats of Ministry of Health	National	Public	High Support	High
Association of Health Administration and Education	National	NGO	High Support	High
MH Public-Private Partnerships Program Consultant	National	Private	High Support	High
MH Department of Public-Private Partnerships	National	Public	High Support	High
International Financial Institutions	National	International	High Support	High
IMF	National	International	High Support	High
Foreign Consultant Companies	National	Private	High Support	High
Foreign Contractor Companies	National	Private	High Support	High
Local Consultant Companies	National	Private	High Support	High
Local Financial Companies	National	Private	High Support	High
Local Contractor Companies	National	Private	High Support	Medium
The State Planning Agency	National	Public	Low Support	High
Media	National	Private	Low Support	High
Association of Private Hospitals and Health Institutions	National	NGO	Medium Opposition	Medium
Healthcare Providers	Local	Public	Medium Support	Medium
Prime Minister Undersecretary at of Treasury	National	Public	Medium Support	Medium
The Privatization Administration	National	Public	Medium Support	High
Recep Tayyip Erdogan (Prime Minister)	National	Political	Medium Support	High
Association of Patient and Patient Relatives Rights	National	NGO	Non-Mobilized	Low
Patient and Patient Relatives	National	Society	Non-Mobilized	Low
Association of Health Administrators	National	NGO	Non-Mobilized	Medium
The Administration of Social Security Organization	National	Public	Non-Mobilized	High

Source: SENEL TEKIN P., CELIK, Y., Analyzing Public-Private Partnership Policy as a Financing Method in Turkey Health Sector with Political Mapping”, 7th Biennial Conference in Organizational Behavior in Health Care: Mind the Gap: Policy and Practice in the Reform of Health Care, Birmingham, 11-14 April, 2010.

The views obtained from the policy mapping provide an insight into the overall socio-economic impacts that may develop from PPP Health Care implementation in Turkey as well as Istanbul province. The positive and adverse impacts that were perceived are summarized in Table 14-22:

Table 14-22: Positive and adverse impacts that were perceived

Perceived Positive Impacts	Perceived Adverse Impacts
Ministry of Health will have large structures in a short time and renew its infrastructure.	Small contractors working with the Ministry formerly will not be able to be included in large scale projects.
Investors and financiers will benefit from projects with high costs, low risks, high profit, Ministry guarantee.	Refund of the project will be provided by circulating capital. This may cause incorrect practices to increase incomes and health personnel, patients and the social security system will be harmed.
Patients and their families will benefit from this policy.	Leasing can be high in cost because of inefficient feasibilities or incorrect model choice and the government will be harmed.
Health personnel will work in modern facilities with low risk.	Leasing can be high in cost because of inefficient feasibilities or incorrect model choice and the government will be harmed.

Having modern and qualified educational services in the health facility.	There might be competition between the health personnel.
Projects conducted by PPP models are resource for employment. Annuities will be evaluated and people owning a property in the related region will benefit from the annuity.	Public hospitals will be a serious competitor for Private hospitals.
Since the municipality where the project is being conducted will bring infrastructure services like new roads, subway and over way crossings, social facilities, the people living in that municipality will benefit from the project.	Public interference might be blocked and a structure without any auditing by the local authorities might be formed.
Consulting firms working for PPP will achieve both experience and material gains.	As a result of these projects, there will not be any structure between family medicine and health campuses and the institutions providing health services will turn into a dualist structure.
A practice and research field will be open for researchers and academicians	Concepts like audit, transparency and common good might not be taken into consideration. The management of this facility might be passed to foreign firms. International consortiums will soon be a monopoly and the “white collar” term used for the health personnel will become reality.

#### **14.4.2 Impact on Health Quality in the Istanbul Province**

The Project will have a substantial developmental impact as being one of the largest PPP projects in the Istanbul province and surrounding provinces to date. In particular, the Project is anticipated to fill a substantial need in the Province and surrounding areas for an updated and consolidated public healthcare facility to serve the lower-medium income public existing hospitals in the region which are outdated and are poorly maintained. In addition, the present hospitals have some of the highest levels of overcrowding in Europe, with only 290 beds per 100,000 people. In addition the poor quality of health infrastructure often forces Turkish citizens to make multiple visits to different facilities in order to obtain patient care that normally could be provided at one facility. The IHC will help eliminate these problems by providing the Province with better infrastructure and cost-effective, efficient health service delivery. The Project also fulfills a major priority of Turkish Government in forming a part of a wider PPP program that encourages the development of modern health facilities and the provision of world class healthcare services. The government aims to both provide Turkish citizens with more effective and higher quality healthcare.

#### **14.4.3 Direct and Indirect Employment Creation- Hospital Closures**

There will be employment opportunities during the operation of the hospital. The workforce requirement during the operation phase is anticipated to be approximately 7,311 in total, with 4,300 health service personnel to be employed by the MoH, and 3,011 service employees to be employed by the IHIC. There were 15,608 specialist physicians and 5,621 general practitioners, 5,358 assistant physicians, 5,725 dentists, 5,228 pharmacist, 15,475 health officer, 20,798 nurses,

and 5,729 midwives within the health service personnel in the Istanbul province in 2012<sup>1</sup>. The opening of the Project will most likely create a health care work force need that may not be present in the region if the existing hospitals are not closed and work force is reduced in the existing structure.

Information on the hospital closure planning in Istanbul were obtained from the MoH. The expected hospitals to be closed are given in Table 14-23:

Table 14-23: Hospitals that are planned to be closed in Istanbul

Hospital Name	District	Current Bed Capacity
<b>Asian side of Istanbul</b>		
Kartal Yavuz Selim State Hospital	Kartal	256
Yakacik Maternity and Children's Hospital	Kartal	100
Tuzla State Hospital	Tuzla	38
Erenkoy Psychiatry Education and Research Hospital	Kadikoy	101
<b>European side of Istanbul</b>		
Lepra Dermatological-Venereal Diseases Hospital	Bakirkoy	50
Skin and Reproduction Diseases Hospital	Bakirkoy	31
Istinye State Hospital	Sariyer	128
Sariyer Ismail Akgun State Hospital	Sariyer	40
Baltalimani Osteopathic Hospital	Sariyer	133
Sisli Hamidiye Etfal Education and Research Hospital	Sisli	784
Sultangazi Lutfiye Nuri Burat State Hospital	Sultangazi	75

Source: Hospital planning by the MoH, 03.07.2013.

Stakeholder consultation with the public authorities provided information on potential hospital closures for the listing given above. The following information was obtained:

Ministry of Health, Istanbul Provincial Directorate of Health, Deputy Manager:

- Yavuz Sultan Selim hospital will be rebuilt following closure to have 300 beds capacity.
- Yakacik Maternity and Children's Hospital will be closed.
- Tuzla State Hospital will be relocated and rebuilt to have 300 bed capacity.
- Lepra Dermatological-Venereal Diseases Hospital will not be closed as it is the only dermatological hospital of Turkey.
- Skin and Reproduction Diseases Hospital will continue its operation.
- Istinye State Hospital, Sariyer Ismail Akgun State Hospital, Sisli Hamidiye Etfal Education and Research Hospital and Sultangazi Lutfiye Nuri Burat State Hospital will be closed (total bed capacity of 1027).
- There are some hospitals located near the Project area, one of which is Basaksehir State Hospital serving people living around and it is not expected to be closed.
- Kanuni Sultan Suleyman Education and Research Hospital which might be affected from the Project in a positive way as a result of reduced occupancy rates. This hospital is not expected to be closed due to its' importance for providing children health services.

<sup>1</sup>Turkish Statistical Institute, Selected Indicators, Istanbul 2012 (<http://www.turkstat.gov.tr>).

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Ministry of Health, Department of Public Private Partnership, Department Manager mentioned that it is not presently possible to define exact hospital closures as the study of the closures is still ongoing. This issue will be further clarified in due course.

Stakeholder consultation with the public authorities provided information on health care workforce sources for future hospital developments in Turkey including IHC. The following information was obtained:

Ministry of Health, Department of Health Services indicated that:

- The employment capacities of current hospitals will be transferred to newly built hospitals.
- There is presently no doctor shortage and a source allocation plan will be made in the future.

Ministry of Health, Department of Management Services stated that;

- The total bed capacities of hospitals in Turkey will be fixed (and will not change) based on the planning of the MoH.
- Number of doctors graduating from medical schools is being increased to meet the demand. Currently, there are 7,500 doctors that graduate yearly from the medical faculties. It is stated that 12,500 students registered to medical schools in 2013 and it is expected that they will graduate after six years.

Ministry of Health, Public Hospitals Institution, Department Manager stated that:

- The medical staff including doctors will be employed in IHC have not been planned yet but it is planned to transfer doctors from other hospitals belonging to the MoH (other hospitals which will be closed or have their capacities reduced). It is not possible to outsource due to the limited financial resources of the MoH.
- Currently, the number of medical staff in state hospitals is not enough (especially specialists and practitioners). The number of graduating medical students is increasing in recent years and it will continue to increase until year 2023.

Ministry of Health, Istanbul Provincial Directorate of Health, Deputy manager stated that;

- Currently, there are an inadequate number of doctors in Istanbul to meet the demands of the public hospitals and this gap will likely increase with the addition of new medical facility investments.

Based on the information provided above, there is unclarity regarding the sufficiency of healthcare workforce. It was however stated by the representative of the Department of Health Services of MoH that a resource allocation plan will be made to resolve any resource issue.

As previously discussed, the health care system is expected to grow in line with the gradual introduction of universal healthcare insurance scheme, increase in annual income per head, growing health awareness, a steady rise in life expectancy and the size of the elderly population in Turkey as well as the Istanbul province. Overall the health care direct employment is expected to be positive even if there are plans to close some of the health facilities in the Istanbul province and transfer MoH staff from these facilities to the IHC.

In addition to the direct employment benefits of the Project, indirect and induced employment benefits will also arise. Indirect employment is that created in providing goods and services to the IHC project; induced employment is that created by the expenditure of direct and indirect employees' earnings in the economy.

#### **14.4.4 Population**

The scale of permanent employment is not expected to result in significant long term changes in residential or working population in the immediate Project area. However, development of supporting economic health infrastructure (pharmacies, private doctor services, hotels, service sector) for the IHC may lead to economic development and increase the population of the neighboring settlements.

#### **14.4.5 Economy**

Economic impact analysis for the IHC involves assessing revenues generated or lost (by closure or potential downsizing of existing hospitals) by the economic activity as they flow through the local economy, tracking jobs created or lost, spending changes that supports local business, and tax revenues. Analysis includes both direct and indirect benefits. Direct benefits, in the context of the IHC take the form of: 1) revenues generated in the course of the practice of medicine (i.e., the value of output); 2) the wages and benefits that go to administrators, providers and all other employees; 3) the number of jobs created in the hospital; and 4) the taxes that are paid by hospitals and their owners and employees.

Economic activities and businesses that will be supported by the IHC hospitals outside of the hospital industry represent indirect benefits. These *business-to-business* effects include the supplies and equipment purchased by the hospital, administrative services, cleaning and property maintenance services, and clinical and laboratory services that support hospital operations. Additional indirect benefits (sometimes called induced effects) will arise when hospital employees and employees of vendors spend their earnings to support local businesses, which, in turn, pay their employees and pay taxes, etc. The 106,462 daily visitors expected at the IHC will be an important source of expenditures for the supporting service sector.

An economic impact analysis was not commissioned as part of the ESIA process, however it can prudent to assume that the overall economic benefits are expected to accrue from the operation of the IHC despite the potential closure of some the existing healthcare facilities. This is partly due to the fact that the health services will be expanding overall with the IHC despite potential closures. The overall health sector envisages an increase in health care needs which will result in direct and indirect benefits to the economy of the Istanbul province.

#### **14.4.6 Road Traffic**

There will be an increase in vehicle traffic with the development of the Project. Vehicle traffic will increase due to the expected large daily volume of visitors. There is an expansion plan for roads and public transportation to this area to be able to handle the increased volume of traffic. The potential impact on road safety and congestions near the IHC are discussed in *Chapter 15: Community Health and Safety*.

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## 14.5 Mitigations

Most of the envisioned economics and social impacts of the Project are positive. A range of options for mitigation of the few potential adverse socio-economic effects is potentially available for the Project, including the types of measures outlined below. These will be considered during all phases of the Project.

- Construction worker accommodation compounds will be located as such to minimize adverse effects on the existing population. A Camp Management Plan will be prepared and implemented.
- Recruitment procedures will be in line with Project Owners Human Resources Policy that is to be developed for the Project. This will include the aim to provide opportunities for employment of local workforce to the extent possible considering unskilled, semi-skilled and skilled workforce.
- The Project will seek to maximize the benefits from the project to local communities in terms of direct and indirect employment, and purchasing of local good and services during construction. This will include measures such as adopting local employment and purchasing policies, to the extent possible establish tenders for procurement of subcontracted goods and services at a scale that local businesses can respond to, ensuring opportunities are advertised locally.
- The Project will also seek to deliver long term local community benefits through promoting local employment and purchasing local goods and services during the operation of the project to the extent possible.
- Transportation impacts will be minimized as far as possible with the establishment of a Traffic Management Plan.

## 14.6 Residual Impacts

There will be a positive residual impact during construction and operation phases of the Project as a result of local employment opportunities. The local economy will also be positively affected overall by the operation of the IHC. With the implementation of mitigation measures mentioned above and in other relevant chapters of the ESIA -related to road traffic-, no negative residual impact on socioeconomic conditions is estimated.

## 15.0 COMMUNITY HEALTH AND SAFETY

### 15.1 Scope

This chapter provides an assessment of the Project activities that may impact nearby communities during the construction and operation phases and the patients during the operation phase. The chapter also sets out the mitigation measures to avoid or minimize the risks together with the residual impacts that are foreseen to remain. The Project area is located in an area where there is an increase in the development of residential buildings. The immediate land use around the Project area is described in *Chapter 5: Land Use and Zoning*.

In accordance with the requirements of IFC Performance Standard 4 (PS4): Community Health, Safety and Security, the following issues in relation to the Project were covered in this chapter:

- dust, noise and vibration;
- community health and exposure to disease;
- road traffic;
- life and fire safety;
- infrastructure and machine/equipment safety; and
- security requirements.

The main information sources used to assist the assessment study are:

- IFC PS 4: Community Health, Safety and Security;
- IFC EHS Guidelines for Health Care Facilities;
- Project information provided by IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC).

The risks and impacts of the Project, in the context of health and safety of off-site communities, will be managed through a Community Health and Safety Management Plan to be developed and implemented by IHIC. This plan will include measures to address the identified risks and will ensure the disclosure of relevant Project-related information to enable the affected communities to understand the risks and impacts.

Additional management plans related to protection of community health and safety will be required including plans to prevent and respond to incidents and emergencies, as well as plans to protect the health, welfare and security of the community from any adverse effects related to generation of noise and dust, road traffic and security operations, as explained further below.

### 15.2 Impacts and Risks

#### 15.2.1 Dust and Noise

Impacts related to generation of air and noise emissions during construction and operation of the Project are addressed in appropriate chapters of this ESIA report (*Chapter 9: Air Quality* and *Chapter 10: Noise*) and is summarized below:

There will be dust and noise generation during construction activities (including earthworks, operation of equipments, vehicle movements and construction of buildings). Emission levels are

estimated to remain below regulatory limits, as evidenced by the results of noise and air emissions modeling studies provided in the relevant chapters. Impacts associated with these emissions are anticipated to be of minor significance, which will be temporary during the construction phase and can be mitigated through good construction site practices and mitigation measures as mentioned in the relevant chapters.

There will be impacts on the air quality from the health campus during the operation phase which will be mainly related with the emissions from the cogeneration system and fugitive emissions (released from sources such as medical waste storage areas, medical technology areas and isolation wards) that may be potentially contaminated with biological agents, pathogens, or toxic materials. It is expected that necessary exhaust/treatment systems will be included in the design of the health campus to eliminate the fugitive emissions and no significant impacts will occur. Related to the cogeneration system, results of the air emission modeling study showed that the emission levels will be significantly lower than the regulatory limits. Similarly, the modeling of noise associated with the operation of the cogeneration system showed that the noise levels will be well below the regulatory limits. There will also be impacts related to increase in air and noise emissions from road traffic during the operation of the health campus which is expected to be minimized through the implementation of a Traffic Management Plan.

### **15.2.2 Community Health and Exposure to Disease**

Community health issues with respect to the construction of the hospitals are common to those of most industrial facilities, which may include communicable diseases associated with the influx of temporary (construction) and permanent labor. The maximum workforce that is anticipated during the construction phase is 3,000 construction workers and 346 white collar employees. IHIC intends to recruit construction workers locally to the extent possible and provide appropriate on-site pre-fabricated facilities to those employees who need accommodation. A Construction Camp Management Plan will be developed and implemented by IHIC. Therefore, risks associated with influx of workforce, such as introduction of diseases or anti-social behavior affecting local communities are not anticipated.

Related to the operation phase, health care wastes may pose the following sources of risk to the community health and safety:

- infectious diseases risk from biological wastes. Diseases that may be transmitted include various forms of hepatitis, e coli infection, tuberculosis and MRSA (bacteria that can lead to serious infections);
- injury and infection risk from wastes containing nuclear material and improperly disposed of sharp instruments;
- improper waste recycling risk leading to cross infection due to scavenging of contaminated waste material and illegal use of hypodermic needles as well exposure to the public in accessible locations; and
- odor and unpleasant appearance risk.

The above potential risks will be minimized with the implementation of the Waste Management Plan, Health Care Waste Management System and other mitigation measures as described in *Chapter 8: Material Resources and Waste Management*, and by following all the applicable

regulatory requirements related to waste management during the construction and operation phases.

### **15.2.3 Road Traffic**

The transport of excavated soil and construction materials during the construction of the Project will result in an increase in road traffic which may pose risks to the community related to accidents, road safety and congestions that may occur near the Project area. However, these risks will be temporary for the duration of the construction phase and can be mitigated through measures identified in relevant chapters of this ESIA report.

The traffic increase during the operation of the IHC will be more important due to the expected large daily visitor volume (estimated as 106,462 people including visitors, patients visiting polyclinics, emergency cases, staff). This will result in an increase in traffic in the existing traffic conditions near the IHC site. If the planned new road construction and metro line are not operational by the time the IHC starts operation, this may increase the risk of accidents and road safety. The relevant authorities have indicated that they have completed the implementation design of the planned roads, however completion dates of the mentioned roads have not been finalized yet. IHIC has assigned a company to undertake a traffic/transportation study-plan that takes into account traffic inside the hospital campus. The traffic/transportation study-plan has provided measures which will need to be taken inside the vicinity of the IHC to minimize traffic related adverse impacts during the operation of the IHC. The description of the traffic conditions and potential impacts are described in *Chapter 11: Traffic Assessment*. IHIC will further develop and implement a Traffic Management Plan within the IHC that will take into account vehicular traffic, emergency conditions, pedestrian traffic entering, exiting and internal traffic. Implementation of the Traffic Management Plan will help to minimize the risks to the community.

### **15.2.4 Life and Fire Safety**

Fire safety risks may occur during the construction phase of the Project which may affect particularly the construction workers and the nearby residents depending on the area that the fire breaks out in and where it spreads to. Fire safety risks will be managed through implementation of several mitigation measures explained in relevant chapters of this ESIA Report and specifically preparation and implementation of an Emergency Preparedness and Response Plan during the construction phase. As a result, significant impacts are not expected related to fire.

Related to the operation phase, health facility operations are exposed to life and fire safety risks, as they are accessible to the public. These risks may arise due to the storage, handling and presence of chemicals, pressurized gases and other flammable substrates. As explained in *Chapter 2: Project Description*, The IHC is being designed in accordance with the Regulation on the Protection of Buildings from Fire (Official Gazette Date/No: 19.12.2007/26735). The Technical Specification Requirements provided by the MoH during the bidding process also include requirements related to fire protection to be integrated into the design to include the following:

- Compartmentalization: The standards for fire compartmentation between floors and between compartments will be 2 hours (120 mins) fire resistance.
- The fire separation shall be reviewed with local officials during the design process to verify compliance with local codes and regulations. The final compartmentation shall represent the regional firefighting principals.

- Sealants: Intumescent sealants and fire stopping compounds will be used to plug smaller gaps around services penetrations in compartment walls and floors.
- Smoke Barriers: Proprietary mineral wool products such as Rockwool will be used to maintain fire separation between compartment floors and walls, and to protect around services penetrations.

In addition to the above, Fire Suppression Systems shall be provided throughout the hospitals as required by Turkish and local codes, and the Fire Alarm System shall be designed and installed in accordance with the requirements of NFPA72 and local codes, as per the Technical Specifications.

Considering that the compliance with national legislation for fire safety and also international standards are already integrated into the design of the IHC and other mitigation measures will be implemented as explained in Section 15.3, impacts from fire are expected to be negligible to the surrounding communities, and in the range of negligible to minor significance to the patients, health care personnel and visitors.

### **15.2.5 Infrastructure Safety**

The risk of structural failure will increase in the event of natural hazards such as earthquakes and floods. Earthquake and flooding risks are discussed in *Chapter 6: Geology, Soils and Contaminated Land* and *Chapter 7: Hydrology and Hydrogeology*, respectively.

The Project area lies within a 2<sup>nd</sup> degree seismic zone. In the event of earthquakes during construction and operation, significant impacts on the community and patients'/workers' health and safety may arise following accidents, spills, fire, etc. related to the seismic incident. Necessary criteria (e.g. appropriate standards, regulations, etc.) will be taken into account in the design of the facilities to address the seismic risks. This will be conducted considering the defined parameters that need to be used in the design of structures located in 2<sup>nd</sup> degree earthquake zone where the Project site is located. During all construction works, the Regulation on Buildings to be Constructed in Seismic Zones (Official Gazette date/no: 06.03.2007/26454) will be complied with. This will minimize the occurrence of incidents and ensure that the risk of structural failures is as low as reasonably practicable in the event of natural hazards.

The flooding assessment from the nearby surface water body is deemed to be low since the site will be developed outside of the flood plain of the Kasap creek. In addition, specific mitigation measures will be included in the IHC design including a storm water drainage system.

### **15.2.6 Security Requirements**

Security arrangements to be performed during the construction phase have not been established yet. IHIC will perform security arrangements in accordance Turkish regulatory requirements.

Regarding the security during the operation of the IHC, security arrangements for the IHC are described in the Technical Specifications provided by the MoH during the bidding process which require installation of an electronic security system in the IHC that will consist of Closed Circuit Television System (CCTV), Access Control System, Intrusion Detection System and Radio Frequency Identification System (RFID).

### 15.3 Mitigation Measures

The potential risks and impacts to the community shall be managed appropriately during the lifetime of the Project through the following measures:

- All relevant health and safety regulations will be followed during the development and operation of the Project in order to minimize accidents that may have impacts on the community and to control potential Project related releases and/or emissions.
- A grievance management system will be in place that will enable the community to raise concerns during the lifetime of the Project.
- All employees will be trained on health and safety and on Emergency Preparedness and Response Plan to respond timely to the incidents.
- Necessary measures (covering materials, water suppression, etc.) will be taken to avoid and/or minimize dust emissions during the construction phase.
- IHIC will prepare and implement an Air Quality Control and Monitoring Plan during the construction and operation phases of the Project.
- Construction activities will be planned in a way considering the nearby communities and noise generating activities will not be undertaken during night time to the extent possible.
- IHIC will prepare and implement a Noise Control and Monitoring Plan during the construction and operation phases of the Project.
- Drivers of trucks and vehicles will adhere to defined speed limits and will be warned against creating unnecessary noise by using horns during the construction phase.
- All vehicles and work machinery will be subject to periodic maintenance with the aim of reducing noise, dust and gas emissions from vehicles.
- Traffic signs will be placed at appropriate locations in order to prevent any accidents during construction and operation phases of the Project.
- A Traffic Management Plan will be prepared and implemented to manage the internal traffic in the IHC that will take into account vehicular traffic, emergency conditions, pedestrian traffic entering, exiting and internal traffic.
- A Security Plan will be developed to be implemented during the construction and operation phases of the Project. Security will be provided in a manner that does not jeopardize the community's safety or IHIC's relationship with the community and that is consistent with national requirements.
- International best practice will be applied to hiring, training and mobilizing security staff. IHIC will ensure that security personnel have not been involved in past abuses and are adequately trained. Force will only be sanctioned in preventive or defensive circumstances in proportion to the threat and security will operate within the law. The grievance mechanism will allow communities to express concerns in accordance with requirements of IFC standards.
- The structural elements and components of the Project will be designed and built according to national regulations and international best practice. All structures will be built taking into account the regulatory requirements to be implemented at 2<sup>nd</sup> degree earthquake zones. Regarding design of the buildings within the Project area, the Regulation on Buildings to be Constructed in Seismic Zones (Official Gazette date/no: 06.03.2007/26454) will be complied with.

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- All hazardous materials will be stored in designated areas having secondary containment and handled with care by authorized staff in order to prevent potential spills in accordance with the Hazardous Material Management Plan to be prepared.
  - All relevant mitigation measures described in other chapters of the ESIA Report will be implemented.

## 16.0 LABOR AND WORKING CONDITIONS

### 16.1 Scope

This chapter will describe how labor and working conditions will be managed for the Project and the requirements of IFC Performance Standard 2: Labor and Working Conditions (PS2) will be discussed. This chapter will address the following issues:

- Legal & Policy Context
- General Condition of Service
- Non Discrimination
- Grievance Mechanism
- Child Labor & Forced Labor
- Health & Safety
- Supply Chains

The assessment is based on the review of the following standards and documents:

- IFC PS2: Labor and Working Conditions
- International Labor Organization (ILO) Fundamental Conventions
- Turkish Labor, Health and Safety Legislation
- IFC General Environmental, Health, and Safety Guidelines
- IFC Environmental, Health, and Safety Guidelines for Health Care Facilities

It is important to note that there will be a joint management system between the Ministry of Health (MoH) and IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC) during the operation of the İstanbul İkitelli Integrated Health Campus (IHC). The MoH will be responsible for providing medical services, doctors and the support health personnel, and the general management of the hospital will be undertaken by the administrative staff provided by MoH. Staff other than the doctors and support health personnel will be provided by IHIC. IHIC will be responsible for the management of services classified as obligatory services and optional services as listed below:

- Obligatory services include building and land services, extraordinary maintenance and repair, utilities management, furnishing, ground and garden maintenance, and other medical equipment maintenance services.
- Optional services include non-medical services including pest control, car parking, cleaning, implementation and operation of the hospital information management system (HIMS), security, guidance and escort for patients/help desk/reception/carrying services, linen and laundry, catering, waste management; and medical support services including laboratory, imaging, sterilization and disinfection, and rehabilitation services.

IHIC will be responsible for the labor and working conditions depicted in this chapter for their own construction workers during the construction phase and personnel providing support services during the operation phase.

## 16.2 Legal and Policy Context

### 16.2.1 IFC PS2 Labor and Working Conditions

IFC PS2 sets out policies and standards of international good practice related to labor and working conditions. The objectives of the PS2 are:

- To establish, maintain and improve the worker-management relationship
- To promote the fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labor and employment laws,
- To protect the workforce by addressing child labor and forced labor
- To promote safe and healthy working conditions, and to protect and promote the health of workers.

The requirements of IFC PS2 are summarized in Table 16-1.

Table 16-1: Requirements under IFC PS2

PS2 Provisions	Summary of the Requirements
<b><i>Working Conditions and Management of Working Relationship</i></b>	
Human Resources (HR) Policy	Client to adopt an HR policy that is consistent with PS2. Under the policy, the client will inform employees of their rights. It will be clear, and will be made available at the start of employment.
Working Relationship	Working conditions and terms of employment will be clearly documented and communicated to employees and contracted workers.
Working Conditions and Terms of Employment	If the client is a party to a collective bargaining agreement, the terms of the agreement will be respected. Where not, working conditions and terms of employment will at least comply with national law.
Worker's Organizations	Where national law recognizes worker's rights to associate and bargain collectively, the client will comply with the national law. Where the law is restrictive, the client will enable alternative means of expression, including a mechanism for grievances.
Non-Discrimination and Equal Opportunity	The employment relationship will be based on the principle of equal opportunity and fair treatment, and will not discriminate with respect to hiring, compensation, working conditions and terms of employment, access to training, promotion, termination of employment or retirement and discipline.
Retrenchment	The client will develop a plan to mitigate the adverse impacts of retrenchment, if layoff is expected to be significant.
Grievance Mechanism	The client will provide a grievance mechanism for workers, inform the workers about the mechanism at the time of hire and make it easily accessible to them. The mechanism should be transparent and well understood, and should address concerns promptly at an appropriate level of management. The mechanism should not impede access to other judicial or administrative remedies that might be available under law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.
<b><i>Protecting the Work Force</i></b>	
Child Labor	The client will not employ children in a manner that is exploitative, is likely to be hazardous, or to interfere with child's education, or to be harmful to child's health or development. The client will follow national laws as applicable, but children below the age of 18 will not be employed in dangerous work.
Forced Labor	The client will not employ forced labor, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor or similar labor-contracting arrangements.

PS2 Provisions	Summary of the Requirements
<b>Occupational Health and Safety (OHS)</b>	
Health and Safety	The client will provide the workers with a safe and healthy work environment, taking into account inherent risks and hazards. Steps will be taken to prevent accidents, injuries and disease arising from, associated with or occurring in the course of work by minimizing the causes of hazards as far as practicable. In line with good international industry practice, the client will address identification of hazards; provision of preventative and protective measures; training of workers; documentation and reporting of accidents, diseases and incidents; and emergency prevention, preparedness and response arrangements.
<b>Non-Employee Workers and Supply Chain</b>	
Non-Employee Workers	The client will use commercially reasonable efforts to apply the requirements of PS2 to non-employee workers directly contracted, except for provisions under HR Policy, Retrenchment, and Supply Chain.
Supply Chain	The client will address child labor and forced labor in its supply chain consistent with the provision under Child Labor and Forced Labor.

### 16.2.2 International Labor Organization (ILO) Fundamental Conventions

IFC PS2 is in part guided by a number of ILO Conventions, and PS2 require complying with four core labor standards of ILO including child labor, forced labor, non-discrimination and freedom of association and collective bargaining. Furthermore, ILO has identified eight conventions as "fundamental (or core)", covering subjects that are considered as fundamental principles and rights at work. These fundamental conventions are presented in Table 16-2, all of which are ratified by Turkey. IHIC will comply with the requirements of these conventions during the construction and operation phases of the Project.

Table 16-2: ILO Fundamental Conventions

Convention Name	Key Provisions
C29: Forced Labor (Ratification by Turkey: 1998)	<ul style="list-style-type: none"> <li>Forced or compulsory labor not permitted</li> <li>Existing practices to be suppressed in the shortest possible time</li> <li>Regulated by governments that are signatories to the convention</li> </ul>
C 87: Freedom of Association and Protection of the Right to Organize (Ratification by Turkey: 1993)	<ul style="list-style-type: none"> <li>Workers and employers have the right to establish and join organizations of their choice, subject to the rules of the organization concerned</li> <li>Regulated by governments that are signatories to the convention</li> </ul>
C98: Right to Organize and Collective Bargaining (Ratification by Turkey: 1952)	<ul style="list-style-type: none"> <li>Workers to be protected against anti-union discrimination in the workplace</li> <li>Worker's and employer's organizations to be protected from acts of interference</li> <li>Regulated by governments that are signatories to the convention</li> </ul>
C 100: Equal Remuneration (Ratification by Turkey: 1967)	<ul style="list-style-type: none"> <li>Men and women to receive equal remuneration for work of equal value, consistent with the provisions of the applicable remuneration methods.</li> <li>Regulated by governments that are signatories to the convention</li> </ul>
C 105: Abolition of Forced Labor (Ratification by Turkey: 1961)	<ul style="list-style-type: none"> <li>Forced labor not to be used for political ends, for economic gain, as a form of discipline or punishment, or in the context of discrimination.</li> <li>Regulated by governments that are signatories to the convention</li> </ul>
C111: Discrimination (Ratification by Turkey: 1967)	<ul style="list-style-type: none"> <li>Equal opportunity in respect of employment and opportunity to be pursued in a manner appropriate to national practice,</li> <li>Discrimination based on race, color, sex, religion, political opinion,</li> </ul>

Convention Name	Key Provisions
	<ul style="list-style-type: none"> <li>nationality not permitted.</li> <li>Exclusion or preference in respect of the requirements of a specific job is not discrimination</li> <li>Regulated by governments that are signatories to the convention</li> </ul>
C138: Minimum Age (Ratification by Turkey: 1998)	<ul style="list-style-type: none"> <li>Child labor to be progressively abolished where it is still practiced</li> <li>Signatories to determine a locally appropriate minimum age, not less than 15 years or 14 in specific circumstances</li> <li>Regulated by governments that are signatories to the convention</li> </ul>
C182: Worst Forms of Child Labor (Ratification by Turkey: 2001)	<ul style="list-style-type: none"> <li>Elimination of child exploitation through slavery, prostitution, pornography, illicit services or work which is harmful to health, morals or safety</li> <li>Regulated by governments that are signatories to the convention</li> </ul>

### 16.2.3 Turkish Health and Safety Regulations

IFC PS2 requires complying with the national laws and regulations that are applicable to projects with regard to labor and working conditions and health and safety. An Environmental, Health, Safety and Social (EHSS) legislation review has been undertaken as part of the ESIA study (see Annex B) including review of the Turkish Labor Law and Occupational Health and Safety Legislation as listed below:

- Labor Law (Official Gazette Date/Number: 10.6.2003/25134)
- Occupational Health and Safety Law (Official Gazette Date/Number: 30.06.2012/28339)
- Regulation on the Minimum Wage (Official Gazette Date/Number: 01.08.2004/25540)
- First Aid Regulation (Official Gazette Date/Number: 22.05.2002/24762)
- Regulation on Working Duration Related to Labor Law (Official Gazette Date/Number: 06.04.2004/25425)
- Regulation on Excess Work and Work in Excess Periods (Official Gazette Date/Number: 06.04.2004/25425)
- Regulation on Special Principles in Works Carried out by Employing Workers in Shifts (Official Gazette Date/Number: 07.04.2004/ 25426)
- Occupational Health and Safety Risk Assessment Regulation (Official Gazette Date/Number: 29.12.2012/28512)
- Regulation on the Provisions of Occupational Health and Safety Training of Employees (Official Gazette Date/Number: 15.05.2013/28648)
- Occupational Health and Safety Services Regulation (Official Gazette Date/Number: 29.12.2012/28512)
- Communiqué on Danger Class Lists Related to Occupational Health and Safety (Official Gazette Date/Number: 26.12.2012/28509)
- Regulation on Duties, Authority, Responsibilities and Trainings of Occupational Health and Safety Specialists (Official Gazette Date/Number: 29.12.2012/28512)
- Communiqué on Occupational Health and Safety Specialists (Class C) that can be Employed in Very Dangerous Works (Official Gazette Date/Number: 14.06.2013/28677)
- Regulation on the Occupational Health and Safety Boards (Official Gazette Date/Number: 18.01.2013/28532)
- Regulation on the Health and Safety Measures to be taken in Workplace Buildings and Additions (Official Gazette Date/Number: 17.07.2013/28710)

- Regulation on Health and Safety at Construction Sites (Official Gazette Date/Number: 05.10.2013/28786)
- Regulation on the Tasks, Authority, Responsibility and Education of On-Site Doctor and Other Health Personnel (Official Gazette Date/Number: 20.07.2013/28713)
- Regulation on Health and Safety Requirements in the Use of Work Equipment (Official Gazette Date/Number:25.04.2013/28628)
- Regulation on Manual Handling (Official Gazette Date/Number: 24.07.2013/28717)
- Regulation on Fire Protection of Buildings (Official Gazette Date/Number: 19.12.2007/26735)
- Regulation on the Emergency Cases in Workplaces (Official Gazette Date/Number: 18.06.2013/28681)
- Regulation on the Use of Personal Protective Equipment in Workplaces (Official Gazette Date/Number: 02.07.2013/28695)
- Regulation on Safety and Health Signs (Official Gazette Date/Number: 11.09.2013/28762)
- Regulation on the Protection of the Workers against Risks Relevant to Noise (Official Gazette Date/Number: 28.07.2013/28721)
- Regulation on the Protection of the Workers against Vibration Risks (Official Gazette Date/Number: 22.08.2013/28743)
- Regulation on Occupational Health and Safety in Temporary or Fixed Term Employment (Official Gazette Date/Number: 23.08.2013/28744)
- Regulation on Suspension of Work in Workplaces (Official Gazette Date/Number: 30.03.2013/28603)
- Regulation on Health and Safety Measures in Works with Carcinogenic and Mutagenic Substances (Official Gazette Date/Number: 06.08.2013/28730)
- Regulation on Health and Safety Measures in Works with Chemical Substances (Official Gazette Date/Number: 12.08.2013/28733)
- Regulation on Protection of Workers from Dangers of Explosive Environments (Official Gazette Date/Number: 30.04.2013/28633)
- Regulation on the Prevention of Exposure Risks from Biological Agents (Official Gazette Date/Number: 15.06.2013/28678)
- Regulation on the Works in Which Workers shall Work Maximum Seven Hours or Less in a Day in Terms of Health Rules (Official Gazette Date/Number: 16.07.2013/28709)
- Regulation on Radiation Safety (Official Gazette Date/Number: 24.03.2000/23999)
- Regulation on the Working Principles and Radiation Dosage Limits of the Personnel Working with Ionizing Radiation Resources in Health Services (Official Gazette Date/Number: 05.07.2012/28344)
- Regulation on Safe Transportation of Radioactive Substances (Official Gazette Date/Number: 08.07.2005/25869)

#### **16.2.4 IHIC Human Resources (HR) Policy**

IHIC will develop an HR Policy as part of the Environmental and Social Management System (ESMS), which will be an Integrated Management System that will cover environmental, health and safety, and social issues, for the construction and operation phases.

IHIC will fulfill the requirements of IFC PS2 by adopting and implementing an HR policy appropriate to its size and workforce during the construction and operation phases of the Project.

### **16.3 General Conditions**

#### **16.3.1 Employment Contract**

IFC PS2 require documenting and communicating to all employees their working conditions and terms of employment, including their entitlement to wages and any benefits. According to Turkish Labor Law, the employer is required to have a written contract with the employees for employment with duration of one year or more. In cases when a written contract is not made, the employer is under obligation to provide the employee with a written document, within two months at the latest, showing the general and special conditions of work, the daily or weekly working time, the basic wage and any wage supplements, the time intervals for remuneration, the duration (if it is a fixed term contract) and conditions concerning the termination of the contract.

IHIC will have a written contract with all employees complying with the requirements of the Turkish Labor Law, and therefore will fulfill the requirements of PS2 with regard to employment contracts.

#### **16.3.2 Working Hours**

Regarding working hours and conditions, IHIC will comply with the Turkish laws and regulations. According to Regulation on Working Duration Related to Labor Law, the maximum working duration is 45 hours a week, and the daily working duration cannot exceed 11 hours in any case. According to Regulation on Excess Work and Work in Excess Periods, excess work is defined as “those works that exceed 45 hours a week”, and work in excess periods is defined as “those works that are lower than 45 hours a week according to a contract and when the work exceeds this working period set in the contract and becomes 45 hours a week”. Pursuant to article 4 of the subject regulation, the wage for each hour of the excess work is paid by increasing the hourly wage of normal working condition by 50%, and the wage for each hour of the work in excess periods is paid by increasing the hourly wage of normal working condition by 25%.

IHIC will ensure to communicate to all employees and workers the working durations including the conditions and wages related to excess works, as appropriate.

#### **16.3.3 Non-Discrimination**

IHIC will strictly prohibit discrimination against any employee or applicant for employment because of the individual’s race, color, religion, gender, sexual orientation, gender identity or expression, national origin, age, disability, veteran’s status, or any other characteristic protected by law.

Turkish Labor Law forbids discrimination due to race, language, gender, political views and opinion and religion. In accordance with the equal treatment principle covered in article 5 of the Turkish Labor Law, employers should treat part time workers with the same rights as full time workers and indefinite period workers to definite period workers unless there are genuine reasons for not doing so. As IHIC will comply with the Turkish Labor Law and will base the employment relationships on the principle of equal opportunity and fair treatment, the Turkish standards will fulfill the requirements of PS2 with regard to avoiding non-discrimination.

#### **16.3.4 Grievance Mechanism**

IFC PS2 requires companies to provide a grievance mechanism for workers (and their organizations, where they exist to raise reasonable workplace concerns. IHIC will develop an ESMS for the construction and operation phases where grievances of employees related to environment, health and safety issues are handled and the workers are informed about the grievance mechanism at the time of employment. The grievances can be raised anonymously and reviewed in one week intervals followed by initiation of corrective action within two days as far as practicable for grievances with high importance.

#### **16.3.5 Child Labor and Forced Labor**

Turkish Labor sets provisions related to child labor and forced labor. According to Turkish Labor Law, it is forbidden to employ children under the age of 15. Children and young employees under the age of eighteen must not be employed on industrial work during the night. Young employees who have not reached the age of sixteen years, children and workers who have not received relevant occupational training for the work they are responsible for must not be employed on heavy and dangerous work. Forced labor is prohibited by the Turkish Labor Law. IHIC will comply with the provisions of Turkish Labor Law with regard to child labor and forced labor.

#### **16.3.6 Non-employee Workers and Supply Chains**

In accordance with IFC PS2, IHIC will use commercially reasonable efforts to apply the requirements of PS 2 to non-employee workers directly contracted by IHIC, except for provisions of PS2 under HR Policy, Retrenchment, and Supply Chain. Contracts including the health, safety and environmental requirements will be signed with all sub-contractors. IHIC will also address child labor and forced labor in its supply chain consistent with the provisions of PS2 under child labor and forced labor, and as defined in section 16.3.5., the third party employers will be managed and monitored by procurement procedure that includes assessment of the third party performance.

### **16.4 Specific Conditions for Service**

#### **16.4.1 Accommodation during Construction**

IHIC will manage workers' accommodation and provide basic services to workers in line with the provisions of IFC PS2 and also follow the guidance note on worker's accommodation published by IFC and European Bank for Reconstruction and Development (EBRD) (Worker's Accommodation: Processes and Standards). During the construction phase, IHIC will provide appropriate facilities to those employees who will need onsite accommodation. Workers' accommodation arrangements will not restrict workers' freedom of movement or of association.

Accommodations will meet national legislation and international good practice; according to the Guidance Note by IFC and the EBRD, giving special attention to the following issues<sup>1</sup> with regard to housing is expected:

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<sup>1</sup>ILO Workers' Housing Recommendation 115

- Minimum space allocated per person (floor area; cubic volume; or size and number of rooms),
- Supply of safe water in the workers' dwelling in such quantities as to provide for all personal and household uses,
- Adequate sewage and garbage disposal systems,
- Appropriate protection against heat, cold, damp, noise, fire, and disease-carrying animals, and, in particular, insects,
- Adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting,
- A minimum degree of privacy both between individual persons within the household and for the members of the household against undue disturbance by external factors.
- Necessary provisions for any health, fire safety or other hazards or disturbances and local facilities as well as the provision of first aid and medical facilities.
- Workers freedom of movement to and from the employer-provided accommodation shall not be unduly restricted.

#### **16.4.2 Health and Safety**

Occupational health and safety considerations during the construction of the IHC are common to most civil construction facilities. The health and safety hazards during the IHC operation may affect health care providers, cleaning and maintenance personnel, and workers involved in waste management handling, treatment, and disposal. Health care facility specific hazards have been highlighted to include: exposure to infections and diseases, exposure to hazardous materials/waste, exposure to radiation and fire safety. The potential impacts are discussed in Section 15.5.

IFC PS2 requires providing the workers with a safe and healthy work environment, taking into account inherent risks and hazards specific to the work. IHIC will develop an ESMS covering OHSAS 18001:2007 certificate for the management of health and safety issues. The management system will ensure that all applicable health and safety legislation is met during the construction phase and operation phase. The mitigation measures discussed below will be part of the ESMS procedures and related instructions for the construction and operation phases.

### **16.5 Impacts**

#### **16.5.1 Health and Safety**

##### Construction Phase

The construction activities will pose certain health and safety risks for the employees involved. These risks will include physical hazards (i.e. use of machinery and vehicles, working with moving machinery and vehicles, working at heights), chemical hazards (i.e. direct contact with fuels or chemicals, contaminated soil), dust emissions with excavation, and noise emissions (vehicular traffic and machinery operation).

The impacts associated with these activities are expected to be of minor significance considering that health and safety management system will be implemented during the construction phase which will ensure identification of intrinsic risks associated with the activities, regular training of the

workers, provision of appropriate personal protective equipments, and presence of emergency response plans.

The implementation of ESMS during construction phase of the Project will minimize the impacts to the extent possible and ensure safe working conditions for the workers.

### Operation Phase

The operation activities will pose specific health and safety risks for the employees involved in the IHC. These potential risks are summarized as follows:

- Biological risks from exposure to general infections, blood-borne pathogens, and other potential infectious materials during care and treatment, as well as during collection, handling, treatment, and disposal of health care wastes.
- Chemical risks from exposure to drugs used in the treatment of cancer, hazardous materials and waste including specific toxic chemical and gases used in sterilization of medical equipment, formaldehyde, mercury (exposure from broken thermometers), solvents, and photographic chemicals.
- Physical risks such as ionizing radiation from equipment emitting X-rays and gamma rays (e.g. CT scanners), radiotherapy machines, and equipment for nuclear medicine activities.
- Ergonomic risks
- Psychosocial risks including violence and working in shifts

Health care facilities may be under fire risks due to the storage, handling, and presence of chemicals, pressurized gases, boards, plastics, and other flammable substrates.

Spread of infectious diseases represents a major risk during IHC operational phase. Infectious diseases can spread due to improper waste management practices (especially medical waste), through air conditioning systems and poor sterilization, primarily during operations and medical treatment.

## **16.6 Mitigation Measures**

### Construction Phase

The following mitigation measures will be applied to manage labor and working conditions during construction including the health and safety of the employees:

- An ESMS covering construction activities and OHSAS 18001:2007 certificate requirements will be developed.
- An HR policy for IHIC will be developed.
- All applicable national health and safety legislation and international regulations will be followed.
- All the risks of each activity during construction will be identified followed by identification of the appropriate mitigation measures/personal protective equipment.
- Workers' accommodation will be managed in line with the provisions of IFC PS2 provisions and the guidance note on worker's accommodation published by IFC and EBRD (Worker's

Accommodation: Processes and Standards), and a relevant procedure will be set out in the ESMS. A Construction Camp Management Plan will be developed by IHIC.

- An HR manager will be appointed to ensure implementation of the HR policy.
- Workers will have contracts in place prior to commencement setting out working conditions, terms of employment and environmental and health and safety (EHS) responsibilities.
- A grievance mechanism will be developed for employees and will be included in the ESMS. Employees will be informed about this mechanism at the time of hiring. Grievance mechanism will be extended to non-employee workers in future.
- Subcontractors will also be encouraged to follow the requirements of IFC PS2. Contracts to be signed with sub-contractors will include EHS.
- Dust emissions will be minimized to the extent possible with the implementation of mitigation measures mentioned in *Chapter 9: Air Quality*.
- All employees (including subcontractors) will be trained on health and safety, and emergency preparedness and response plan to respond timely to the incidents.
- Workers (including subcontractors) will be provided safety briefings before commencement of the work and will be provided with necessary personal protective equipment.
- Method statements and risk assessments will be required for high risk activities such as working at heights, operation of heavy equipment and similar.
- All accidents and incidents will be recorded. The efficiency of health and safety practices will be monitored through internal and external audits, and corrective actions will be taken if required.
- All workers will be insured under the Social Security Institution.
- IHIC will develop and implement a detailed management plan to mitigate immediate health and safety hazards on site.

### Operation Phase

The following mitigation measures will be applied to manage labor and working conditions during operation including the health and safety of the employees:

- An ESMS covering operation activities and OHSAS 18001:2007 certificate requirements will be developed.
- All applicable national health and safety legislation and international regulations will be followed.
- An HR policy for IHIC will be developed. An HR manager will be appointed to ensure implementation of the HR policy.
- Employees will have contracts in place prior to commencement setting out working conditions, terms of employment and EHS responsibilities.
- A grievance mechanism will be developed for employees and included in the ESMS. Employees will be informed about this mechanism at the time of hiring. Grievance mechanism will be extended to non-employee workers in future.
- Subcontractors will also be encouraged to follow the requirements of IFC PS2. Contracts to be signed with sub-contractors will include health, safety and environmental requirements.
- All employees will be insured under the Social Security Institution.

- All employees (including subcontractors) will be trained on health and safety, and emergency preparedness and response plan to respond timely to the incidents.
- All the health and safety risks of each activity during operations will be identified followed by identification of the appropriate mitigation measures/personal protective equipment. This will be conducted as part of the OHSAS 18001:2007 certification process within the scope of ESMS. The risk and mitigation measures will ensure that the following items are considered at a minimum:
  - Development of a comprehensive plan to control radiation exposure
  - Formulation of an Exposure Control Plan for blood-borne pathogens. In addition, staff members will be informed on infection control policies.
  - Minimization of risks from hazardous material and hazardous wastes by appropriately following the Hazardous Material Management Plan, Waste Management Plan and Health Care Waste Management System (HWMS). These plans will be developed, implemented and monitored.
  - Immunization for staff members, provision of necessary personal protection equipment for personnel involved in waste management, provision of necessary hand washing facilities.
- Fire safety measures will be taken by performing the following steps at a minimum:
  - The IHC will be designed, constructed, and operated in full compliance with the "Regulation on the Protection of Buildings from Fire" Official Gazette 26735 Date 19.12.2007.
  - The IHC will also satisfy internationally accepted life and fire safety standards such as Life Safety Code82. IHIC will demonstrate that the buildings as well as life and fire safety systems and equipment have been designed and installed appropriately at the facilities.
  - A Life and Fire Safety Master Plan will be prepared identifying major fire risks, applicable codes, standards and regulations, and mitigation measures. This plan will need to be approved prior to the construction of the facilities to ensure compliance with local and international standards.
  - "Regulation on Protection of Buildings from Fire (Official Gazette Date/Number: 19.12.2007/26735) brings forward detailed requirements for the design and operation of the facilities that take into account fire prevention issues (i.e. fuel load and control of combustibles), means of egress, detection of alarm systems, compartmentalization, fire suppression and control as are required by IFC EHS Guidelines for Health Care Facilities.
- The efficiency of health and safety practices will be monitored through internal and external audits, and corrective actions will be taken if required.

## 16.7 Residual Impacts

If the ESMS is implemented properly during construction phase and operation phase which will cover the implementation of all mitigation measures mentioned above and ensure compliance with Turkish regulatory requirements, the residual impact is considered to range between insignificant to of minor significance.

## 17.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT

This chapter describes and outlines the arrangements by how environmental, occupational and community health and safety, social and labor related (*altogether described as “environmental and social”*) risks and impacts will be managed during the construction and operation phases of the Project. A management system is proposed to be used in order to manage these risks and also to meet applicable laws and regulations in Turkey as well as the Lenders’ Requirements.

IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş (IHIC) will establish an integrated management system (*referred to here as the Environmental and Social Management System - ESMS*) for the construction and operation phases of the Project as it will be the main construction work contractor and the service provider (except medical services<sup>1</sup>) of the Project. The IHIC sponsors include world class construction contractors, engineering and project management firms as well as facility management companies. Existing plans, programs and procedures defined under the management systems of these experience partners and the plans, programs and procedures prepared by IHIC during the bidding process of the Project will be integrated to the ESMS or adopted to the ESMS after making necessary amendments and improvements. The certified management systems of some of the partners in IHIC are provided in Table 17-1.

Table 17-1: Existing management systems of some of the joint venture partners

Joint Venture Partner	Type of Management System	Certification
Emsaş İnşaat Turizm Ticaret ve Sanayi Inc.	Quality Management System	ISO 9001:2008
	Environmental Management System	ISO 14001:2004
Sürat Bilişim Teknolojileri Sanayi Ticaret Inc.	Information Security Management System	ISO/IEC 27001
Forcimsa Empresa Constructore, S.A	Quality Management System	ISO 9001:2008
	Environmental Management System	ISO 14001:2004
Şahin Tıp Sanayi ve Ticaret Co. Inc.	Quality Management System	ISO 9001:2008

The ESMS will be established and implemented separately for the construction and operation phases in line with the following international good practice and guidelines:

- ISO 9001:2008 - Quality Management System;
- ISO 14001:2004 - Environmental Management System;
- OHSAS 18001:2007-Occupational Health and Safety Management System;
- IFC Performance Standard 1 (PS1)-Assessment and Management of Environmental and Social Risks.

The following issues will be taken into account during the establishment of the ESMS:

- Compliance with relevant Turkish laws and regulations
- IFC Performance Standards
- IFC Environmental, Health and Safety (EHS) General Guidelines
- IFC EHS Guidelines for Health Care Facilities
- “Environmental and Social Management Plan (ESMP)” prepared within the scope of the ESIA study

<sup>1</sup> Medical services (treatment, operative surgery, polyclinic medical examination, emergency and intense care, maternity etc.) will be provided by the Ministry of Health (MoH) and under their responsibility. The Ministry will appoint doctors, nurses and other health-related personnel. Provision of the medicine and office consumables will also be the responsibility of the Ministry.

The ESMS will integrate planning, implementation, control and review of the processes in terms of environmental and social impacts and will enable IHIC (i) to manage the above mentioned risks and impacts (ii) implement, monitor and review identified mitigation measures, (iii) provide continuous control of the processes and (iv) improve environmental and social performance. The system will cover all project-related construction and operation activities of the IHIC partners. In case of acquiring any service from subcontractors, ESMS will also be applicable for these companies' activities related to the Project. The scope of the ESMS will be clearly defined in an "ESMS Manual" to be developed. The requirements of the ESMS will be reflected in the contracts with all contractors, subcontractors and suppliers.

This chapter has been prepared to describe the outline structure of the ESMS and the relevant documentation. Existing documents prepared by IHIC during the bidding process will also be referred as applicable under the relevant sections of this chapter. The scope will cover the following issues:

- 16.1:** Environmental, Health and Safety and Social Policy
- 16.2:** Planning of the ESMS
- 16.3:** Implementation of the ESMS
- 16.4:** Control of the ESMS (including monitoring and audit)
- 16.5:** Stakeholder Engagement
- 16.6:** Grievance Process

In addition to the ESMS, a "Health Care Waste Management System" will be established and implemented as per IFC requirements. It is also expected that the IHIC will obtain a Joint Commission International (JCI) Accreditation for improved quality of services and patient safety, however it is anticipated that application for the accreditation will be done jointly by the MoH and IHIC.

### **17.1 Environmental, Health and Safety and Social Policy**

The senior management (or the Board of Directors) of IHIC will officially define a written "Environmental, Health and Safety and Social (EHSS) Policy". The Policy will be relevant and compatible to the activities and environmental and social issues of the Project in order to provide a framework for the determination and review of environmental and social targets and objectives. In addition, a Project specific *Human Resources (HR) Policy* will be developed, as described in *Chapter 16: Labor and Working Conditions*, to set values and principles including active and competent participation of all employees in management and decision taking processes, and equal employment opportunity to all employees.

"EHSS Policy" and "HR Policy" will be developed both for construction and operation phases of the Project. These policies will encompass the following:

- Commitment to comply with environmental protection requirements and be in line with the Environmental, Health and Safety Legislation,
- Occupational health and safety, human resources management and satisfaction of employees,
- Lender's requirements

- Satisfaction of stakeholders (including patients),
- Commitment to continuous development and improvement of service quality

The Policies will be provided to employees, subcontractors and suppliers as an attachment of the contracts and will also be disclosed to the public on the Project website.

## 17.2 ESMS Planning

### 17.2.1 Environmental, Health and Safety and Social Aspect/Risk Assessment

The identification of the environmental, health and safety and social aspects, significant risks and impacts of the Project is considered to be the principle stage of the planning of an effective ESMS. Significant impacts of the Project have been identified within the scope of the ESIA study and an ESMP has been developed for the Project in order to manage these significant impacts as set out in Annex C (and as explained in more detail in Section 17.3.4). IHIC will determine the aspects and significant risks and impacts based on the results of the ESIA study and the ESMP and further refine it for specific processes, activities and/or services that could interact with the environmental and social elements. For this purpose, IHIC will establish an “*Environmental, Health and Safety and Social Aspects and Risk Assessment Procedure*”. For the operation phase, a similar procedure will be established within the scope of operational phase ESMS. This procedure will define the methodology to be followed with respect to the assessment of the activities during construction and operation phases of the Project.

The EHSS Aspects/Risk Assessment study will define the (i) mitigation measures and required actions for the identified risks and impacts of the Project, (ii) source of the action (e.g. applicable legislation, Project ESIA commitments, Lender’s requirements) and (iii) deadlines and responsible parties. The Aspect/Risk Assessment study will be performed considering but not limited to the following:

- Legal and other requirements (e.g. Lender’s requirements)
- Type, scale, and location of the Project
- Environmental and social baseline data
- Resource and energy use
- Waste generation
- Frequency, duration, possibility of the aspect/impact
- Opinion of relevant internal and external parties
- Affected party (e.g. patients, community, environment)
- Regular and irregular situations and emergency situations

### 17.2.2 Legal and Other Requirements

The applicable legislation for the Project will be identified and followed by a “*Legal and Other Requirements Follow-up List*” in line with a “*Legal and Other Requirements Determination and Compliance Procedure*”. This will provide an understanding of the legal (e.g permits) requirements and ensure that employees are aware of the legal liabilities of their work and the Project operations. Apart from the legal requirements, the list will also include other requirements (such as Lender’s requirements). The list will be updated in case of any amendments in the legislation/other requirements or any change in the Project. Updates of this document will be reflected on the

Project especially by means of the EHSS Aspect/Risk Assessment and accordingly additional plans and procedures as needed. A detailed “*Environmental, Health, Safety and Social Legislation Review*” has been prepared as part of the ESIA study (presented in Annex B) which can be used as a basis.

### **17.2.3 Targets, Objectives and Programs**

EHSS objectives and targets will be set for the continuous improvement of the environmental and social quality of the Project. Targets and objectives will cover issues such as efficient use of raw materials, auxiliary materials/matters, natural resources/energy consumption and reduction, improvement awareness of employees. Targets and objectives will be specific, measurable and feasible and supported by the programs. Deadlines and responsible party for each plan established to achieve desired results will be assigned. Environmental and social targets and plans will be documented and monitored.

## **17.3 Implementation of the ESMS**

### **17.3.1 Responsibilities, Resources and Training**

#### *Responsibilities and Resources*

The overall responsibility for the establishment, implementation, maintenance and effectiveness of the ESMS will lie with the Board of Directors of IHIC. For this purpose, necessary human and financial resources and technical infrastructure will be provided by the Project Board for all phases of the Project.

IHIC has developed organizational structures (provided in *Chapter 2: Project Description*) anticipated to be applicable for the construction and operation phases of the Project. Prior to start of both the construction and operation of the Health Campus, the Board will review these organizational structures based on the ESMS requirements. If it is required, organizational charts will be improved to include necessary staff, especially those who have critical importance in the implementation and management of the ESMS (i.e. management representatives). Key environmental and social roles, responsibilities and authorities as well as qualifications will be clearly defined and announced to the relevant responsible personnel and to the rest of the employees working within the Project. For this purpose, an “*Environmental and Social Task Qualification Table*” will be developed by the IHIC.

Figure 17-1 and Figure 17-2 represent basic presentation of the potential organization charts of the construction and operation phases. The original/detailed charts given in *Chapter 2: Project Description* are summarized in this Chapter to highlight key employees/departments to be potentially appointed and have critical responsibilities in the implementation of the ESMS. These charts may be improved or amended as the Project moves forward.

For the construction phase, IHIC will appoint a QA/QC Manager having overall responsibility for the establishment, implementation and the maintenance of the ESMS. The QA/QC Manager will be assigned as ESMS Management Representative as well. The QA/QC Manager will report directly to Project Director. QA/QC team will basically be responsible for the supervision and monitoring of the construction activities on site in terms of ESMS requirements. A Liaison Officer responsible for the community engagement process during the construction phase will also be employed (or an

employee will be delegated for this position). IHIC will assign one or more labor representatives among the employees considering the total numbers of the workers. Human Resources (HR) Officer may be assigned for this task. Emergency Response Teams will be established among the employees considering the required qualifications of the team members.

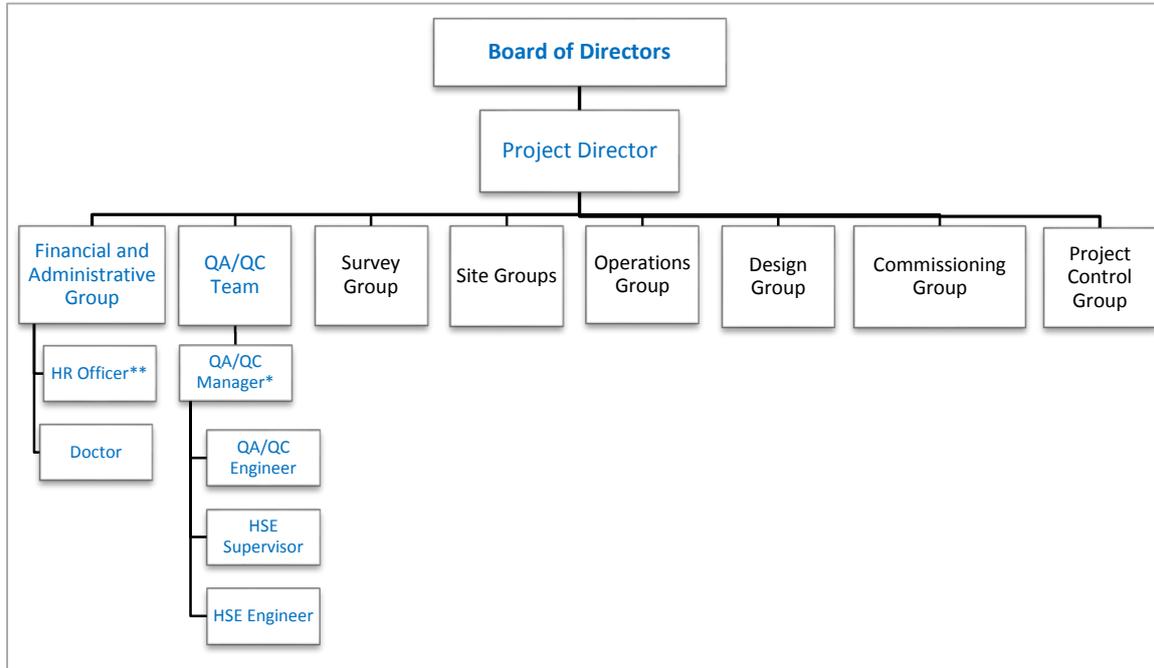


Figure 17-1: Potential organization chart for the construction phase of the Project

\*ESMS Management Representative

\*\*Labor Representative

Some key tasks and responsibilities of the certain ESMS related employees during construction phase are set out as follows.

Title	Tasks and Responsibilities
<b>Board of Directors</b>	<ul style="list-style-type: none"> <li>o Overall responsibility for the establishment, implementation, maintenance and effectiveness of ESMS</li> <li>o Providing necessary resources for the ESMS such as human resources, technology and financial resources, training</li> <li>o Definition, announcement and periodical review of the ESMS Policy</li> <li>o Reviewing and improvement of the ESMS system</li> </ul>
<b>Project Director</b>	<ul style="list-style-type: none"> <li>o Ensuring the implementation, maintenance and effectiveness of the ESMS by working with QA/QC Manager</li> <li>o Developing site specific management plans and procedures as required by the Project with QA/QC Manager</li> <li>o Providing trainings to workforce and employees about the ESMS requirements</li> <li>o Taking necessary measures for the EHSS aspects/risks and impacts</li> <li>o Evaluation of complaints coming from any party and solving the problem with QA/QC Manager</li> </ul>
<b>QA/QC Manager</b> (ESMS Management Representative also)	<ul style="list-style-type: none"> <li>o Establishment, implementation, maintenance and effectiveness of the ESMS</li> <li>o Ensuring implementation of Project's overall management plans and procedures by all organization</li> </ul>
<b>QA/QC Engineer</b>	<ul style="list-style-type: none"> <li>o Development and implementation of site specific management plans and procedures as required by the Project</li> <li>o Organizing training to workforce and employees about the ESMS requirements (i.e safe working practices, environmental and social risks etc.)</li> <li>o Coordination and performing EHSS aspects/risk and impact assessments and reporting the outputs of the assessment to the Project General Director and Board of Directors</li> </ul>

Title	Tasks and Responsibilities
	<ul style="list-style-type: none"> <li>○ Monitoring the ESMS performance and reporting the results to the Board of Directors, Project Director and other related parties</li> <li>○ Supervising subcontractors' and suppliers' activities (if any) to ensure that environmental, health and safety and social requirements are met</li> <li>○ Evaluation of complaints coming from any party and solving the problem</li> </ul>
<b>HSE Supervisor</b>	<ul style="list-style-type: none"> <li>○ Ensuring that all works carried out at the site meet with HSE requirements</li> </ul>
<b>HSE Engineer</b>	<ul style="list-style-type: none"> <li>○ Ensuring implementation of Project's management plans and procedures related to HSE by all organization</li> <li>○ Providing regular information to QA/QC Manager on HSE performance and HSE related issues</li> <li>○ Reporting non-conformities, near miss and accidents to the QA/QC Manager</li> <li>○ Ensuring the maintenance of a safety of employees and visitors</li> <li>○ Investigating the causes and results of any accidents which may occur at the site and submitting detailed reports to the QA/QC Manager</li> <li>○ Organization and participation to EHSS Aspect/ Risk Assessment Studies</li> <li>○ Monitoring the implementation of ESMS at site in terms of HSE</li> </ul>
<b>Doctor</b>	<ul style="list-style-type: none"> <li>○ Providing medical services for the employees in line with the relevant legislation</li> <li>○ Providing necessary trainings to the employees in line with the relevant legislation</li> <li>○ Providing consultancy service to the employer for health-related issues (e.g hygiene)</li> <li>○ Participation to EHSS Aspect/ Risk Assessment Studies</li> </ul>
<b>Labor Representative</b>	<ul style="list-style-type: none"> <li>○ Taking relevant actions to provide legally acceptable workplaces/labor standards</li> <li>○ Informing HSE Supervisor and QA/QC Manager in case of any potential Occupational HS risk</li> <li>○ Participation to HS Risk Assessment Studies and HS Meetings</li> </ul>
<b>Liaison Officer</b> ( <i>not demonstrated in the above Chart</i> )	<ul style="list-style-type: none"> <li>○ Responsible for ongoing Stakeholder Engagement at all levels (statutory stakeholders, community, NGOs) and being accessible for them upon any request/grievance.</li> <li>○ Provide regular information to QA/QC Manager on social performance and community and other related issues</li> </ul>
<b>Emergency Response Teams</b> ( <i>not demonstrated in the above Chart</i> )	<ul style="list-style-type: none"> <li>○ Implementation and maintenance of the Emergency Preparedness and Response Plan (EPRP) and related procedures as necessary</li> <li>○ Reviewing and improving, if necessary, the EPRP and related procedures together with the QA/QC Manager and HSE Supervisor</li> <li>○ Attending the trainings and emergency drills to exercise the EPRP and related procedures</li> </ul>

When the operation of the Health Campus begins, there will be a different organizational structure. The basic presentation of the organization chart is given in Figure 17-2. IHIC will assign required employees for the implementation of the ESMS before the health campus starts operation. The General Manager and Quality and Safety Department will have the key roles in the establishment, implementation and maintenance of the ESMS. Technical Work Services Department will also have significant responsibilities in the implementation of the ESMS as the “Waste Management Services” and “Building and Land Services” will be provided under this department. Within the scope of the “Waste Management Services” to be developed for the management of the wastes generated from hospital activities, a Waste Management Manager, waste services chiefs, people responsible for storage and field persons will be assigned. Job definitions of these employees are provided in “Waste Management Plan” (See Annex G) prepared within the scope of this ESIA. Undertaking of emergency drills and implementation of emergency response procedures for the buildings will be the responsibility of the Building and Land Services. For this purpose a person responsible for Emergency case/crisis desk will be employed within the scope of the Building and Land Services (or the task will be assigned to an employee). A Liaison Officer will be employed and delegated for the community engagement process. One or more labor representatives among the employees considering the total numbers of the workers will be assigned. Emergency Response Teams will be established considering the required qualifications of the team members. Main tasks and responsibilities of the key positions such as management representative, HSE-related employees, and emergency response teams will be similar to those in the construction phase. However, titles/departments of these positions may differ as the organization structures of the construction

and operation phases are not similar. Moreover, due to the fact that there will be a joint management system during the operation phase between the MoH and IHIC, there may be task distribution between these two parties during the development and for the effective implementation of the ESMS.

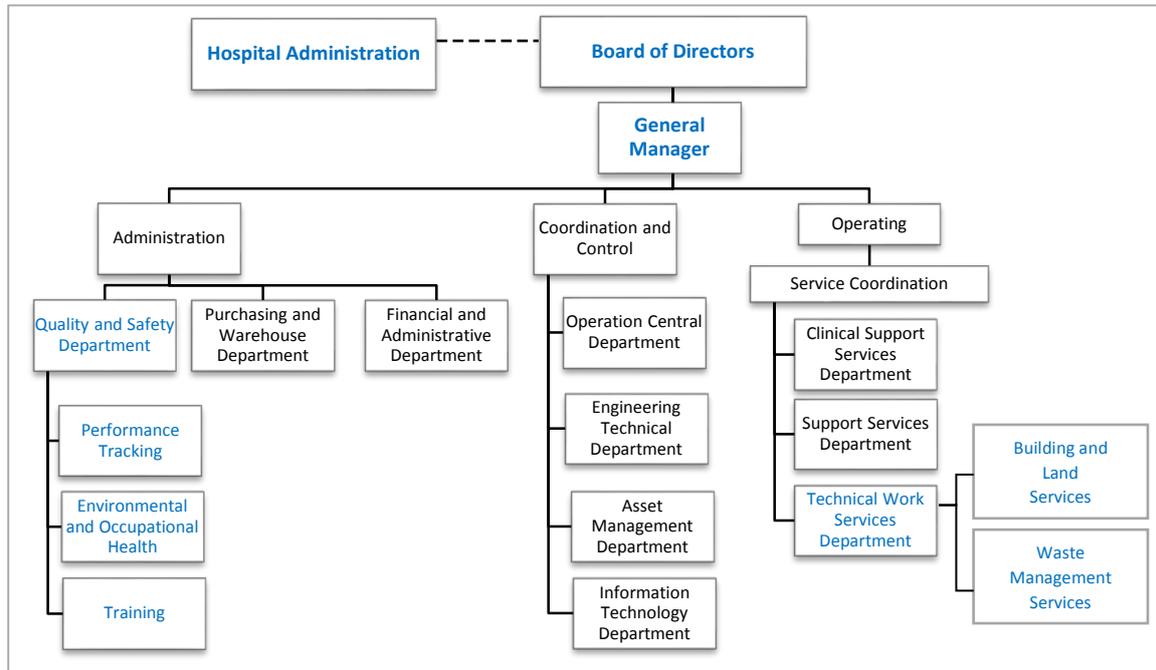


Figure 17-2: Potential Organization Chart for the operation phase of the Project

In the establishment of the ultimate organization structures for the implementation of the ESMS, (i) general organization structure of the IHIC in both construction and operation phases (ii) relevant people identified in the plans, programs and procedures for construction and operation phases of the Project and (iii) ESMS requirements (including legal liabilities) will be taken into consideration.

### *Training and Awareness*

Personnel with direct responsibility for the Project's environmental and social performance such as health and safety specialist, environmental officer, on-site doctor, emergency team members will be adequately qualified, trained and experienced to perform their work. Competences of these employees will be met with national legal requirements and Lenders' expectations. External experts and/or consultancy services, if legally or technically necessary, will also be acquired during the Project phases.

Those employees having responsibilities in the ESMS and other personnel will undergo training on an ongoing basis. Determination and providing of the training needs, informing and increasing the awareness of the employees, subcontractors and suppliers (if any) regarding the ESMS Policy; significant environmental and social risks and impacts; and procedures will be defined in the "Training and Improvement Management Process Procedure" to be prepared.

### **17.3.2 Communication**

IHC will develop procedures to establish and maintain an effective and strong internal and external communication within the scope of the Project. Internal communication will be provided via means such as boards, website of the Project and meetings. Grievances, requests and suggestions coming from all parties (employees, patients, community and others) will be taken, recorded, evaluated and solved/responded in line with a “*Grievance and Request Management Process Procedure*”. A Stakeholder Engagement Plan (SEP) has been prepared for the duration of the ESIA study. Engagement activities for the duration of construction and operation phases are briefly outlined in the SEP. Communication methods/tools defined in the SEP will be considered in the establishment of this procedure and updated as necessary as the Project proceeds.

### **17.3.3 Documentation and Document Control**

Documentation structure of the ESMS will include the following;

*ESMS Manual:* An official document that details how the ESMS is operated. The ESMS manual will include the ESMS policy, description of ESMS control, roles, responsibilities and relationships, plans, procedures, systems and similar.

*Environmental, Health and Safety and Social Policy:* Consists of all the commitments which are formally expressed by the Senior Management for the construction and operation phases of the Project and which help to determine the framework of the objectives and targets.

*Procedures:* Documents outlining the main activities and phases, defined procedures, authorities and responsibilities concerning the ESMS that is to be established separately during the construction and operation of the Project.

*Plans:* Documents supporting the procedures and describing the studies in detail.

*Other Supporting Documentation:* Forms, lists and other documents used within the scope of the ESMS.

*External Documentation:* Laws, regulations and standards which define the service conditions and are used mandatorily.

*Controlled Copy:* Documents in current use.

*Uncontrolled Copy:* Documents not requiring follow-up.

A “*Document and Data Control Procedure*” will be established within the scope of construction and operation phase ESMS to control and approve any document before it is issued, to determine writing format and numeration system to be used; to determine approval system; to provide controlled distribution, review and update of the documents; to provide relevant and updated documents in the relevant points; to abolish invalid documents and to manage external documents.

#### **17.3.4 Operational Control**

An “*Environmental and Social Management Plan (ESMP)*” has been developed for the Project (covering construction and operation phases) in order to manage the adverse impacts on the environment. The ESMP has been prepared based on the international standards and national laws and regulations. The ESMP of the Project is presented in Annex C of this report. The ESMP includes description of the mitigation measures to avoid, minimize or compensate the adverse impacts during the construction and operation phases of the project; responsible parties for the implementation of the mitigation measures; the timing of implementation; monitoring and audit requirements. The ESMP focuses on the avoidance of impacts, and where this is not possible, presents technically and financially feasible and cost-effective mitigation measures to minimize possible impacts to acceptable levels. The ESMP is based on the results of the ESIA study and is a framework document that specifies the necessary work to be conducted for the Project such as preparation of detailed management plans for each topic (i.e. air quality control and monitoring, noise control and monitoring, traffic management). The ESMP will be kept up to date with any required additional mitigation throughout the Project and reflect the requirements of new and/or amended laws and regulations.

A “*Waste Management Plan*” has also been established as part of the ESIA and presented in Annex G. In addition, the following plans are described in the ESMP and will be developed to achieve EHSS objectives both for the construction and operation phases:

- Air Quality Control and Monitoring Plan
- Noise Control and Monitoring Plan
- Hazardous Material Management Plan
- Emergency Preparedness and Response Plan
- Construction Camp Management Plan
- Traffic Management Plan
- Radiation Exposure Control Plan
- Exposure Control Plan for Blood-borne Pathogens
- Life and Fire Safety Master Plan
- Community Health and Safety Management Plan
- Security Plan
- Archaeological Chance Finds Plan

All these plans will be supported with operational procedures and related instructions as necessary as part of the ESMS. The ESMS procedures and plans will be periodically (or when necessary) reviewed and revised. Additional procedures and plans will be developed as necessary as the Project progresses.

Apart from the above listed plans defined within the scope of the ESIA, IHIC have developed a series of plans, programs, and procedures during the bidding process to ensure environmental, social and service quality of the Project during the construction and operation phases. These plans, programs and procedures may (i) directly be implemented to the Project or (ii) be integrated to the system after making necessary improvements or (iii) be considered as a basis for the establishment of detailed plans and procedures to be followed during the construction and operation phases of the Project. These are as follows:

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### Construction Phase

“*Safety Program*” involves (i) measures to be taken to prevent accidents in the construction site: using personal protective equipment; safe storage of the hazardous (explosive, flammable etc.) materials; safe working practices for risky works (e.g. electrical works, handling of radioactive materials, welding, excavation, gas cutting, scaffolding etc.) (ii) general procedures to be followed in certain emergency cases like fire and site accidents.

“*Environmental Plan*” basically provides a framework for methodology to achieve environmental objectives; significant environmental concerns and protection measures; waste management and disposal procedures; and the procedures to be followed in the event of an environmental accident for the Project activities during construction.

### Operation Phase

A “*Business Continuity Plan*” has been developed by IHIC to ensure operational continuity of the hospital services in case of certain threats and risks (e.g failures of certain units, extreme air conditions etc.) on various functions and services that are identified as critical. The Plan also provides procedures for departmental specific issues mostly related to insufficient staff numbers inducing inability to provide a service. “*Business Continuity Plan*” involves rather the procedures to be followed for continuous service quality which directly affect especially the patients’ satisfaction. The procedures defined within the scope of this Plan are related to: Air Conditioning Plant Failure; Air Pollution; Extreme Weather (Ice & Snow-Heavy Rain-High Winds-Excessive Heat); Boiler Failure; Building Management System (BMS) Failure; Domestic Hot Water Services Failure; Drainage-Foul; Drainage-Rain Water; Electrical Supply Failure; Steam, Gases, Chemicals etc.; Fire; Fire Alarm Failure; Flooding-External; Gas Supply Failure; Infestation; Kitchen Failures; Lift Failures; Operating Theatre Failure; Piped Medical Gas Failure; Medical Gas Alternatives; Telephone Failure; Water Contamination (Underground Supplies); Water Supply Failure-MCW (Drinking Water); and Water Treatment Failure (Boiler house-Hydrotherapy Pool).

*Service Plans for the Operation of Hospital:* Service Plans listed below are related to the services to be provided during the operation of the hospital. Each Plan has its own organizational structure and task definitions, work flow and process description, health and safety procedure and reporting method. Some plans also involve a grievance mechanism, a quality control plan, performance indicators for the relevant process, and a waste collection procedure. These plans can be considered in the establishment of the ESMS and related plans and procedures.

- Clinical Support Services: *Laboratory Services Management Plan, Imaging Services Management Plan, Sterilization and Disinfection Services Management Plan, Rehabilitation Services Management Plan and Hospital Data Management System Management Plan*
- Support Services: *Patient Orientation/Reception/Help Desk/Portering Services Management Plan, Linen and Laundry Services Management Plan, Cleaning Services Management Plan, Security Services Management Plan, Catering Services Management Plan and Medical Equipment Support Service Management Plan.*
- Technical Works Services: *Building and Land Services Management Plan, Extraordinary Maintenance Repair Service Management Plan, Utilities Management Service Management Plan, Furniture Service Plan, Ground And Garden Maintenance Services Plan, Pest Control Service Plan, Car Parking Services Management Plan, , Waste Management Plan*

### **17.3.5 Environmental and Social Emergency Preparedness and Response**

An “*Emergency Preparedness and Response Procedure*” will be developed for emergency cases that consist of incidents such as accidents, explosions, fires, gas leakages, hazardous chemical and liquid waste spills, disease outbreaks and similar that occur unexpectedly due to equipment/infrastructure failures, employee errors, natural disasters (flooding, landslides, earthquakes, storms), sabotage and similar. Emergency cases are incidents that cause the activities to cease and also cause serious damages on environment, occupational and community health and assets.

The following needs to be detailed in the procedure:

- Emergency Response Team (Title, Responsibilities and key features);
- Emergency Response Plans, Emergency Drills, Internal Trainings (The drill scenarios should be conducted for different emergency cases;
- Maintenance and Control of Emergency Response Equipment (Fire Emergency Equipment, Pollution Prevention Materials, First Aid Cabinet, Material Safety Data Sheets, Personal Protective Equipment (PPE), Warning and Guiding Signs etc.);
- Measures to be taken in case of Emergencies/Natural Disasters (Communication in case of Emergency, Liquid Chemicals/Hazardous Liquid Wastes Spills, Gas Leakage (O<sub>2</sub>, Natural Gas, LPG, LPG Forklift, etc.) and Explosion, Flash/Fire, Earthquakes.

In the establishment of “*Emergency Preparedness and Response Procedure*” the plans, programs and procedures prepared during the bidding process of the Project can be taken into consideration as they involve certain emergency response procedures.

As it is explained in section 17.3.4, a “*Business Continuity Plan*” has been developed by IHIC during the bidding process to ensure operational continuity of the hospital services in case of certain threats and risks and departmental specific issues. Although this plan does not provide emergency response procedures, it may be considered for the “*Emergency Preparedness and Response Procedure*” of hospital operation as the plan covers procedures for certain cases such as fire, and flooding. A “*Building and Land Services Management Plan*” has also been prepared by IHIC during the bidding process for the building and land services to be provided for the health facility. The situations determined as emergency within the scope of this plan include fire, flood, natural disasters, terror, strike-lockout and civil commotion, unauthorized demonstration and marches, explosions of electric-electronic and mechanic installations, ventilation and pump failures. However, emergency procedures for these cases have not been defined in the documents and will need to be established within the scope of the ESMS.

## 17.4 ESMS Control

### 17.4.1 Monitoring, Measurement and Review

For an effective environmental and social management, the ESMS should be continuously monitored and periodically reviewed.

IHIC will monitor:

- the compliance of the ESMS with the environmental and social provisions of the legal and other requirements as well as the commitments given in the ESMP;
- overall implementation of the ESMP and other plans and procedures; and
- improvements achieved as the Project goes forward.

Periodical internal audits, independent parties' audits, regular (daily, monthly) checks, site inspections and measurements, impact monitoring, implementation of the processes in accordance with the ESMS and regulations, regular audits of the overall implementation of the ESMP and site inspections will be the tools of this purpose. Realization of environmental targets and objectives, environmental and social performance, equipment calibrations, air emissions, energy, fuel and natural resource consumption, noise, waste amounts, environmental and social complaints etc. will be monitored, measured and evaluated. Conformance with legal and other requirements will be periodically evaluated and recorded.

Internal audits will be conducted in line with an *"Internal Audit Process Procedure"* to be developed within the scope of the ESMS. The *"Legal and Other Requirements Determination and Compliance Procedure"* will be used to evaluate conformance with the legal and other requirements. Other relevant and required procedures for the monitoring and measurement processes will be established for the Project as needed.

### 17.4.2 Non-conformities and Corrective, Preventive and Improving Actions

Non-conformities, weaknesses, deficiencies, deviations and improvement opportunities will be identified by means of audits, checks, and measurements and grievances; the non-conformities will be analyzed in order to identify their root cause, and appropriate corrective/preventive/improving actions will be determined, initiated, and tracked through to completion. Required amendments will be reflected to the management programs, procedures, and plans including ESMP. A *"Management of Non-conformities and Corrective and Preventive Actions Procedure"* will be developed to manage this process.

### 17.4.3 Data Control

Any information and data relevant to the ESMS will be recorded in line with a *"Document and Data Control Procedure"* to be developed for the Project. This procedure will set procedures and principles related to the establishment, prevention, maintenance, and disposal of the ESMS records.

#### **17.4.4 Management Review**

Management reviews will be conducted (at least once a year) to maintain effectiveness of the ESMS and to determine the modification necessities and improvement opportunities in line with a “*Management Review Procedure*”. Internal and external audit results, conformance of the Project with legal and other requirements, external notifications including grievances, ESMS performance (e.g. achievement level to targets and objectives), corrective and preventive actions taken, decisions/actions coming from previous meetings, improvement recommendations will be taken as the inputs for the management reviews. Based on the results generated from the reviews, senior management will take the necessary and appropriate actions to ensure the policy is met, procedures and plans are being implemented, and are effective.

#### **17.5 Stakeholder Engagement**

A stand-alone Stakeholder Engagement Plan (SEP) has been developed for the Project, to help structure systematic communication with the stakeholders during the ESIA study. Within the scope of the SEP, stakeholders were identified including governmental authorities and non-governmental organizations (NGOs) at national, regional and district level, and local communities. Project information documents were prepared and sent to the identified stakeholders via mail, and the stakeholders were asked to comment on the Project, its potential impacts and to provide information that may be important for the ESIA study. Responses that were received from stakeholders are compiled in a register and presented in Annex D.

The consultation activities will continue during the construction and operation phases of the Project and will aim to maintain constructive relationships both with the local communities and other stakeholders. As briefly outlined in the SEP, the following activities will be undertaken during the construction and operation phases of the Project:

##### *Construction Phase*

- Project information will be disclosed from the project website which will be updated as deemed necessary.
- Ongoing meetings, as deemed necessary with national and local authorities will continue during construction phase related to permitting and other issues.
- The stakeholder list will be updated regularly and any new stakeholder identified will be included in the list.
- Any activities likely to cause particular disturbance to the nearby residents will be announced through handouts to be distributed to local people. This information will also be provided in the Project website.
- All comments and grievances will be managed in accordance with the Grievance Management Procedure.
- The security staff at the construction site will be informed about the Grievance Management and in case a local person wants to submit a comment or grievance, the security person will be able to convey this person to the responsible staff.

##### *Operation Phase*

- The Project website will be updated to include information on operation activities and any changes in environmental policy, plans and procedures that are followed.

- Ongoing meetings, as deemed necessary will be conducted with the national and local authorities to inform them of any changes in project activities and related to permitting.
- Ongoing meetings with the Ministry of Health will be conducted as necessary.
- The stakeholder list will be updated regularly and any new stakeholder identified will be included in the list.
- All comments and grievances will be managed in accordance with the Grievance Management Procedure.
- The security staff at the hospital will be informed about the Grievance Management and in case a local person wants to submit a comment or grievance, the security person will be able to convey this person to the responsible staff

## 17.6 Grievance Management

A Grievance Management Procedure will be established in order to ensure that all comments, suggestions and objections received from the Project stakeholders especially from local communities that are mostly affected by the Project are dealt with appropriately and in a timely manner. It is important to note that there will also be a separate grievance management procedure for workers during construction and operation phases, and for patients during the operation phase.

Local communities will be informed about the grievance management system during the consultation and disclosure activities. All grievances will be recorded, responded and resolved in a defined timeframe. Comments and grievances can be sent to IHIC via mail, e-mail, and fax during the construction and operation stages as well as through the Project website and telephone.

The procedure to handle grievances is described below:

1. All grievances submitted by stakeholders verbally and/or written will be considered. Verbal grievances will be written on grievance forms by the responsible person as defined below.
2. All grievances will be reflected in a grievance log to ensure that each grievance is assigned an individual number and that consistent tracking and corrective actions are carried out.

The grievance log will contain:

- Date of submission of the grievance
  - Reference number
  - Contact details of the complainant
  - Content of the grievance
  - Identification of parties responsible for the resolution
  - Dates when the investigation was initiated and completed
  - Findings of the investigation
  - Proposed corrective action
  - Date of response sent to the complainant (unless it is anonymous)
  - Statement of satisfaction of the complainant (unless it is anonymous)
  - Date of closing out the grievance
  - Any outstanding actions for non-closed grievances
3. The grievance will be evaluated by the relevant staff and management to identify what actions need to be taken, and an appropriate response will be developed. The complaint action form will be filled in.

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4. The complainant will be informed about the proposed corrective action in writing and the date of response to the complainant will be recorded in the grievance log,
  5. The complainant will be contacted through telephone or face-to-face meeting, if needed to confirm that the proposed corrective action taken is satisfactory, and the complainant's response will be recorded in the grievance log,
  6. The grievance will be closed out and the close out date will be recorded, if the complainant is satisfied with the action taken. If not, further assessment is needed and reevaluation of the grievance is required.
  7. It is envisaged that the grievances will be resolved within one month after receipt. If this is not possible, the complainant will be informed about the progress on a regular basis.
  8. Any grievances related to subcontractors' activities will be managed in line with the mechanism described above.

In addition to grievances, comments will be reviewed once a week to identify if they require a response. In case the comment requires a response, an appropriate response will be developed by the Project team in a month after the submission date of the comment. Comments will be reflected on a comment log that will include information on the date of the comment submission, details of the person submitting the comment, issue of comment, if a response is required or not, and date of response.

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## **ANNEX A**

### **Official Letter from Ministry of Environment and Urban Planning related to Turkish EIA Requirements**



T.C.  
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI  
Çevresel Etki Değerlendirmesi İzin ve Denetim Genel Müdürlüğü



Sayı : 38496763-220.99/  
Konu : İkitelli Entegre Sağlık Kampüsü Projesi

DAĞITIMLI

İlgi: İHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.'nin 25.12.2013 tarihli ve ISH0001-M sayılı yazısı.

İlgi yazı ile, Sağlık Bakanlığı tarafından 2003 yılında başlatılan Sağlık Dönüşüm Programı çerçevesindeki "İkitelli Entegre Sağlık Kampüsü Projesinin" tasarımı, inşaatı, finansman ve bakım işleri gibi hizmetlerin İHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş tarafından gerçekleştirileceği belirtilmiştir.

Söz konusu proje ile ilgili olarak, uluslararası finansman kredisi kullanılması planlandığı, finans kuruluşlarının gereklilikleri uyarınca, proje için Çevresel ve Sosyal Etki Değerlendirmesi çalışmalarına 2013 yılı itibari ile başlanıldığı belirtilerek, çevresel açıdan bu raporda ele alınması gereken hususlar kapsamında Bakanlığımız görüşü talep edilmiştir.

Bilindiği üzere, hastane projeleri, 03.10.2013 tarih ve 28784 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren ÇED Yönetmeliği Ek-I Listesi 46.Maddede "500 yatak ve üzeri kapasiteli hastaneler" ve Ek-II Listesi 37.Maddede "50-500 yatak kapasiteli hastaneler ve hastane ve tıp merkezleri bünyesi dışında yer alan diyaliz merkezleri (15 cihaz ve üzeri)" olarak Yönetmelik kapsamına alınmıştır.

Bu bağlamda, kamu yatırım programına alınmış hastane projeleri değerlendirilirken, ÇED Yönetmeliği yayım tarihinden önce projenin ihale sürecinin tamamlandığının belgelenmesi şartıyla, ÇED Yönetmeliği kapsamı dışında tutulması uygun mütalaa edilmektedir. Kapsam dışı faaliyetlerin, "Çevrimiçi ÇED Süreci Yönetim Sistemi" ile kayıt altına alınarak değerlendirilebilmesi için ise, proje ile ilgili detaylı bilgilerin (Proje Adı, İli, Mevkii, Proje Sahibi ve Adresi, Proje Sahibinin Vergi Dairesi ve Vergi Numarası, Projenin Kapasitesi, Proje Özeti, Varsa Sağlık Bakanlığı ile Ortaklık Sözleşmesi, İhale Süreçleri Hakkında Detaylı Bilgi) Bakanlığımıza gönderilmesi gerekmektedir.

Ayrıca, Yönetmeliğin 24.Madde (b) bendinde "ÇED Yönetmeliğine tabi olmayan veya Seçme Eleme Kriterlerine tabi olduğu halde proje sahibinin ÇED Raporu hazırlanması talebi üzerine Bakanlıkça uygun görülen projeler için uygulanacak yöntem Bakanlıkça belirlenir" hükmü yer almakta olup, proje sahibinin talebi üzerine, projenin çevresel etkilerinin değerlendirilebilmesi için, ÇED prosedürü uygulanabilmektedir.

Bilgilerinizi ve gereğini rica ederim.

M.Mustafa SATILMIŞ  
Bakan a.  
Genel Müdür V.

" Belgenin aslı  
elektronik imzalıdır."

Adres : Vekaletler Cad.No:1 Bakanlıklar/ ANKARA Ayrıntılı Bilgi : G.ERTÜRK Ziraat Mühendisi  
Telefon : 0-312-4101746 Fax : 0-312- 4192192 e-mail : gokce.erturk@csb.gov.tr

Bu belge 5070 sayılı elektronik imza kanuna göre güvenli elektronik imza ile imzalanmıştır.

Elektronik imzalı suretine <http://evrakkodgrolama.csb.gov.tr> adresinden Belge Num.:38496763/220.99/1381 ve Barkod Num.:107696 bilgileriyle erişebilirsiniz.



T.C.  
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI  
Çevresel Etki Değerlendirmesi İzin ve Denetim Genel Müdürlüğü

DAĞITIM

Gereği:

Bilgi:

- ELC Group Müşavirlik Müh.A.Ş. - İstanbul Valiliği(Çevre ve Şehircilik İl Müdürlüğü)  
Energy Plaza, Rüzgarlıbahçe Mah. Cumhuriyet Cad.  
Çınar Sok. No:2 K:6 34805 Kavacık / Beykoz / İSTANBUL

- IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.  
( İdealtepe Mah.Turgut Özal Bulvarı No:141 Maltepe/İSTANBUL)

Adres : Vekaletler Cad.No:1 Bakanlıklar/ ANKARA  
Telefon : 0-312-4101746 Fax : 0-312- 4192192

Ayrıntılı Bilgi : G.ERTÜRK Ziraat Mühendisi  
e-mail : gokce.erturk@csb.gov.tr

TURKISH REPUBLIC  
MINISTRY OF ENVIRONMENT AND URBAN PLANNING  
General Directorate of Environmental Impact Assessment, Permitting and Auditing

No : 38496763-220.99/1381

03/02/2014

Subject : Adana Integrated Health Campus Project

DISTRIBUTED

Ref: The letter of IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. dated 25/12/2013 and numbered as ISH0001-M.

With the referenced letter, it was mentioned that services including design, construction, financing and maintenance works of "İkitelli Integrated Health Campus Project" to be established within the scope of Health Transformation Program initiated in 2003 by the Ministry of Health, will be undertaken by IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.

It was stated that international financing loan is planned to be used for the mentioned Project and an Environmental and Social Impact Assessment study was initiated in 2013 as per the requirements of financial institutions; and the opinion of our Ministry was requested related to those environmental issues that need to be covered in the mentioned report.

As known, hospital projects were included in the scope of EIA Regulation with the EIA Regulation entered into force through publication in the Official Gazette dated 03.10.2013 and numbered 28784 as included in article 46 of Annex-I list as "Hospitals with a capacity of 500 beds and above" and in article 37 of Annex-II as "Hospitals with 50-500 bed capacity and dialysis centers (15 devices and above) located outside hospitals and medical centers".

In this context, when hospital projects that were included in the public investment program are evaluated, it is found appropriate to scope out these projects from the EIA Regulation on condition that it is documented the project bidding process is completed before the issue date of the EIA Regulation. In order to record and evaluate the scoped-out activities by "Online EIA Process Management System", detailed information related to the Project (Name, Province, Location of the Project, Name and address of the Project owner, tax office and tax ID Number of the Project owner, capacity of the Project, summary of the Project, Partnership Agreement with the Ministry of Health (if available), detailed information about the bidding process) needs to be submitted to our Ministry.

In addition, Article 24 paragraph (b) of the EIA Regulation includes a provision as "If it is requested by the project owner for preparation of an EIA Report for projects that are not subject to the EIA Regulation or subject to selection elimination criteria, the method is determined by the Ministry for the projects found appropriate by the Ministry", and if it is requested by the project owner, EIA procedure can be implemented for the assessment of the environmental impacts of the project.

Kindly submitted for your information and necessary action.

## DISTRIBUTION

### Necessary:

- ELC Group Consulting and Engineering Inc.  
(Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20  
Kavacık/İSTANBUL)

-IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (İdealtepe Mah. Turgut  
Özal Bulvarı No:141 Maltepe/İSTANBUL)

### Information:

-İstanbul Governorship (Provincial Directorate  
of Environment and Urban Planning)

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## **ANNEX B**

### **ENVIRONMENTAL, HEALTH, SAFETY and SOCIAL (EHSS)**

#### **LEGISLATION REVIEW**

**Table 1. Summary of Environmental, Health and Safety and Labor Legislation in Turkey that are applicable to the Project**

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<b>ENVIRONMENT</b>		
<b>GENERAL</b>		
<p><b>Environmental Law (No. 2872)</b> (Official Gazette Date/Number: 16.08.1983/18132;last amended on 08.07.2009)</p>	<p>This is the framework law for environmental legislation (and penalties).</p> <p>Article 8. Prohibition on Pollution: It is forbidden to discharge, store, carry and transfer any type of waste contrary to defined standards and methods given in relevant regulations and in a way that causes harm to the environment. When there is a possibility of pollution, the concerned parties are liable to prevent pollution. If pollution occurs, the concerned parties are liable to eliminate pollution and to take necessary measures to remove or minimize the effects of pollution.</p> <p>Article 10. Environmental Impact Assessment: The institutions, businesses and enterprises, which may cause environmental problems as a result of the activities they are planning to perform, are obliged to prepare a Project Introduction File and if required an Environmental Impact Assessment Report. For projects subject to EIA, no permit, approval, incentive, license to build or operate may be given for the proposed project and the investments cannot commence and be tendered unless an “EIA positive” or “EIA is not necessary” decision is received.</p> <p>Article 11. Permitting, Treatment and Disposal: The enterprises, facilities, and the residential units, which are not deemed to be suitable for direct or indirect disposal of waste material that they produce as a result of their production, consumption and service operations to the receiving environment, are obliged to dispose of their waste and subject it to treatment as per the standards and methods determined in the regulations and obtain the required permissions as such. The producers of waste are responsible for taking the necessary measures to minimize the amount of waste they create by using appropriate technologies and methods. Waste that cannot be recovered shall be disposed of by using the appropriate methods that are determined in the relevant regulations.</p> <p>The institutions, businesses and enterprises whose activities may have adverse effects on the environment, should prepare emergency response plans related to any accidents that may occur as a result of their activities, in order to control and minimize the adverse effects of the accidents.</p> <p>Article 20. Administrative Fines: Article 20 defines the penalties of administrative nature related to different environmental violations related to air emissions, waste, noise, discharges, etc.</p> <p>e) Any party that starts construction or operation before completing the EIA process shall be charged with an administrative fine of 2 percent of the project value. In these situations, the investor is obliged to reinstate the area to its previous condition. Any party that acts contrary to the commitment letter given during the EIA process shall be charged with an administrative fine of 16,929 Turkish Liras for each violation.</p> <p>Article 26. Fines of Judicial Nature: Any party that supplies wrong or misleading information and acts against the liability defined in article 12 shall receive imprisonment ranging from six months to one year.</p>	<p><b>Relevant permits as per the applicable regulations (i.e. EIA, Environmental Permit (discharge, air, noise- if necessary), temporary waste storage area permit)</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>Article 28. Polluter's Responsibility: Polluters of the environment and those who cause damage to the environment are responsible, regardless of degree of fault, for the damage arising from the pollution and destruction they cause. The polluter shall be required to pay compensation for the resulting damage according to the general provisions. The claims made for the indemnification of the environmental damages shall lapse after five years from the date that the damaged party learns of the damage and the obligation to indemnify.</p>	
<p><b>Environmental Impact Assessment Regulation</b> (Official Gazette Date/Number: 03.10.2013/28784)</p>	<p>Pursuant to the regulation, depending on the type of the project, its capacity, or the location of the activity, an EIA or a Project Description File may be required. Based on classification of projects according to the potentially expected environmental impacts, the projects listed in Annex-I of the regulation are directly subject to prepare a full EIA Report and they should first apply to Ministry of Environment and Urban Planning (MEUP) with an EIA Application File. The projects listed in Annex-II should prepare a Project Description File and are subject to screening by MEUP to derive a decision whether or not a full EIA is needed.</p> <p><i>Hospitals: In terms of the Turkish regulatory requirements, hospital projects were scoped out from the 2008 Turkish Environmental Impact Assessment (EIA) Regulation (Official Gazette date/number 17.07.2008/26939). This regulation has been recently replaced with a new EIA Regulation (Official Gazette date/number 03.10.2013/28784) that now requires hospital projects to conduct an EIA study. Correspondence conducted with the Ministry of Environment and Urban Planning (MEUP) as part of the ESIA stakeholder engagement process revealed the following condition "When hospital projects that were included in the public investment program are evaluated, it is found appropriate to scope out these projects from the EIA Regulation if it is documented that the project bidding process is completed before the issue date of the EIA Regulation. In order to record and evaluate the scoped-out activities by "Online EIA Process Management System", detailed information related to the Project (Name, Province, Location of the Project, Name and address of the Project owner, tax office and tax ID Number of the Project owner, capacity of the Project, summary of the Project, Partnership Agreement with the Ministry of Health (if available), detailed information about the bidding process) needs to be submitted to MEUP". The official correspondence MEUP letter is included in Annex A. IHIC has submitted an application to MEUP (dated 31.01.2014) informing MEUP about the completion of the bidding process before the issue date of new EIA regulation and asking for obtaining an EIA exemption letter.</i></p> <p><i>Apart from the main Project, associated facilities such as the cogeneration plant and/or concrete plant may be subject to Turkish EIA requirements depending on their capacities.</i></p> <p><i>Cogeneration Plant: The article that might be applicable for the cogeneration plant is given below:</i></p> <p style="padding-left: 40px;"><i>Annex-2 of EIA Regulation, Item 50 - Industrial facilities installed to obtain electric, gas, steam and hot water (includes recycling, waste disposal and biogas power plants, between 20 MWt – 300 MWt).</i></p> <p><i>Currently, the cogeneration plant is planned to be installed with a capacity of 16.745 MW. Therefore it does not fall under the scope of the EIA regulation unless planned capacity is increased to 20 MW and above at further planning stages of the project.</i></p> <p><i>Concrete Plant: The article that might be applicable for the concrete plant is given below:</i></p> <p style="padding-left: 40px;"><i>Annex-2 of EIA Regulation, Item 19- Facilities with a production capacity of 100 m<sup>3</sup>/hour or above, such as ready-mixed concrete plants, shaped material production plants that use cement or other binding materials, plants that produce pre-</i></p>	<p><b>EIA Positive Decision</b> or <b>Not Required Certificate</b> or <b>Exemption Letter</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p><i>stressed concrete component, aerated concrete, concrete panel and similar.</i></p> <p><i>Two concrete plants with production capacities of 65 m<sup>3</sup>/h and 30 m<sup>3</sup>/h, respectively, are planned to be operate during the construction and therefore they do not fall under the scope of the EIA regulation unless planned capacities are increased to 100 m<sup>3</sup>/h and above at further planning stages of the Project.</i></p>	
<p><b>Environmental Audit Regulation</b> (Official Gazette Date/Number: 21.11.2008/27061; last amended on 16.08.2011)</p>	<p>This regulation defines procedures and principles of environmental inspection for businesses and activities. The regulation further imposes qualifications and obligations of inspection officers, environmental management unit/environmental employee and authorized firms for environmental services.</p> <p>Article 5. Facilities or activities subject to audit requirements: All kinds of pollution sources and violations covered by the provisions of the Environment Law No. 2872 and related legislation in the land and sea areas within the borders of the Turkey are subject to audits.</p> <p>Article 6. Obligations of facilities or activities subject to audit requirements: (i) To have measurement and analysis required under the relevant legislation conducted by Ministry or Ministry authorized laboratories, (ii) to provide personnel and equipment of all kinds during the audit; to enable the environmental inspection officers to enter areas of facilities or activities and ensure their security, (iii) to cover the costs of measurement and analysis when the environmental inspection officer deems necessary or in case of appeals, (iv) to provide the information and documents required under environmental legislation timely and in full during the audit,(v) to notify the governorship within one month in case of signing a contract for purchasing environmental consulting services from an consulting firm authorized to provide environmental management services,(vi) to notify the governorship within one month in the case of cancellation of the contract with the authorized consulting firm, (vii) In the case of cancellation of the contract with the authorized consulting firm, to sign a new contract with a new authorized consulting firm, or establish an environmental management unit, or employ an environmental official within two months.</p> <p>Article 7. Self-monitoring of facilities and activities and internal audits: Self-monitoring of facilities and activities and internal audits shall be conducted by the environmental management unit or the environmental officer (must be authorized by the MEUP). Facilities and activities that do not establish an environmental management unit or employ environmental officer shall acquire services from companies authorized by MEUP.</p>	<p><b>Yearly environmental audit by environmental officer or Environmental Management Unit or authorized consulting company</b></p> <p><b>Notification to the governorship regarding purchasing environmental consulting service from an authorized consulting company</b></p>
<p><b>Regulation on Environmental Officers and Environmental Consulting Firms</b> (Official Gazette Date/Number: 21.11.2013/28828)</p>	<p>The regulation defines the environmental officials' qualifications, responsibilities and the documenting and the principles and procedures about granting a certificate of competency to environmental consulting firms.</p> <p>Article 5. Criteria for Environmental Officer Employment and Environmental Management Unit Establishment: Facilities or activities listed in Annex-1 of the "Regulation on Permits and Licenses to be obtained pursuant to the Environmental Law" shall establish an environmental management unit or obtain environmental management service from environmental consulting firms.</p> <p>Facilities listed in Annex-2 of the "Regulation on Permits and Licenses to be obtained pursuant to the Environmental Law" shall permanently employ at least one environmental officer or obtain environmental management service from environmental consulting firms or establish an environmental management unit.</p>	<p><b>Employ an environmental officer or establish Environmental Management Unit or acquire services from an authorized consulting company (for Annex-2 activities)</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p><i>Health institutions and hospitals with bed capacity of 20 and above shall employ at least one environmental officer or establish an environmental management unit or obtain environmental management service from environmental consulting firms.</i></p> <p>Employment of an environmental officer is not obligatory, if the facility is held exempt from an Environmental Permit by the relevant authority despite it is listed under Annex-1 or Annex-2 of the "Regulation on Permits and Licenses to be obtained pursuant to the Environmental Law".</p>	
<p><b>Regulation on Permits and Licenses to be obtained pursuant to the Environmental Law</b> (Official Gazette Date/Number: 29.04.2009/27214; last amended 03.12.2011)</p>	<p>The purpose of this regulation is to determine the permitting and license liabilities of the activities and facilities listed in the annexes of the regulation, the responsibilities of the competent authorities, the environmental management units and competent environmental representatives working at the facilities, the facility owners and the environmental consultancy firms that take part in works related to permitting and licenses.</p> <p>The regulation classifies the facilities into two groups according to their environmental impacts: Annex-1 includes facilities that have a high pollution impact on the environment; Annex-2 includes facilities that have a pollution impact on the environment. The facilities that are included in the lists should get an integrated environmental permit in accordance with this regulation (Annex-1 facilities from MEUP, Annex-2 facilities from Provincial Directorate of Environment and Urban Planning (PDEUP)). Environmental permit is defined as at least one of the permits for emissions, discharge, noise control, deep sea discharge or hazardous materials discharge.</p> <p>Pursuant to article 7 of the regulation, a Temporary Operation Permit is issued for a period of one year while the requirements for the integrated Environmental Permit are completed. According to article 8, facilities listed in Annex-1 and Annex-2 are required to complete the application process for the Environmental Permit within six months following the receipt of the temporary operation permit. If the processes cannot be completed, temporary operation is repealed.</p> <p>Those activities and facilities in Annex-1 and Annex-2 marked with (*) are exempt from noise provisions of the Environmental Permit.</p> <p>In case of having more than one facility at the same address, permitting processes are carried out in an intergrated manner and finalized in the name of the enterprise.</p> <p>Pursuant to article 13, those facilities that are not included in the Annex-1 and Annex-2 shall also meet the limit values defined in regulations.</p> <p>Prerequisites of an Environmental Permit (Annex-3C) include an Emissions Measurement Report, Acoustic Report and Wastewater and/or Hazardous Materials Wastewater Discharge Technical Information List.</p> <p><i>The following activities/facilities listed under Annex-1 and Annex-2 of the regulation are relevant/potentially relevant to the Project components.</i></p> <p><i>Hospitals:</i> <i>Annex-2, Item 10.14 - Hospitals and health institutions with bed capacity of 20 and above.*</i></p> <p><i>Cogeneration plant:</i> <i>Annex-2, Item 1.3 - Combined cycle, combined heat power plants, internal combustion engines and gas turbines with</i></p>	<p><b>Temporary Operation Permit and Environmental Permit, as necessary (i.e. for noise, air emissions, discharge, hazardous material wastewater discharge)</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<p><i>thermal power between 1 - 100 MW (combustion engines and gas turbines used in mobile power plants included).</i></p> <p><i>Construction phase:</i></p> <p><i>Annex-2, Item 2.14- Facilities that produce concrete, mortar or road materials using cement with a production capacity of 10 m<sup>3</sup>/hour or above, including the areas where these materials are mixed in their dry form (facilities that will be operated less than 1 year are excluded)</i></p>		
<p><b>WATER</b></p>		
<p><b>Water Pollution Control Regulation</b> (Official Gazette Date/Number: 31.12.2004/25687; last amended on 30.11.2012)</p> <p><b>Administrative Procedure Communiqué of Regulation on Water Pollution Control</b> (Official Gazette Date/Number: 10.10.2009/27372; last amended on 12.05.2010)</p>	<p>The purpose of this Regulation is to set the legal and technical principles to be followed in the control of water pollution, in order to protect the ground and surface waters and to prevent water pollution. The regulation provides quality criteria for surface, marine and ground waters, rules and principles for water pollution control, industry specific discharge (effluent) standards, and the principles for discharging wastewater into the surroundings, the sea or the sewer system.</p> <p>According to Article 25, (a) Discharge of all kinds of wastewaters to sewer system (where there is one) is a right and obligation, and (c) Natural persons or legal entities that create wastewater are liable to cover the expenses of using the sewer system, and/or treatment facilities. (e) For industrial wastewaters to be connected directly to the sewer system or to be discharged into the sewer system via transportation with tankers or similar vehicles; they</p> <ol style="list-style-type: none"> <li>(1) shall not do any harm to the structure and operation of the sewer system,</li> <li>(2) shall not pose any health concerns to their personnel or the population in the area,</li> <li>(3) shall not adversely affect the operation and efficiency of the treatment plant that their sewer system is connected to,</li> <li>(4) shall not include substances that are not suitable for biological treatment operations,</li> <li>(5) shall not render difficult to dispose or use the sludge or similar residues generated as a result of wastewater treatment operations or shall not cause these wastes to acquire pollutant characteristics.</li> </ol> <p>Pursuant to article 32, wastewater from facilities having a population of less than 84 can be collected in septic tanks that are to be built in accordance with the “Regulation on Septic Tanks to be Built in Areas Unsuitable for Sewer Construction” published in the Official Gazette dated 19.03.1971 and numbered 13783. Collected wastewaters are transferred to wastewater infrastructure facilities by sewage trucks. The Protocol signed between wastewater producer and wastewater management authority; and documents taken after each transfer of the wastewater by sewage truck shall be maintained at least five years and provided to relevant authority when they are requested.</p> <p>Pursuant to article 37, an environmental permit must be obtained from MEUP or PDEUP for the direct discharge of any domestic and/or industrial wastewaters and site run-off where this is discharged from a point source into receiving waters. The lists in “Regulation on Permits and Licenses to be obtained pursuant to the Environmental Law” should be followed to identify the activities that require permit.</p> <p>Pursuant to article 44, in a city and/or industrial area, connection to the sewer system is subject to a Wastewater Connection Permit to be issued by the wastewater infrastructure management. The Wastewater Connection Permit is a permission granted by the administration in return for a written document for domestic wastewaters; and for the industrial and combined</p>	<p><b>Wastewater discharge permit</b> (within the scope of the "Environmental Permit") - required if wastewaters are discharged into receiving environments)</p> <p><b>Wastewater connection permit</b> (for connection to sewer system)</p> <p><b>Wastewater disposal protocol with relevant wastewater management authority</b> (ISKI for this case)</p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>wastewaters after compliance with the conditions set forth in the quality control permit certificate.</p> <p><i>As reported, the domestic wastewater to be generated during the construction phase is planned to be discharged to a septic tank to be constructed within the Project site and the septic tank will be emptied by the Istanbul Water and Sewerage Administration (ISKI). Necessary discussions shall be made with the Basaksehir Municipality and/or Istanbul Metropolitan Municipality related to the use of a septic tank during the construction phase.</i></p> <p><i>Wastewater to be generated during the operation phases of the Project is planned to be discharged to the municipal sewer system. For discharge of domestic and/or industrial wastewaters into a sewer system, a Wastewater Connection Permit from the wastewater infrastructure management (Istanbul Water and Sewerage Administration (ISKI)) should be obtained and the quality criteria set forth in Table 25 (see Table 4 of this Annex) of the Regulation should be complied with.</i></p> <p>The Communiqué sets forth the procedures to be followed by facilities to obtain a Wastewater Discharge Permit (within the scope of the Integrated Environmental Permit), and the sampling frequency for industrial and wastewater effluents.</p>	
<p><b>Regulation on Septic Tanks to be Built in Areas Unsuitable for Sewer Construction</b> (Official Gazette Date/Number: 19.03.1971/13783)</p>	<p>The regulation sets technical principles for project design, location selection, construction, operation and maintenance for septic systems. Discharge of wastewaters to sewer system (where there is one) is mandatory at areas where sewer systems are built by the municipalities. However, in cases when this is not possible, the provisions of this regulation is implemented. Pursuant to Article 7 of the regulation, projects shall be submitted to the relevant authority for their approval in terms of technical and sanitary aspects to obtain building licence.</p>	<p><b>Project Approval</b></p>
<p><b>Regulation on Control of Pollution Caused by Hazardous Substances in Aquatic Environment</b> (Official Gazette Date/Number: 26.11.2005/26005; last amended on 30.03.2010)</p>	<p>This Regulation includes the technical and administrative basis regarding the determination of hazardous substances in surface waters, estuary waters and regional waters; organization of pollution reduction programs; prevention and monitoring of pollution; creating an inventory of hazardous substances discharged into water; determination of discharge standards and quality criteria.</p> <p>Pursuant to article 10 of the regulation, facilities should obtain the “Connection Quality Control Permit Certificate” from the relevant municipality for discharge of wastewaters that contain dangerous substances listed in Annex-1 or Annex-2 into the sewage system.</p>	<p><b>Connection quality control permit certificate</b> <i>(if the wastewaters containing hazardous substances will be discharged to sewer system)</i></p>
<p><b>Urban Wastewater Treatment Regulation</b> (Official Gazette Date/Number: 08.01.2006/26047)</p>	<p>This regulation concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors. The objective of the regulation is to protect the environment from the adverse effects of the above mentioned wastewater discharges. This regulation covers collection, treatment and discharges of urban and certain industrial wastewaters discharged to sewer systems.</p> <p>According to article 4, urban wastewater is defined as domestic wastewater or the mixture of domestic wastewater with industrial wastewater and/or run-off rain water.</p> <p>Article 8. Treatment requirements for urban wastewater treatments: Limit values for the receiving environment discharges are given in the Table 1 of Annex IV for the urban wastewaters <i>(see Table 4 of this Annex)</i>.</p> <p><i>This regulation does not have direct relevance to the Project, however has been included in this list due to the fact that the</i></p>	

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	<i>wastewater from the Project will be discharged to the municipal sewer system which will ultimately end up in an urban wastewater treatment plant.</i>	
<b>Law on Groundwater (No. 167)</b> (Official Gazette Date/Number: 23.12.1960/10688; last amended on 01.03.2013)	The legal framework for groundwater usage is defined by this law. Permits should be received from the State Hydraulic Works (DSI) for groundwater exploration, and construction and operation of wells to be utilized by facilities for groundwater extraction purposes.	<b>Well utilization permit - if necessary</b>
<b>AIR</b>		
<b>Industrial Sourced Air Pollution Control Regulation</b> (Official Gazette Date/Number: 03.07.2009/27277; last amended on 10.11.2012)	<p>The regulation regulates, with its annexes, the rules, principles and emission (fume, smoke, dust, gas, vapor and aerosol) limits that industrial and energy generation facilities shall follow.</p> <p>Pursuant to article 5, an Environmental Permit is obligatory for the establishment and operation of the facilities and activities that generate air emissions and fall under the scope of "the Regulation on Permits and Licenses to be Obtained Pursuant to the Environmental Law." An Emissions Measurement Report must be included in the electronic Environmental Permit application file and is valid for a period of 2 years. Pursuant to Article 24, the Emissions Measurement Report must conform to the format provided in Annex-11 of the regulation.</p> <p>Pursuant to Article 8, a letter of conformity regarding emissions must be obtained from the Provincial Directorate which involves prior inspection of the facility in order to ensure that the provisions of the Regulation are met (including measures taken at the facility and physical conditions, excluding measurements and analysis results).</p> <p>The air quality limits to be complied within the impact area are included in Annex-2 of the regulation "Air Quality and Calculation of Contribution to Air Pollution". Pursuant to the regulation, Contribution to Air Pollution value of proposed facilities is calculated for the pollutants with mass flow rates exceeding the limit values given in Annex-2 Table 2.1 of the regulation. The air quality limits to be complied with in the impact area are included in Annex-2 Table 2.2 of the regulation (<i>Air quality limits given in Table 2.2 of Annex 2 are valid until the end of year 2013. As stated in the regulation, the limits will be updated after 01.01.2014. Limit values for the year 2013 are provided in Table 2 of this Annex</i>). If air quality limits stated in Annex-2 are exceeded in the region in which the enterprise to be established, operator shall apply the action plan prepared by the governorship.</p> <p>Annex-1 provides the "Regulation Principles and Limits for All Facilities". If there is no emission limit for the facilities subject to the emission permit, it is obligatory to comply with the emission limits stated in Annex-1.</p> <p>Measures set out in Annex-1 must be taken in order to prevent dust emissions from temporary storage of bulk material in open areas (excavated soils and cement for concrete production):</p> <ul style="list-style-type: none"> <li>• placing wind-barriers</li> <li>• covering the top of conveyors and other carriers.</li> </ul>	<b>Air emissions permit</b> <i>(within the scope of the "Environmental Permit") - for trigeneration plant</i>  <b>Emissions Measurement Report</b> <i>(required for trigeneration plant and may be concrete plant)</i>

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	<ul style="list-style-type: none"> <li>• loading and unloading without spreading dust</li> <li>• covering dusty materials with canvas or with materials that have particle sizes greater than 10 mm</li> <li>• maintaining top layers at a moisture content of 10%.</li> </ul> <p>Measures set out in Annex-1 must be taken in order to prevent dust emissions from concrete production plants:</p> <ul style="list-style-type: none"> <li>• Relevant measures such as establishment of pressurized pulverized water and non-toxic chemical dust suppression systems should be taken to comply with stated dust limits. Water spraying systems should simultaneously be started with the production and should be applied as long as production continue. Chemical dust removal systems shall not be harmful for the environment and human health.</li> <li>• Cleaning of the dust filters (<i>if any</i>) are conducted in closed areas or the filters are moisten before they are cleaned.</li> <li>• Machines used in the productions which process materials having grain size below 1 mm should be operated in closed areas to prevent fugitive dust. Dust generated from these operations are collected and passed through dust separation systems. Conveyance of this-sizes materials are conducted using closed systems if their surface does not involve a moisture content of 10%.</li> </ul> <p>Dust emission limits including “special dust” limits provided in Annex 1 must also be considered for the operation of the concrete plant (<i>See Table 3 of this Annex</i>).</p> <p>Stack heights and gas velocities are determined in accordance with Annex-4.</p> <p>Annex-5 provides special emission limits (<i>see Table 3 of this Annex</i>) for the facilities of high pollutant capacity (<i>including combustion plants using natural gas (i.e gas turbines). Fuel type and calorific power is principle in the determination of the emission limits for these facilities</i>).</p> <p>Annex-7 sets out emission limits for inorganic and organic dusts, inorganic and organic vapors and gases, carcinogenic substances.</p>	
<p><b>Air Quality Assessment and Management Regulation</b> (Official Gazette Date/Number: 06.06.2008/26898; last amended on 05.05.2009)</p>	<p>The purpose of this regulation is to determine and build the air quality targets, to assess the air quality, to protect the current condition where the air quality is good and to improve it where needed.</p> <p>The regulation sets limits for ambient air quality parameters in Annex I and Annex IA (<i>See Table 2 of this Annex</i>).</p>	
<p><b>Regulation on Control of Exhaust Gas Emissions and Gasoline and Diesel Oil Quality</b> (Official Gazette Date/Number: 30.11.2013/28837)</p>	<p>The regulation determines the required principles and procedures to ensure reduction of exhaust gas pollutants and their control by monitoring, in order to preserve the environment from pollution caused by motor vehicles in traffic.</p> <p>According to Article 9, an “exhaust emission measurement stamp” and an “exhaust emission emission certificate” are issued by the MEUP to the owners of vehicles with compliant exhaust measurement results. Exhaust measurement stamps and certificates may not be issued to any vehicles which have not undergone exhaust gas testing or to those which do not meet emission limits.</p>	<p><b>Exhaust measurement stamp and Exhaust emission certificate for the vehicles (if needed)</b></p>

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<b>SOIL</b>		
<p><b>Regulation on Soil Pollution Control and Point-Source Contaminated Sites</b></p> <p>(Official Gazette Date/Number: 08.06.2010/27605; last amended on 11.07.2013)</p> <p><i>Note: All articles (except articles 1, 2, 3, 4, 5, 6, 35, 40, 41 and 42) of this regulation will enter into force in 08.06.2015</i></p>	<p>The regulation defines the principles and procedures to prevent the contamination of soil, to determine the sites and sectors where pollution exists or is likely to exist, and to remediate and monitor contaminated soil and sites in line with the sustainable development goals.</p> <p>According to article 6, it is fundamental to prevent soil pollution at its source. It is forbidden to dispose of any kind of waste that can cause harm to the soil directly or indirectly, by discharging into the receiving environment or storing waste in a way that is contrary to the standards and methods defined in Environmental Law and relevant regulations. It forbids the mixing of contaminated soil with clean soil.</p> <p>Pursuant to article 8, the regulation requires all existing and prospective industries which are included in Annex-2 Table 2 of the regulation to declare a Preliminary Operation Information Sheet to the Provincial Directorate of the Ministry of Environment and Urban Planning. The Provincial Directorate shall include all the declared industrial sites in a "Potentially Contaminated Sites List".</p> <p>According to article 10, the Provincial Directorate will then make an assessment of the sites with respect to the Evaluation Criteria given in Annex-4. If at least one of the criteria is valid for the subject site, it is characterized as a "Suspicious Site" and added to the "Suspicious Site List".</p> <p><u>Annex-4 "Evaluation Criteria":</u></p> <ol style="list-style-type: none"> <li>1. Presence of hazardous chemicals within the operation site and based on storage type for any hazardous chemical: (a) Regarding storage: (i) Lack of ground isolation, or (ii) Use of open space without a drainage system. (b) Aboveground tanks: (i) Lack of leakage control, or (ii) Lack of leakage control in pipes, or (iii) Lack of ground insulation. (c) Underground tanks: (i) Tank is single wall, or (ii) Tank is 10 years old and older, or (iii) Lack of leakage control, or (iv) Lack of leakage control in pipes, or (v) Lack of corrosion protection or cathodic protection.</li> <li>2. Occurrence of industrial accidents within the operation site.</li> <li>3. Temporary storage of hazardous wastes within the operation site, and: (a) Any of the stored wastes is marked as (A) in Annex IV Waste List of the "Regulation Concerning General Principles of Waste Management ", or (b) Absence of impermeable layer in the hazardous waste temporary storage area, or (c) Absence of drainage system around the hazardous waste temporary storage area.</li> <li>4. Presence of a treatment plant for the industrial wastewater generated during the operation, and: (a) Temporary storage of treatment sludge within the operation site, or (b) Discharge of treated wastewater to land.</li> </ol>	<p><b>Preliminary Activity Information Sheet</b> (<i>Note: This requirement will enter into force on 08.06.2015</i>)</p>
<b>WASTE</b>		
<p><b>Regulation on General Principles of Waste Management</b></p>	<p>This regulation is intended to establish general principles concerning management of wastes from their production to disposal. In this scope, the regulation covers prohibition on importing hazardous wastes, creation of waste management plans, obligation to obtain licenses, keeping records, issue of liability insurance and disposal costs. Annex-2 of the regulation includes definitions</p>	<p><b>Hazardous waste financial liability insurance</b></p>

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(Official Gazette Date/Number: 05.07.2008/26927; last amended on 05.07.2008)	<p>and characteristics of hazardous wastes and Annex-4 includes a list of wastes consistent with European Union (EU) identifying hazardous and non-hazardous wastes. This regulation does not cover radioactive wastes.</p> <p>Article 6. Prohibition of Pollution: Recycling, disposal of wastes in any place other than the permitted facilities or to land, sea, lakes, rivers and other receiving environments, polluting the environment by filling and storing is prohibited.</p> <p>Article 11. Obligation of Record Keeping: Waste-generating facilities and businesses together with the persons, institutions and organizations who perform the disposal and recycling of the wastes specified in Annex-2A and Annex-2B, are liable to keep records of the type of waste and the waste code specified in Annex-4, waste quantity, waste source, disposal facility, transportation type and the processes that the waste is subjected according to the methods specified in Annex-2A and Annex-2B, maintain the records for at least 5 years, send them to the Ministry at intervals specified by the Ministry and provide them to the Ministry for review and audit.</p> <p>Article 12. Obligation of Liability Insurance: Those who are engaged in the activities of hazardous waste collection, transportation, temporary and interim storage, recycling, reuse and disposal, are obliged to hold liability insurance according to the principals specified in this regulation against any accidents that may occur or damages to the third parties and the environment. Those facilities who do not comply with the obligation of having liability insurance shall not be permitted to undertake such activities.</p> <p>Article 18. Audit: (i) Waste generating facilities and businesses are audited by the MEUP periodically (ii) The persons, organizations and institutions subject to audits are required to provide the information and documents required by the MEUP, provide the costs of the analyses and measurements and show all the ease during audit.</p>	<b>Notification to the MEUP</b>
<p><b>Regulation on Control of Excavated Soil, Construction and Demolition Wastes</b></p> <p>(Official Gazette Date/Number: 18.03.2004/25406; last amended on 26.03.2010)</p>	<p>The Regulation defines the management of excavated soils and wastes from works of demolition or construction activities.</p> <p>Article 9. Obligations of Excavation Soil and Construction/Demolition Waste Generators: Excavation soil and construction/demolition waste producers shall: (i) Ensure the minimization and management of the adverse effects of wastes on the environment and human health in accordance with the provisions of this regulation (ii) Obtain the necessary permits and approvals during the stages of generation of waste, transportation and storage (iii) Collect the wastes separately, recycle and store during their operations. Wastes should not contain any hazardous, dangerous and foreign matters (iv) Obtain “Waste Transportation and Acceptance Certificate” for waste transportation and storage before the commencement of operation (if the amount of waste exceeds 2 tonnes) (v) Not dispose the wastes anywhere except for recycling and landfill sites permitted by the municipality or local administrative authority (vi) Meet all the expenses required for the management of wastes (vii) Compensate and remediate the pollution as a result of an accident that may happen during waste generation, transportation and landfilling.</p> <p>Article 14. Precautions to be taken during excavation work: Excavators are required to take the precautions to reduce dust emissions, noise and visual impacts and enclose the activity area. The amount of soil to be generated during the excavation procedure shall be planned to be equal to filling volumes and the usage of excavation soil primarily in the activity area shall be ensured. Operators who have at least 2,000 square meters area of land apart from the construction site, can store the</p>	<b>Waste transportation and acceptance certificate</b>

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<p><b>Medical Waste Control Regulation</b> (Official Gazette Date/Number: 22.07.2005/25883; last amended on 03.12.2011)</p>	<p>excavation soil in this area temporarily for reuse.</p> <p>Article 22. Hazardous Waste Collection and Disposal: Asbestos, paint, fluorescent, mercury, acid and similar hazardous wastes that are present in construction/demolition wastes shall be collected separately from other wastes and disposed in accordance with the provisions of the Hazardous Waste Control Regulation.</p> <p>Article 23. Waste Transportation and Acceptance Certificate: The generators of excavation soil and construction/demolition wastes are responsible of transporting/having them transported to appropriately permitted landfill sites with transportation vehicles having the necessary transportation permissions. Generators of excavation soil and construction/demolition waste above 2 tonnes shall apply to municipalities if within the municipal boundaries, to related district municipalities if within the metropolitan municipality boundaries, to the greatest local administrative authority if outside the municipal boundaries, and obtain a “Waste Transportation and Acceptance Certificate”.</p> <p>Includes the principals regarding the collection of the medical wastes generated from operational activities of health institutions indicated in the Annex-1, and the temporary storage, transportation and disposal of medical wastes indicated in the Annex-2 of the regulation.</p> <p>Article 4. Definitions Unit: Person, institution and organization producing wastes defined in Annex-2 as a result of the activities listed in Annex-1. Medical Wastes: Medical wastes mean the infectious, pathological and sharps wastes defined in C, D and E Groups of Annex-2. Hazardous Wastes: Hazardous wastes mean the pharmaceuticals, genotoxic, chemical, heavy metal containing wastes and pressurized containers defined in F group of Annex-2. Temporary Storage: Temporary keeping of the wastes in containers or constructed storage sites in the units before they are transferred to disposal area (Storage duration shall not exceed 48 hours). Conveyance within the unit: Conveyance/carriage of the wastes from waste sources to temporary storage facility with proper vehicles. Transportation: Transportation of the wastes from temporary storage facility to disposal area with proper vehicles.</p> <p>Article 5. General principles: (i) Direct or indirect disposal of the medical wastes to the receiving environment is prohibited (ii) Minimization of the medical, hazardous and domestic wastes at source is essential (iii) Medical wastes shall not be mixed with hazardous and domestic wastes (iv) Separate collection, transportation and disposal of the medical wastes at source is essential (v) Medical waste producers, transporters and disposers are responsible for the hazards arising from environmental pollution and deterioration (vi) Medical waste producers are obliged to cover expenses for waste disposal (v) Works within the scope of the medical waste management shall be carried out by the relevant trained personnel. The personnel shall be regularly trained and medically checked.</p> <p>Article 8. Obligations of the medical waste producers: Medical waste producers are obliged to (i) establish a system for waste minimization at source (ii) prepare and apply an internal unit waste management plan involving information relevant to separate</p>	<p><b>Construction of Temporary Storage Area or provision of container</b></p> <p><i>Building license for temporary storage area</i></p> <p><b>Yearly medical waste notification/declaration to the MEUP</b></p> <p><b>Internal Unit Waste Management Plan</b></p> <p><b>Waste receipt document/National waste transportation form</b></p> <p><b>Personnel issues</b> (<i>periodical trainings and medical checks, personal protective equipment etc.</i>)</p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>collection, transportation and temporary storage of the wastes and measures to be taken in case of an incident (iii) separately collect medical, hazardous and domestic wastes and packaging wastes at source (iv) use bags and containers technically specified in this regulation for medical and sharps wastes (v) separately transfer medical and domestic wastes with the vehicles allocated for this work (vi) construct temporary waste storage area or provide container, and for the outpatient units, to transfer the wastes to closest temporary waste storage/container or give the wastes to waste collection vehicle (v) provide periodic training for the personnel employed for medical waste management (vi) provide special clothing for the personnel employed for medical waste management (vii) cover expenses required for collection, transportation and disposal of the medical wastes (viii) regularly record the information regarding the amounts of the medical wastes and submit them to the Governorship by year-end, to maintain this information at least three years and to hold open for the review of the Ministry when requested.</p> <p>Article 10. Internal unit waste management plan: Units shall prepare and apply Unit Internal Waste Management Plan involving detailed information particularly on separate collection of the wastes defined in Annex-2, equipment and vehicles to be used in collection and transportation, waste amounts, collection frequency, temporary storage systems, cleaning and disinfection of collection equipment, measures to be taken and procedures to be followed in an incident, responsible personnel for waste management and their trainings.</p> <p>Article 11. Domestic wastes: Domestic wastes listed under Group A of Annex-2 are separately collected in black plastic bags. These wastes are transferred with the vehicles allocated for this purpose to the temporary waste storage area or container and temporarily stored. In case of contamination of the domestic wastes with the medical wastes, they are accepted as medical wastes. Domestic wastes are transferred and disposed in accordance with the Solid Waste Control Regulation.</p> <p>Article 12. Packaging wastes: Paper, cardboard, plastic and metal packaging wastes listed in Group B of Annex-2 are separately collected in blue plastic bags provided that they are not contaminated.</p> <p>Provided that they are not contaminated, glass packaging wastes such as serum and medicine bottles are collected in glass packaging boxes and if there is no collection box, they can be collected in blue plastic bags with other packaging wastes. Serum bottles are removed from the contaminated materials such as rubber, hose, and needle that contact with the patient. Contaminated materials are collected with the other wastes in accordance with the principles indicated in Article 13.</p> <p>Collected packaging wastes are recycled in accordance with the provisions of the Packaging Waste Control Regulation.</p> <p>Article 13. Medical wastes: Medical wastes defined in C, D and E Groups of Annex-2 are separately collected at source by relevant health personnel especially doctors, nurses, midwives, vets, dentists, laboratory technical personnel when they are being produced. Collecting equipment is kept ready in the nearest location of the waste source. Medical wastes shall not be mixed with domestic, packaging and hazardous wastes.</p> <p>Red plastic bags with “INTERNATIONAL BIOHAZARD (Uluslararası Biyotehlike)” sign and “ATTENTION! MEDICAL WASTE (Dikkat! Tibbi Atık)” label on each two sides are used in the collection of the medical wastes. The red plastic bags should be resistant to tear, puncture, burst and impact of transport; leak-proof; made of original medium density polyethylene raw material; with double thread stitch in the bottom and without bellows; has a double layer thickness of 100 microns; has a lifting capacity of at least 10 kg. The bags are not filled more than three quarters and closed securely to ensure their tightness. These bags shall not</p>	

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	<p>be recycled or reused. Content of the medical waste bags shall not be pressed, removed from the bag, emptied or transferred to another bag.</p> <p>In case of sterilization of medical wastes with pressurized vapor, wastes are placed in autoclavable sharp medical waste containers with autoclave bags. It is obligatory that autoclave bags are resistant to humid-pressurized heat up to 1400 °C and have vapor permeability.</p> <p>Liquid medical wastes are placed in the bags defined above after they are condensed with proper absorbents.</p> <p>Sharp medical wastes are separately collected from other medical wastes in red plastic bags or boxes or containers made of laminated cardboards with the "INTERNATIONAL BIOHAZARD" sign and "ATTENTION! SHARP MEDICAL WASTE (Dikkat! Kesici ve Delici Tıbbi Atık)" label. The bags/boxes/containers should be resistant to puncture, tear, breakage, or burst; waterproof and leakproof; and impossible to either to open or to confuse with other boxes or containers. Such waste containers shall be filled to at most three quarters capacity, then closed securely and placed in red plastic bags. Once the sharps boxes are filled, they shall not under any circumstances be opened, emptied, or recovered.</p> <p>Medical waste bags and sharps waste containers are immediately changed with new ones when three quarters of them are filled. New bags and containers are kept ready at waste source or in the nearest location of the waste source.</p> <p>Article 14. Hazardous wastes: Genotoxic wastes, pharmaceutical wastes, heavy metal-containing wastes, chemical wastes and pressurized containers defined in F Group of Annex-2 are separately collected from other wastes. Disposal of these wastes are carried out in accordance with the Hazardous Waste Control Regulation.</p> <p>Nonhazardous solid chemical wastes are collected together with the domestic wastes while liquid ones are discharged to the sewage system.</p> <p>Radiograph processing waters generated from units are recycled or disposed in accordance with the provisions of the Hazardous Waste Control Regulation.</p> <p>Hazardous wastes shall not be disposed to the sewer system, directly emitted to the atmosphere, burned at low temperatures, mixed with domestic wastes and disposed through storing.</p> <p>Article 15. Radioactive wastes: The provisions of this regulation do not apply to radioactive wastes. Disposal of these wastes are carried out in accordance with the legislation of Turkey Atomic Energy Agency.</p> <p>Article 16. Conveyance/Carriage of the medical wastes within the units: Medical waste bags are collected and carried by trained personnel using the wheeled and capped vehicles made of stainless metal, plastic or similar material. The vehicles should not have sharp edges which may cause damages or holes on the bags during the loading-unloading. They should be easy to load, unload, clean and disinfect. The vehicles to be used for the transportation of the medical wastes in the unit will be orange color with "International Biohazard" sign and "Attention! Medical Waste" label.</p> <p>Medical waste bags are tightly closed and loaded to the collection vehicles without pressing. During collection and transport, it is hand and body contact is avoided. Waste bags are never carried with hand. Garbage chutes and conveyor belts are not used.</p> <p>Medical wastes shall not be loaded and transported together with the domestic wastes. Waste transport vehicles are daily</p>	

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	<p>cleaned and disinfected. In case of any spills within vehicles, wastes are safely unloaded and the vehicles are immediately disinfected.</p> <p>It is obligatory that the personnel responsible for the transportation of the wastes within the unit wear special orange clothing. The clothing is provided by the unit.</p> <p>Waste collection program and the routes to be used by the collection vehicles will be as far as possible from patient treatment areas and other clear areas, crowded areas in terms of people and patient traffic.</p> <p>Article 17. Collection of medical wastes produced in small amounts: Medical wastes generated from the units indicated in c clause of Annex-1, are separately collected from the other wastes using the proper bags and containers defined in Article 13 and temporarily stored as defined in the Article 22.</p> <p>Article 18. Temporary storage: Units listed under Annex-1 and having a bed capacity of 20 and above are obliged to construct temporary storage area and units having a bed capacity less than 20 are obliged to provide container for this purpose.</p> <p>Wastes can be held in these containers maximum 48 hours before they are transferred to disposal area. Waiting period can be extended to one week provided that the temperature of the storage area is below 4 °C.</p> <p>Article 19. Temporary waste storage facility: (a) The temporary storage facility shall be constructed as an indoor area consisting of two sections. Medical waste shall be kept in the first section, while domestic quality waste shall be kept in the second section. (b) The volume of temporary storage facility shall be large enough to hold at least two days' collection of waste material. (c) Floor and walls of the facility shall be sturdy and it shall be coated with a non-permeable material resistant to accumulation of microorganisms and dirt and also easy to clean and disinfect. (d) The facility shall have a sufficient lighting system, a passive system of ventilation, and, in warmer areas, it shall be refrigerated. (e) Doors of the facility shall either open outwards or they shall be sliding doors. Doors shall always be kept clean and painted. The door of the section that holds medical waste shall be painted in orange color and it shall bear on it, in a visible manner, the "International Biohazard Symbol" in black color and the expression "Attention Medical Waste" also in black color. (f) Doors of the facility, when they are not being used, shall be kept always closed and locked; any person not authorized shall not be permitted to enter the facility. The facility and its doors shall be constructed so as to prevent entry of any animals. (g) The interiors and doors of temporary storage facility shall be constructed with such dimensions as to permit the personnel in charge to work comfortably, and waste material to be unloaded, stored, and finally re-loaded, with ease. (h) Temporary storage facility shall be constructed at such a location and in such a manner that the transport vehicles can easily access and dock. (i) Temporary storage facility shall not be constructed near any places where there is intensive traffic of patients or humans in general, such as hospital gates or parking lots, or near places where food is stored, prepared, or sold. (j) Cleaning and disinfecting of the storage section that holds medical waste shall be performed through use of dry methods. Once the waste in storage is removed, the section shall be cleaned, disinfected, and, where necessary, treated with insecticide. Any waste spilled due to tear or burst of a waste bag shall be collected using appropriate equipment, with any liquid waste thereof being concentrated by applying appropriate absorbent, and then placed again in red-colored plastic bags; finally the storage section, along with the equipment used thus, shall be promptly disinfected. (k) In the section where domestic quality waste is held; there shall be a system of drainage with a grill connected to sanitation network, along with a water tap</p>	

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	<p>with (reasonably) high water pressure to facilitate cleaning of the section. Once the waste is removed; the section shall be cleaned, and, where necessary, it shall be disinfected and insecticide shall be applied. (I) Cleaning equipment, protective apparel, waste bags, and containers shall be stored in places near the temporary storage facilities.</p> <p>Article 20. Building license for temporary storage facility: Metropolitan municipalities, municipalities and governorships are authorized to give building license to the units regarding the temporary storage facilities.</p> <p>Article 21. Usage of the containers as temporary storage facilities: Units in Annex-1 and having less than 20 beds shall use containers as temporary storage facility (If they prefer they can build temporary waste storage facility). These containers shall have following technical specifications. (i) Sizes and numbers of the containers should cover at least two-day medical wastes of the unit (ii) Containers are located in the areas that prevent containers from direct sun lights and away from dense human and patient traffic areas such as hospital entrance-exit, car park and pavement and food storage, preparation and selling areas (iii) The containers do not have sharp edges (iv) Caps of the containers are always closed and knocked, only the authorized people are allowed to open them. Caps are designed and built as to prevent entrance of the animals into the containers (v) Outsides of the containers are painted in orange color having black "INTERNATIONAL BIOHAZARD" sign and black "ATTENTION! MEDICAL WASTE" label (vi) Containers are always cleaned and painted (vii) Containers are cleaned everyday after unloading or cleaned and disinfected immediately after an accident.</p> <p>Article 22. Temporary storage of the medical wastes produced in small amounts: Medical wastes generated from the units indicated in c clause of the Annex-1 are transferred to closest temporary storage facility or containers with the vehicles defined in article 16. If there is no opportunity, medical wastes are collected with the medical waste collection and transfer vehicles of relevant municipality. Wastes are kept safely and if necessary put in a second waste bag. Wastes shall not put out unless medical waste collection vehicle comes, mixed with domestic wastes and put in the same container with domestic wastes.</p> <p>These health institutions are obliged to make an agreement with closest health institution which have temporary storage facility or container or relevant municipality and submit the agreement to the governorship before they obtain work permit.</p> <p>Article 23. Financial obligation in waste disposal: Medical waste producers are obliged to cover expenses for collection, transportation and disposal of the medical wastes.</p> <p>Article 24. Responsibilities of the units (in transportation of the medical wastes to disposal area): Units indicated in Annex-1 shall collect and package their medical wastes in accordance with the provisions of this regulation and put them in proper bags and containers stated in this regulation to provide safely transportation of the medical wastes to disposal areas.</p> <p>Article 25. Transportation of medical wastes: Metropolitan municipalities in metropolises; and municipalities, persons and organizations delegated by municipalities in other sites are responsible for transportation of the medical wastes from temporary storage units indicated in c clause of Annex-1 to disposal areas.</p> <p>These organizations and institutions are obliged to periodically train and medically check personnel responsible for transportation of the medical wastes.</p> <p>Article 27. Medical waste transportation rules: It is obligated to adopt principles stated in article 12 of Hazardous Wastes Control</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>Regulation and use National Waste Transportation Form during the transportation of medical wastes from temporary storages to disposal areas.</p> <p>It is not obligated to use National Waste Transportation Form for the wastes generated from the units stated in c clause of Annex-1. However, it is obligated to use waste receipt document during the collection of the medical wastes from units.</p> <p>Article 30. Waste receipt document: Waste receipt document is used for legally proving that the wastes are given to the transporter by the unit and transferred to the disposal area by the transporter. Waste receipt document is composed between the unit and the transporter/disposer. The document involves unit name, address, responsible person/institution/organization, driver's name, license plate of the transfer vehicle, license number and information regarding the disposal facility. The document is prepared as three copies: first one is taken by waste producer health institute, second copy is taken by transporter institution/organization and the last copy is taken by operator of the disposal facility. Relevant personnel sign the document.</p> <p>It is obligatory that the all relevant parties provide this document when auditors request. The document are maintained at least one year and kept available for the authorities.</p> <p>Article 46. Sterilization of infectious waste: Sterilization can render Infectious wastes and sharps wastes harmless. Sterilization systems are constituted and operated by metropolitan municipalities, municipalities and the organizations/institutions delegated by the municipalities. Units shall not constitute and operate separate sterilization facilities.</p> <p>Article 52. Training: It is obligatory that personnel responsible for collection and transporting of the wastes within the units and operation of the temporary storage facility or container and the municipality personnel responsible for the transportation of the wastes from temporary storage facility to disposal area or cleaning and transportation companies' personnel in case of provision of these services by suppliers are regularly trained relevant to the rules in collection, carrying, temporary storage and transportation of the medical wastes and health risks generated from these wastes, measures to be taken in case of an accident (Training shall be documented/proved).</p> <p>In case of provision of the collection and transportation works via service procurement, training and documentation/certification requirement for the relevant personnel are added to the tender specifications.</p> <p>Procedures and principles are determined by the Ministry.</p> <p><i>Following units defined in Annex-1 of the Regulation are relevant/potentially relevant to the Project components.</i></p> <p><i>a) Health Care Institutions that Generate Medical Waste in Large Quantities</i></p> <p><i>2) General hospitals and clinics,</i></p> <p><i>3) Maternity hospitals and clinics,</i></p> <p><i>b) Health Care Institutions that Generate Medical Waste in Medium Quantities</i></p> <p><i>1) Health centers, medical centers, dispensaries,</i></p> <p><i>3) Morgues and autopsy centers,</i></p> <p><i>6) Medical and biomedical laboratories,</i></p> <p><i>9) Emergency room and first aid centers,</i></p> <p><i>11) Rehabilitation centers,</i></p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
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*c) Health Care Institutions that Generate Medical Waste in Small Quantities*

*4) Physical therapy centers,*

*8) Ambulance services,*

Annex-2 Classification of Waste Generated by Health Care Institutions

DOMESTIC QUALITY WASTE (20 03* and 15 01*)		MEDICAL WASTE (18 01* and 18 02*)			HAZARDOUS WASTE	RADIOLOGICAL WASTE
A: General Waste 20 03 01*	B: Packaging Waste 15 01 01* 15 01 02* 15 01 04* 15 01 05* 15 01 06* 15 01 07*	C: Infectious Waste 18 01 03* 18 02 02*	D: Pathological Waste 18 01 02*	E: Sharps Waste 18 01 01* 18 02 01*	F: Hazardous Waste 18 01 06* 18 01 08* 18 01 10* 18 02 05* 18 02 07*	G: Radiological Waste
Areas occupied by healthy persons, sections where healthy persons are examined, first aid areas, administrative units, cleaning services, waste originating from warehouse and ateliers:  All waste originating from health care institutions, except for those referred to under Groups B, C, D, E, F and G.	All administrative units, kitchen, and recoverable / reusable waste originating from ateliers etc.: paper cardboard carton plastic glass metal etc.	Waste requiring special procedures for transport and disposal in order to prevent spread of infectious agents: Primary sources; I. Waste from microbiology labs Culture and culture stocks Infectious body fluids Serological waste Other contaminated lab waste (micro slides, pipettes, petri dishes, etc.) II. Blood / blood products, objects contaminated with same III. Used surgery apparel (cloths, aprons, gloves, etc.) IV. Dialysis waste (waste fluid & equipment) V. Isolation / quarantine waste VI. Air filters containing bacteria / virus, VII. Infected corpse, organ parts, and blood of test animals, objects having come to contact with same	Anatomic waste tissue, organs and body parts, body fluids generated in course of surgery, medical attention, autopsy, etc.: Body parts, organic parts, placenta, severed members, etc (human pathological waste) Corpse of test animals used biological tests	Waste that could cause puncture, piercing, graze, or injuries: Injector needles, Other sharps containing needles Scalpels Micro slides Glass Pasteur pipettes Other broken glass, etc.	Waste requiring special processing due to physical or chemical properties or for legal reasons Hazardous chemicals Cytotoxic or Cytostatic drugs Amalgam waste Genotoxic cytotoxic waste Pharmaceutical waste Waste containing heavy metals Pressurized containers	Waste in this category shall be collected and disposed of in accordance with legislation related to Atomic Energy Institute of Turkey.

**Regulation on Wastes Generated from Radioactive Substances Use**  
(Official Gazette Date/Number: 02.09.2004/25571)

The purpose of this regulation is to determine disposal conditions of wastes generated from the use of radioactive materials. The regulation defines limits and conditions regarding the collection, storage and disposal of the wastes generated from usage of the radioisotopes with half-lives less than 100 days and C-14 and H-3 containing radioactive substances in medical, industrial and research fields.

Enclosed radioactive sources, radioisotopes with half-lives higher than 100 days, and wastes generated from nuclear fuel cycle are out of the scope of this regulation. Wastes generated after discharge of the patients from hospitals, who have been applied radioisotopes, are exempt from the provisions of this regulation.

The regulation sets out discharge limits for liquid wastes, solid wastes, gas emissions as well as the procedures that must be followed with respect to such wastes.

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<b>Radioactive Waste Management Regulation</b> (Official Gazette Date/Number: 09.03.2013/28582)	<p>The purpose of this regulation is to set out procedures and principles regarding safe management of the radioactive wastes generated from use of the nuclear energy and ionized radiation sources, considering safety of employees, society, environment and next generations. The regulation is applicable to activities and facilities relevant to radioactive waste management.</p>	
<b>Hazardous Waste Control Regulation</b> (Official Gazette Date/Number: 14.03.2005/25755; last amended on 30.10.2010)	<p>The regulation lays down the principles and procedures for production, collection, temporary storage, transportation, exportation, recycling and disposal of hazardous wastes. The Regulation also provides design criteria and standards for hazardous waste management, and hazardous waste storage and treatment facilities.</p> <p>Article 9. Liabilities of Waste Generators: (i) Take precautions to minimize waste generation (ii) Ensure the waste management with the provisions of this Regulation to minimize the harmful effects of wastes on human health and the environment. Hazardous waste producers shall prepare a three-year Waste Management Plan and receive approval from the Provincial Environmental Directorate (iii) Obtain a permit from Provincial Environmental Directorate for temporary onsite storage of wastes above 1,000 kg/month at their facilities in accordance with the provisions of this Regulation, provided that wastes are transferred to licensed facilities every six months and subject to audit every six months (iv) Keep records of the wastes generated; perform appropriate packing and labeling as required by the recycling or disposal facility holding an environment license, in line with international standards (v) Authenticate the non-hazardousness of the wastes that are claimed to be not carrying the features specified in Annex-III B and marked as (M) in Annex-IV of the Regulation on General Principles of Waste Management through analysis performed by laboratories of institutions/entities that are authorized by the Ministry and/or internationally accredited entities (vi) Cover the expenses incurred for the determination of the characteristics of waste (vii) Fill in the waste declaration form every year until the end of the month of March of the following year using the web-based program of the Ministry, Facilities producing hazardous wastes are responsible for submitting annual hazardous waste declaration forms to the relevant Provincial Environmental Directorate for the preceding year by the end of March through the web based system of MEUP, indicating the amount of hazardous wastes produced at their site (printing out and keeping the copy of it for 5 years) (viii) In the case of undertaking waste storage and disposal out of the facility, fill the transportation form with the information given in (Annex-9 A-B) and comply with the required procedure (ix) Comply with the existing international standards regarding waste transportation (x) Send the hauler to another facility or ensure that the waste is returned and provide its disposal if the waste disposal facility does not accept the waste (xi) Establish waste disposal facilities together with the municipalities or real and legal entities collectively to dispose the wastes within the direction of the principles specified in this Regulation and contribute to necessary expenses (xii) Dispose or have disposed the wastes in line with the principles specified in this Regulation using its own resources or at a licensed waste disposal facility by covering necessary expenses or at a waste disposal facility to be established collectively with municipalities or real and legal entities (xiii) Keep the wastes temporarily in containers which are secure, leakproof, safe and compliant with internationally accepted standards, and placed in a concrete area within the facility far from plants and buildings, to label the containers as hazardous waste, to state the quantity of storage material and date of storage on containers, to transfer wastes to another container having the same properties in the event of container damage, to ensure that the containers are always closed, to temporarily store the wastes in such a way as to prevent chemical reactions (xiv) A generator who generates up to 1000 kilograms of waste per month may temporarily store wastes on his land without a permit</p>	<p><b>Hazardous waste management plan</b></p> <p><b>Temporary storage area permit</b> (<i>if necessary</i>)</p> <p><b>Yearly hazardous waste notification to the MEUP (Waste Declaration Form)</b></p>

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	<p>from the governorship for a maximum period of 180 days, on the condition that the waste quantity does not exceed 6000 kilograms. In such case, to commission at least one person to take measures in conditions of danger and to notify this person's contact information to the governorship (xv) Make wastes harmless by taking necessary precautions through physical, chemical or biological processes prior to sending them to disposal facilities according to provisions specified in this Regulation, transport or provide appropriate transportation to disposal facilities that have environment license if any residual waste occurs (xvi) Take precautions for health and safety of workers who are responsible for collecting, transportation and temporary storage of wastes within the facility (xvii) Restore the incident place within a month and cover all the expenses in case of waste spilling by accident or deliberately or similar in order to prevent the environmental pollution (xviii) Notify the governor's office in case of waste spilling by accident or deliberately or similar, present a report containing information regarding the date of accident, the place of accident, the type and quantity of waste, the reason for the accident, the waste disposal method and the rehabilitation of accident location to the governor's office (xix) At the stage of obtaining construction and operating licenses for their activities, provide documentation for disposal of hazardous wastes in accordance with the provisions specified in this Regulation.</p>	
<p><b>Communiqué on Recycling of Certain Non-hazardous Wastes</b> (Official Gazette Date/Number: 17.06.2011/27967)</p>	<p>This Communiqué regulates minimization, collection, separation, temporary storage, recycling, and reuse of the certain non-hazardous wastes, constitution of recycling facilities etc. The Communiqué covers certain non-hazardous wastes listed in Annex-4 of Regulation on General Principles of Waste Management. Non-hazardous wastes listed in Annex-2 of this communiqué are out of scope.</p> <p>Pursuant to Article 5 of the Regulation, recycling of non-hazardous wastes in unlicensed facilities is forbidden.</p> <p>Pursuant to Article 8, a 3-year Non-Hazardous Waste Management Plan shall be prepared and approval from the Provincial Environmental Directorate shall be received. As of 01.01.2015, annual non-hazardous waste declaration forms shall be submitted for the preceding year by the end of March, through the web-based system of MEUP and the records/prints maintained at least 5 years.</p> <p>According to the Article 10, non-hazardous waste can be temporary stored for maximum one year provided that all required measures are taken (drainage system, screen, collection systems etc.).</p>	<p><b>Non-hazardous waste management plan</b></p> <p><b>Non-hazardous Waste Declaration Form (as of 01.01.2015)</b></p>
<p><b>Waste Oil Control Regulation</b> (Official Gazette Date/Number: 30.07.2008/26952; last amended on 30.03.2010)</p>	<p>The purpose of the Waste Oil Control Regulation is to provide standards for storage, transportation and disposal of waste oils and to prevent their discharge into the receiving environment. Under the regulation, waste oils are categorized into three categories and can be managed as defined below:</p> <ul style="list-style-type: none"> <li>• The generation of Category I waste oils must be minimized and Category I waste oils must be disposed of by recycling (refining or regeneration) at oil recovery facilities holding a license from the MoEU.</li> <li>• Category II waste oils must be disposed of by use as a secondary fuel in facilities holding a license from the MoEU.</li> <li>• Category III waste oils are not appropriate for refining and regeneration, and pose a risk to human health and environmental features if used as fuel, and therefore must be returned to harmless products by incineration in hazardous waste incineration facilities.</li> </ul> <p>Article 9 - Waste oil producers are liable to take all the necessary measures to minimize waste oil generation, to analyze waste</p>	<p><b>Annual waste oil declaration to the MEUP (Waste Oil Declaration Form)</b></p>

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	<p>oils (or have them analyzed) and temporarily store them separately depending on their categories, not to mix different category waste oils or with PCBs and any other hazardous wastes, to have waste oils transferred to disposal facilities that hold an environmental license by licensed transporters, to keep records in line with article 26 of the regulation and to fill the waste oil declaration form given in Annex 2 and send it to the MoEU by the end of February of the succeeding year.</p> <p>Pursuant to article 22 of the Regulation; wastes that are not appropriate for recycling, Category III wastes that need to be disposed of in hazardous waste incineration facilities, hazardous wastes that are generated in recovery operations and materials contaminated with these wastes, and bottom sludges of waste oil storage tanks must be disposed of in facilities that hold an environmental license.</p>	
<p><b>Solid Waste Control Regulation</b> (Official Gazette Date/Number: 14.03.1991/20814; last amended on 26.03.2010)</p>	<p>The Solid Waste Control Regulation lays down the principles and procedures for production, collection, temporary storage, recycling, and disposal of solid wastes. The regulation provides information on landfilling, composting and incineration of solid wastes.</p> <p>Household wastes, organic wastes from green areas, large-volume solid wastes, non-hazardous industrial and commercial wastes having nature of household wastes and wastewater treatment plant sludge (not falling in hazardous waste class) are regarded as solid wastes. It is forbidden to dump solid wastes into seas, lakes and similar receiving media and in streets, forests and places that may cause adverse effects on the environment. Solid wastes shall be kept in closed containers and disposed of in licensed disposal facilities. Producers of solid wastes are liable not to mix any hazardous wastes into the solid wastes and must participate in works related to recovery of solid wastes.</p>	
<p><b>Packaging Waste Control Regulation</b> (Official Gazette Date/Number: 24.07.2007/26562; last amended on 24.08.2011)</p>	<p>The regulation governs collection, recycling, and disposal of packaging waste.</p> <p>Producers of packaging wastes are liable to collect packaging waste separately at their source and give the packaging waste free of charge to the municipal system. It is forbidden to dispose of packaging wastes, directly or indirectly, by discharging them into receiving bodies and storing them in landfills.</p>	
<p><b>Regulation on Control of Waste Batteries and Accumulators</b> (Official Gazette Date/Number: 31.08.2004/25569; last amended on 30.03.2010)</p>	<p>The purpose of the regulation is to control the disposal of batteries and accumulators. The regulation defines the labeling and marking, reducing the amount of hazardous materials in manufacturing process and collection, transportation and disposal of waste batteries separate from other domestic wastes.</p> <p>The facilities are required to dispose of the batteries and accumulators in accordance with certified collectors and disposal facilities.</p>	
<p><b>Regulation on Control of End of Life Tires</b> (Official Gazette Date/Number: 31.08.2004/25569; last</p>	<p>Article 5. The principles related to end-of-life tire management include the following;</p> <p>(i) End-of-life tire producer, after replacing the vehicle tires, shall deliver the tires to an authorized hauler or the tire distribution and sale companies (ii) End-of-life tires shall be delivered to the authorized haulers free of charge. Unauthorized institutions or individuals are prohibited from transportation.</p>	

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amended on 30.03.2010)		
<b>Regulation on Control of Waste Vegetable Oils</b>  (Official Gazette Date/Number: 19.04.2005/25791;last amended on 30.03.2010)	Regulates storage of waste vegetable oils and their transfer to waste oil recycling facilities by licensed haulers.	
<b>ENVIRONMENTAL NOISE</b>		
<b>Regulation on the Assessment and Management of Environmental Noise</b>  (Official Gazette Date/ Number: 04.06.2010/27601; last amended on 27.04.2011)	<p>The regulation establishes standards for acceptable levels of noise and vibration during the day and at night in different environments (residential, commercial, industrial, etc), limits on increases in noise levels and standards for construction sites. The regulation also covers principles and criteria for buildings exposed to vibration.</p> <p>Environmental noise levels from activities at construction sites shall not exceed the limits given in Table 5 of Annex-7. Construction activities that are inside or close to residential areas shall not be carried out in evening and night times. For projects that are identified as public benefit including urban main roads, construction activities that would interrupt traffic during the daytime can be carried out in the evening and at night provided that (i) the limit values of 5dB(A) below the daytime limits are met in the evening and 10 dB(A) below at night (ii) a permit is obtained from the relevant authority taking into account the opinion of the Provincial Directorate of Environment and Urbanization.</p> <p>Vibration levels at very sensitive and sensitive areas, which will be created by activities such as driving piles during construction and by heavy construction machines, shall not exceed the levels given in Table 7 of Annex 7.</p> <p>Facilities listed in Annex-1/ Annex-2 of the "Regulation on Permits and Licenses to be obtained pursuant to the Environmental Law" which are subject to an integrated Environmental Permit, with the exception of those indicated with * are required to prepare an Acoustic Report for noise evaluation pursuant to this regulation.</p> <p><i>Noise and vibration limits are given in Table 5 of this Annex.</i></p>	<p><b>Acoustic Report</b> (if requested by relevant authority)</p> <p><b>Environmental noise level assessment report</b> (if requested by relevant authority)</p> <p><b>Noise permit</b> (within the scope of the "Environmental Permit") - may be required for trigeneration plant and/or concrete plant</p>
<b>CHEMICAL CONTROL</b>		
<b>Regulation on Road Transportation of Hazardous Materials</b> (by Ministry of Transport, Maritime and Communication)  (Official Gazette Date/Number: 24.10.2013/28801)	<p>The regulation defines the transportation conditions for hazardous materials (packaging and signing of hazardous materials, vehicle properties etc.) by road and responsibilities, rights, provisions and working conditions of the senders, receivers, loaders, unloaders, packaging parties, transporters and drivers. This regulation is prepared in accordance with the provisions of the European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR).</p> <p>Under the regulation, entities that transport hazardous materials are required to hold one of the authority certificates C1, C2, K1, K2, L1, L2, R1, R2.</p>	<p><b>Transportation Authority Certificate</b> (relevant hauler should hold this permit)</p>

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<p><b>Regulation on Chemical Inventory and Control</b> (Official Gazette date/number: 26.12.2008/27092; last amended on 23.05.2010)</p>	<p>Provides guidelines for chemical inventory to be registered and submitted to the MEUP for chemicals that are imported, produced or exported from site operations.</p> <p>The chemicals produced or imported more than 1 ton and above in a year shall be registered to the MEUP.</p> <p>The chemicals listed under Annex-1 of the regulation are excluded from the registration provisions.</p>	
<p><b>Regulation on Ozone Layer Depleting Substances</b> (Official Gazette Date/Number: 12.11.2008/27052; last amended on 12.11.2008)</p>	<p>Provides guidelines on decreasing the use of ozone layer depleting substances in line with the Montreal Protocol. Pursuant to article 14, the use of any substances listed in Article 5 of the regulation is prohibited, with the exception of laboratory and obligatory uses.</p> <p>Article 17 (Leakage control) requires that the controlled substances contained in refrigeration, air-conditioning, heat pump equipment, equipment containing solvents or fire protection systems and fire extinguishers shall be recovered by the end user for recycling or reclamation, during the maintenance of equipment or before the dismantling or disposal of equipment.</p> <p>According to article 18 (Periodic Control of Fixed Equipment), as of 1/1/2012, it is required by the end-user to annually conduct and document inspections of fixed equipment containing more than 3 kg of controlled substances.</p> <p>Periodic control of air-conditioning and cooling equipment to be used by the project and if necessary, recovery and proper handling of refrigerants during dismantling of equipment.</p>	
<b>NATURE CONSERVATION and BIODIVERSITY</b>		
<p><b>Forest Law No. 6831</b> (Official Gazette Date and Number: 08.09.1956/9402)</p>	<p>Regulates the protection of forests. In accordance with article 17 of the Law, forest areas can be used by real persons and legal entities for installations which are for the public benefit after obtaining a permit from Ministry of Forestry and Water Works, and the period of the permit cannot exceed 49 years.</p>	
<p><b>Regulation Concerning Principles and Procedures for Exploitation of Trees and Shrubs in Areas not Regarded as Forests</b> (Official Gazette Date/Number: 03.08.2013/28373)</p>	<p>Defines the principles for exploitation of trees by owners in areas not regarded as forests under the Forestry Law No. 6831.</p> <p>Pursuant to article 4, those who wish to remove trees located in areas not regarded as forests per Article 1 of the Law on Forests No. 6831, should make an application to the Forestry Administration indicating address, location, surface area, feature and adjacent neighbours of the immovable asset and numbers and species of the trees and shrubs within the asset, purpose of the removal, and the information whether this asset is previously subject to the removal permission or not.</p> <p>Article 9 of the regulation specifies limitations and exemptions based on certain issues such as species and locations of the trees.</p>	<b>Permit for removal of trees</b>
<b>CULTURAL HERITAGE</b>		
<p><b>Law on Preservation of the Cultural and Natural Assets No. 2863</b></p>	<p>The law defines the movable and immovable cultural and natural assets to be protected, arranges the related actions to be taken, determines the establishment and duties of the organization that will take implementation decisions.</p>	<b>Contact museum directorate in case of a chance find during</b>

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(Official Gazette Date/Number: 23.07.1983/18113; last amended on 11.10.2013)	<p>Article 3. Definitions:</p> <p><b>Cultural Assets:</b> All movable and immovable assets on the surface, underground or underwater regarding science, culture, religion and fine arts that belong to prehistoric and historic area or which have scientific or cultural genuine qualifications that belong to prehistoric and historic areas.</p> <p><b>Natural Assets:</b> Valuables from geological, prehistoric and historic era, on surface, underground or under water, of which the preservation is essential due to their unique features and beauty.</p> <p>Article 4 defines the Notification Liability: Any individual who finds movable or immovable cultural and natural assets, who are aware of, or acknowledge that cultural and natural assets exist within their land they own or utilize should notify, at the latest within three days, the nearest museum management or mukhtars in villages or public officials in other locations.</p>	<b>construction</b>
<b>ENERGY CONSUMPTION</b>		
<p><b>Regulation on Increasing Efficiency in the Use of Energy Sources and Energy</b></p> <p>(Official Gazette Date/Number: 27.10.2011/28097)</p>	<p>The purpose of this regulation is to regulate procedures and principles regarding increasing efficiency in the use of energy and energy sources, in order to ensure effective use of energy, to prevent waste of energy, to decrease energy costs and protect the environment.</p> <p>TEP: Tons equivalent petroleum</p> <p>According to the regulation, industrial facilities which annually consume 1000 TEP of energy and above employ a certified employee as energy manager. Commercial and service buildings which occupy a construction area of 20,000 m<sup>2</sup> and above or annually consume 500 TEP of energy and above and public sector buildings which occupy a construction area of 10,000 m<sup>2</sup> or annually consume 250 TEP of energy and above employ a certificated employee as energy manager. In such cases that it is not possible to employ an energy manager among the employees, this service is supplied from external energy managers or companies.</p> <p>Pursuant to Article 9 of the regulation; total annual energy consumption is calculated using coefficients provided in Annex-2. The General Directorate of Electric Power Affairs and Study Administration identifies the facilities/buildings to apply energy management, to employ energy manager or to establish energy management unit based on the annual average energy consumption of last three years. Energy consumptions and energy management practices shall be declared to the General Directorate each year until the end of the March.</p>	<b>Energy Manager or Energy Management Unit (if required)</b>
<p><b>Regulation on Energy Efficiency in Buildings</b></p> <p>(Official Gazette Date/Number: 05.12.2008/27075; last amended on 20.04.2011)</p>	<p>Pursuant to this regulation, Energy Performance Certificates must be obtained for buildings constructed in municipal areas with over 1000 m<sup>2</sup> total construction area.</p> <p>Article 2 - The following are out of the scope of this regulation: Buildings with utilization area less than 50 m<sup>2</sup>, industrial buildings built for production purposes, temporary buildings (less than 2 years) and other buildings which do not require heating/cooling (such as warehouses).</p>	<b>Energy Performance Certificate</b>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<b>OCCUPATIONAL and COMMUNITY HEALTH &amp; SAFETY</b>		
<p><b>Labor Law No. 4857</b> (Official Gazette Date/Number: 10.6.2003/25134; last amended on 03.05.2013)</p>	<p>The purpose of this law is to regulate the working conditions and work-related rights and obligations of employers and employees working under an employment contract.</p> <p>Article 3. Declaring the establishment: The employer who sets up or takes over an establishment covered by this Act, who completely or partly changes the nature of his business, or who permanently closes down an establishment due to the completion of work or for any other reason must, within one month, notify the Regional Directorate of Labour of the name and surname or trade mark and address as well as the names, surnames and addresses of employer representatives, if there are any.</p> <p>Article 10. Employment which, owing to its nature, lasts only up to 30 days is transient; and employment which requires a longer period is continuous.</p> <p>Article 63. In general terms, working duration is at most forty-five hours a week.</p> <p>Article 69. Night hours and night work: Night work for employees must not exceed seven and a half hours.</p> <p>Article 73. Children and young employees under the age of eighteen must not be employed in industrial work during the night.</p>	<p><b>Workplace notification</b></p>
<p><b>Occupational Health and Safety Law</b> (Official Gazette Date/Number: 30.06.2012/28339; Last amended on 03.05.2013)</p>	<p>The purpose of this Law is to regulate the employer and the employees' duties, powers, responsibilities, rights and obligations to provide the occupational health and safety at work and improve the current health and safety conditions.</p> <p>Pursuant to Article 2, this law shall be applied on all public and private sector jobs and businesses, all workers including the employers with employer representatives of these businesses, apprentices and trainees regardless of the fields of activity.</p> <p>According to Article 4, the employer is obliged to provide work related health and safety. The employer's obligations are; (i) Prevention of occupational risks, taking all necessary measures including education and providing information, making organization, providing the necessary tools and equipments, adapting the health and safety measures into the changing conditions and making efforts to improve the current situation (ii) Monitoring and inspecting the occupational health and safety measures in the workplace and help to recover incompatibilities (iii) Performing the risk assessment or getting performed (iv) Considering the employee's eligibility in terms of health and safety while tasking (v) Taking necessary measures to prevent workers to enter in the vital and special danger areas other than the workers who have adequate information and instruction.</p> <p>Article 6 states the employer's responsibilities on providing occupational health and safety services(occupational health and safety expert, onsite doctor etc.) to prevent occupational risks and the works to protect against these risks</p> <p>Pursuant to Article 8, Health and Safety experts shall have at least (A) class certificate for very dangerous works, (B) class certificate for dangerous works and (C) class certificate for low dangerous works. If full time on-site doctor and health and safety expert are required to be employed, employer establishes an onsite health and safety unit.</p> <p>Pursuant to Article 10, employer shall conduct a risk assessment.</p> <p>Pursuant to Article 11, emergency action plans are prepared, emergency teams are established and emergency practices are conducted.</p>	<p><b>Onsite doctor</b></p> <p><b>Health and Safety specialist</b></p> <p><b>Health and Safety Unit (if required)</b></p> <p><b>Risk Assessment</b></p> <p><b>Emergency Action Plan</b></p> <p><b>Safety Report (for higher level establishments)</b></p> <p><b>Major incident prevention policy (for lower level establishments)</b></p>

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	<p>Article 14. The employer keeps records of all work related accidents, makes the necessary inspections and prepares related reports. Notifies occupational accidents, occupational diseases to the Social Security Institution within three days after being reported by the occupational physician and health service providers.</p> <p>Pursuant to Article 15, employer shall medically check employees before they start working, in case of any work change, etc.</p> <p>Article 17. The employer is obligated to provide occupational health and safety training to the workers. This training shall be given especially before starting the work, after workplace or job changings, work equipment changings or application of any new technology. The training shall be repeated in accordance with changings and emerging risks and when necessary shall be renewed by regular intervals.</p> <p>Article 20. Employer delegates one or more employee representatives (if he/she cannot be determined by election of other workers) considering the total numbers of the workers.</p> <p>Article 22 states that occupational health and safety board is required to be established for the workplaces having 50 and more worker and active along six months and more.</p> <p>Article 25 states the issues related to situations that require the work to be suspended.</p> <p>Article 26 lays down the penalties to be applied in case of non fulfillment of employer's obligations.</p> <p>Pursuant to Article 29, for the workplaces which may cause major industrial accidents, employers prepare a major incident prevention policy or safety report.</p>	
<p><b>Occupational Health and Safety Risk Assessment Regulation</b> (Official Gazette Date/Number: 29.12.2012/28512; Last amended on 29.01.2012)</p>	<p>The purpose of this regulation is to determine the procedures and principles of the risk assessment in terms of occupational health and safety.</p> <p>Article 5. The employer performs the risk assessment for the purpose of providing, maintaining and developing health and safety of work environment and the workers. Performing risk assessment shall not eliminate the employer's obligation to ensure the occupational health and safety at work.</p> <p>Article 10 lays down steps that shall be applied for risk control; (i) Planning (ii) Deciding on risk control measures (iii) Implementation of risk control measures (iv) Monitoring applications.</p> <p>Pursuant to Article 11, risk assessment is required to be documented.</p> <p>Article 12. Performed risk assessments shall be renewed regularly according to the hazard class; every two years for very dangerous workplaces, every four years for dangerous workplaces, every six years for less dangerous workplaces. Apart from this, under certain conditions (process changes, accidents etc.) risk assessment shall be updated or renewed.</p>	<p><b>Risk assessment</b></p>
<p><b>Regulation on the Provisions of Occupational Health and Safety Training of Employees</b> (Official Gazette Date/Number:</p>	<p>The regulation sets the principles for health and safety trainings to be given at workplaces to employees by the employers. This regulation is applicable to those workplaces that are within the scope of Occupational Health and Safety Law.</p> <p>Article 5. Liabilities of the Employer: Employers are responsible for (i) informing workers on their legal rights and responsibilities, (ii) preparing occupational health and safety training programs on the occupational risks they are faced and the necessary</p>	<p><b>Employee training</b></p>

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15.05.2013/28648)	<p>precautions that need to be taken, (iii) organization of the trainings, (iv) ensuring the participation of employees to these trainings. Employers are responsible for providing the necessary training to employees regardless of the type of employment contract.</p> <p>Article 6. Employer shall provide occupational health and safety trainings for employees. Trainings shall include subjects defined in Annex-I.</p> <p>Article 10. Development of Training Programs: A yearly training program is developed including information on the purpose, topic, duration and date of the trainings, the names and titles of the trainers, the number of the participants.</p> <p>Article 11. Training Durations and Topics: Workers are trained before they start work and at determined periods during the work. Durations of the trainings for each worker are minimum eight hours for low dangerous works, twelve hours for dangerous works, and sixteen hours for very dangerous works. Topics of trainings are given in Annex-1.</p> <p>Pursuant to Article 13, occupational health and safety specialist and on-site doctor assigned in workplaces, other authorized institutions and organizations and common health and safety units can provide occupational health and safety trainings.</p> <p>Article 15. The trainings are recorded and kept in the workers' personal files.</p>	
<p><b>Occupational Health and Safety Services Regulation</b> (Official Gazette Date/Number: 29.12.2012/28512; last amended on 31.01.2013)</p>	<p>The purpose of this regulation is to regulate the principles related to the establishment of “workplace health and safety units” and certification of “common health and safety units”, and set out the duties and responsibilities of these units.</p> <p>This regulation is applicable to those workplaces that are within the scope of the Occupational Health and Safety Law.</p> <p>Pursuant to Article 5 of the regulation, The employer appoints one or more on-site doctor, occupational health and safety specialist and other health care personnels among the workers who meet the qualifications set out in this Regulation in order to determine and monitor the implementation of the occupational health and safety measures to be taken at workplace, prevention of occupational accidents and occupational diseases and in order to ensure the first aid and emergency treatment of the workers with protective health and safety services. The employer is responsible (i) to assign one or more than one workplace doctor, occupational health and safety specialist and other health personnel. This service can be externally supplied from Common Health and Safety Units (CHSU) in case of absence of qualified personnel in the workplace (ii) to establish a Workplace Occupational Health and Safety Unit (WHSU) for the workplaces in which full time on-site doctor and occupational health and safety specialist are required. For the workplaces in which full time doctor is employed, other health personnel is not obligatory (iii) The employer is responsible that the workplace doctor, the occupational health and safety specialist, and the units from which services are obtained have valid authorization certificates in accordance with the Occupational Health and Safety Law.</p> <p>Pursuant to Article 7, employer maintains (i) any records relevant to health and safety activities (ii) personal health files at least 15 years after release date (iii) each page of the “approved notebook” is approved by relevant Provincial Directorate of Labor and Employment Agency, General Directorate of Occupational Health and Safety or notaries (<i>Approved notebook is a unique notebook for each workplace which is used by on-site doctor and occupational health and safety specialist to note detections, advices and other required issues</i>). Approved notebook is required to be submitted to relevant authorities whenever it is requested.</p>	<p><b>Occupational health and safety specialist</b></p> <p><b>On-site doctor and other health personnel</b></p> <p><b>Workplace occupational health and safety unit</b></p> <p><b>Supply an approved Notebook</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>Pursuant to Article 10, WHSU is composed of at least one on-site doctor and one occupational health and safety specialist who is appropriate for the hazard class of the workplaces. Any other health personnel can be employed at this unit.</p> <p>Article 10 and Article 11 state requirements and relevant conditions to be provided in workplaces (Annex-1 states minimum first aid equipment requirements) in case of establishment of a WHSU, or employment of on-site doctor and occupational health and safety specialist or obtaining service from CHSU. First aid and emergency response room; instruments listed in Annex-1 and transportation vehicle are not stipulated to be made available in WHSUs that are agreed with health care provider by The Ministry of Health.</p>	
<p><b>Communiqué on Danger Class Lists Related to Occupational Health and Safety</b> (Official Gazette Date/Number: 26.12.2012/28509; Last amended on 29.03.2013)</p>	<p>The communiqué classifies the works in three categories including less dangerous works, dangerous works and very dangerous works (Annex-1).</p> <p><i>According to Annex-1 of the regulation danger class of the Project components are classified as below:</i></p> <p><i>23.63.01- Concrete production: "Dangerous"</i></p> <p><i>35.11.19-Energy generation: "Very dangerous"</i></p> <p><i>41.20.01-Construction of non-residential buildings (school, hotel, hospital, shopping mall etc.): "Very dangerous"</i></p> <p><i>86.10.04-Hospital services given by public bodies intended to provide human health and require special expertise (gynecology, oncology, psychiatric hospitals ect.): "Very dangerous".</i></p>	
<p><b>Regulation on Duties, Authority, Responsibilities and Trainings of Occupational Health and Safety Specialists</b> (Official Gazette Date/Number: 29.12.2012/28512; last amended on 31.01.2013)</p>	<p>The purpose of this regulation is to set out the principles related to the qualifications, trainings, certification, duties, authority and responsibilities of the occupational safety specialists.</p> <p>This regulation is applicable to those workplaces and educational institutions that are within the scope of Occupational Health and Safety Law.</p> <p>Pursuant to article 5, employer shall appoint at least one employee as the occupational safety specialist by taking into consideration of certificate class that is appropriate to the danger class of the workplace. In case of absence of qualified employee, employer obtains this service from common occupational health and safety units. Occupational safety specialist employment shall not affect employer's responsibilities.</p> <p>Pursuant to article 6, in case of full time employment of workplace doctor and health and safety specialist, employer establishes workplace health and safety unit.</p> <p>Article 7. An occupational safety specialist shall have a valid occupational safety specialist certificate. Occupational safety specialists who have (i) C class certificate can work in low dangerous works, (ii) B class certificate can work in low dangerous and dangerous works, and (iii) A class certificate can work in workplaces with all danger class.</p> <p>Pursuant to Article 12, the working duration of the occupational safety specialists at workplaces under:</p> <p>Low dangerous class and having less than 10 workers: At least 60 minutes per worker in a year</p> <p>Low dangerous class: At least 6 minutes per worker in a month</p>	<p><b>Occupational health and safety specialist</b> (<i>working duration is determined considering the specification of the project components such as numbers of workers, danger class etc.</i>)</p>

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	<p>Dangerous class: At least 8 minutes per worker in a month            Very dangerous class: At least 12 minutes per worker in a month            Low dangerous class and having 2000 and more workers: One full time specialist per 2000 workers. If the numbers of the workers are greater than the multiple of 2000, additional numbers of occupational health and safety specialists are appointed considering the remaining number of workers.            Dangerous class and having 1500 and more workers: One full time specialist per 1500 workers. If the numbers of the workers are greater than the multiple of 1500, additional numbers of occupational health and safety specialists are appointed considering the remaining number of workers.            Very dangerous class and having 1000 and more workers: One full time specialist per 1000 workers. If the numbers of the workers are greater than the multiple of 1000, additional numbers of occupational health and safety specialists are appointed considering the remaining number of workers.</p> <p><i>According to the Communiqué on Danger Class Lists Related to Occupational Health and Safety concrete production is classified as dangerous, energy generation, construction of non-residential buildings (school, hotel, hospital, shopping mall etc.) and hospital services given by public bodies intended to provide human health and require special expertise (gynecology, oncology, psychiatric hospitals ect.) are classified as very dangerous (see above).</i></p>	
<p><b>Communiqué on Occupational Health and Safety Specialists (Class C) that can be Employed in Very Dangerous Works</b>  (Official Gazette Date/Number: 14.06.2013/28677)</p>	<p>This Communiqué regulates procedures and principles on Occupational Health and Safety Specialists employed in sectors defined in Occupational Health and Safety Law.</p> <p>According to Article 5, Occupational Health and Safety Specialists (Class C) with 3 years of experience, can work in sectors defined in Annex-1.</p>	
<p><b>Regulation on the Occupational Health and Safety Boards</b>  (Official Gazette Date/Number: 18.01.2013/28532)</p>	<p>The regulation determines workplaces in which health and safety boards are to be established, and the working methods and the tasks, authorities, working procedures and principles of these boards.</p> <p>The employer is liable to establish an occupational health and safety committee at workplaces where (i) works regarded as industrial is carried out, (ii) with minimum 50 workers that work permanently, and (iii) with permanent jobs that last more than 6 months.</p>	<p><b>Occupational Health and Safety Board</b></p>
<p><b>Regulation on the Health and Safety Measures to be taken in Workplace Buildings and Additions</b>  (Official Gazette</p>	<p>The purpose of this regulation is to determine minimum health and safety conditions in the workplace buildings and additions. The regulation covers all workplaces within the scope of the Occupational Health and Safety Law.</p> <p>Pursuant to Article 5, employers are obliged to apply minimum conditions stated in Annex-1 of the regulation.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
Date/Number: 17.07.2013/28710)		
<b>Regulation on Health and Safety at Construction Sites</b> (Official Gazette Date/Number: 05.10.2013/28786)	<p>The purpose of this regulation is to determine the minimum health and safety requirements to be taken in construction works.</p> <p>Article 4. Definitions Project responsible: Natural or legal entity assigned by employer and responsible to preparation, application and control of the application on behalf of the employer. Health and safety coordinator: Natural or legal entity given responsibility by employer or project responsible in preparation or application of the project and working on the health and safety assignments stated in articles 10 and 11 of this regulation. Article 5 of the regulation sets the general obligations of the employer regarding the works (i.e waste management, sub-contractor relations, material use and transport, health and safety rules in the construction areas, personal protective equipment use) in construction areas. Article 6. Project responsible and obligations of employers: Employers can assign one or more project responsible to fulfill provisions stated in this regulation instead of them. Article 8. Employment of health and safety coordinators, health and safety plan and declaration: (i) In cases where there is more than one employer or subcontractor at a construction area, the employer or the person responsible for the project must assign one or more coordinators for health and safety issues (ii) The employer or the responsible person must prepare a health and safety plan prior to commencement of construction works (iv) In cases defined below, the employer or the responsible person is liable to declare the information defined in Annex III, to the relevant Regional Directorate of the Ministry of Labor and Social Security: If the construction works will last more than 30 days and there will be more than 20 permanent workers, If the size of the work requires more than 500 daily paid workers. A signboard presenting the declared information must be placed in an appropriate location on the construction site and the information must be updated when required. Article 10 and 11 states duties of the coordinators in site preparation and construction phases, respectively. Pursuant to article 12, workers will be informed on health and safety measures taken at the construction area. Annex-IV of the regulation defines the necessary measures for health and safety at the construction site by taking into account the minimum requirements.</p>	<p><b>Health and Safety Coordinator</b> <i>(if required)</i></p> <p><b>Health and Safety Plan Signboard</b> <i>(if required)</i></p>
<b>Regulation on the Tasks, Authority, Responsibility and Education of On-Site Doctor and Other Health Personnel</b>	<p>The purpose of this regulation is to set out the principles related to the qualifications, education, certification, duties, authority and responsibilities of the workplace doctors and also authorization of public health centers. Pursuant to Article 5 of the regulation, employer shall employ an on-site doctor considering dangerous class of the workplace and numbers of the workers.</p>	<p><b>On-site doctor</b></p>

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(Official Gazette Date/Number: 20.07.2013/28713)	<p>Pursuant to article 6, in case of full time employment of workplace doctor and health and safety specialist, employer establishes workplace health and safety unit.</p> <p>Article 7. An on-site doctor shall have a valid certificate.</p> <p>Pursuant to Article 12, the working duration of the on-site doctor at workplaces under:</p> <p>Low dangerous class and having less than 10 workers: At least 25 minutes per worker in a year</p> <p>For others:</p> <p>Low dangerous class: At least 4 minutes per worker in a month</p> <p>Dangerous class: At least 6 minutes per worker in a month</p> <p>Very dangerous class: At least 8 minutes per worker in a month</p> <p>Low dangerous class and having 2000 and more workers: One full time on-site doctor per 2000 workers. If the numbers of the workers are greater than the multiple of 2000, additional numbers of on-site doctors are appointed considering the remaining number of workers.</p> <p>Dangerous class and having 1500 and more workers: One full time on-site doctor per 1500 workers. If the numbers of the workers are greater than the multiple of 1500, additional numbers of on-site doctor are appointed considering the remaining number of workers.</p> <p>Very dangerous class and having 1000 and more workers: One full time specialist per 1000 workers. If the numbers of the workers are greater than the multiple of 1000, additional numbers of on-site doctor are appointed considering the remaining number of workers.</p> <p><i>According to the Communiqué on Danger Class Lists Related to Occupational Health and Safety, concrete production is classified as dangerous, energy generation, construction of non-residential buildings (school, hotel, hospital, shopping mall etc.) and hospital services given by public bodies intended to provide human health and require special expertise (gynecology, oncology, psychiatric hospitals etc.) are classified as very dangerous.</i></p>	
<p><b>Regulation on Health and Safety Requirements in the Use of Work Equipments</b></p> <p>(Official Gazette Date/Number:25.04.2013/28628)</p>	<p>The regulation sets out the minimum requirements to be met in terms of health and safety in the use of work equipments. All workplaces within the scope of the Occupational Health and Safety Law are covered by the regulation.</p> <p>Article 5. General Liabilities of the Employer: (i) The employer shall take all the necessary measures to ensure that work equipment is appropriate to the work to be done and this equipment does not endanger the health and safety of workers (ii) While selecting the work equipment, by considering the specific working conditions and hazards regarding health and safety of workers the employer shall mind that the equipment will not pose an additional hazard (iii) In cases where the work equipment is not free from danger, the employer shall take measures to reduce the risk to a minimum level.</p> <p>Article 6. The employer will ensure that the work equipments meet the minimum requirements defined in Annex 1 of the regulation and that they are at an appropriate safe level in accordance with the defined issues in Annex 2.</p> <p>Article 7. Control of the Work Equipment: In cases where the safety of the work equipment depends on its installation conditions, the equipment will be checked after its installation, before used for the first time and when its position is changed.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>Accordingly, a document will be prepared showing that the equipment is correctly installed and working safely. Periodical control of the equipment that may pose a hazard will be done by specialists. The results of the controls will be recorded and kept. The equipments to be controlled, control frequency and conditions, and the procedures and principles regarding the documents to be prepared as a result of these controls are given in Annex-3.</p> <p>Article 8 states that, work equipment having special risk shall only be used by assigned personnel and the repair, modification, control, maintenance, and commissioning shall only be made by specifically assigned people.</p> <p>Article 10. Informing Workers: The employer is responsible for informing the workers on work equipment and their use by giving them written instructions. Written instructions will consist of at least the following information: (i) the provisions of the use of work equipment, (2) the predictable abnormal conditions in the work equipment, (3) the results of the previous use experiences. Workers, even if they do not use the equipment, shall be informed about the hazards of the work equipment and hazards that arise upon modification of the work equipment. All the information and the written instructions shall be understandable by the relevant workers.</p> <p>Article 11. Training of the Workers: The workers who use the work equipment shall be trained on the risks that may be caused by the use of the work equipment and ways to avoid these risks. Workers who are responsible for repair, control and maintenance of work equipment shall be given an adequate special training.</p>	
<p><b>Regulation on Manual Handling</b> (Official Gazette Date/Number: 24.07.2013/28717)</p>	<p>The regulation sets principles to determine the necessary measures at works where manual handling is performed, to protect the workers from the risks particularly from back injuries.</p> <p>According to Article 5 of the regulation, the employer is responsible for the following: (i) to take appropriate organizational measures, or use the appropriate means, in particular mechanical equipment, in order to avoid the need for the manual handling of loads by workers and (ii) where the need for the manual handling of loads by workers cannot be avoided, to take the appropriate measures and use the appropriate means or provide workers with such means by taking into account the provisions set out in Annex 1 (risk factors related to loads), in order to reduce the risk involved in the manual handling of loads.</p> <p>Pursuant to Article 7, the employer is responsible to consider if the worker is appropriate for the work in terms of health and safety by considering Annex-2 (Individual Risk Factors).</p> <p>Pursuant to Article 8, the employer shall inform workers and/or their representatives of measures to be implemented with regard to the protection of health and safety. The employer shall ensure that workers and/or their representatives receive general indications and, where possible, precise information on (i) the weight of a load and (ii) the centre of gravity of the heaviest side of eccentric loads. The employer shall provide information and training to workers on how to handle loads correctly and the risks they might be open to if the loads are not handled correctly. According to Article 9, the employer shall take the opinions of the workers and/or their representatives on this regulation and the annexes, and ensure their participation.</p>	
<p><b>Regulation on Fire Protection of Buildings</b> (Official Gazette Date/Number:</p>	<p>The purpose of this regulation is to determine procedures and principles to protect any building, workplace, facility etc. against fire. Temporary or permanent, official of private construction activities and their additional facilities are treated under this regulation. Pursuant to “Regulation on Opening and Operation Licenses of Workplaces”, any company employing more than 30</p>	<p><b>Fire Safety Report</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
19.12.2007/26735; Last amended on 05.04.2012)	<p>employees is required to obtain a report which proves that the precautions taken against fire in the workplace are sufficient.</p> <p>Pursuant to the Article 11, buildings for the purpose of healthcare services (i.e. hospitals) are classified as “Corporate Buildings”.</p> <p>Pursuant to Article 14, energy generation plants are classified as “Industrial Buildings”</p> <p>Pursuant to Article 114 (Notification and permit obligation), notifications shall be made regarding explosive and flammable storage units. In case of exceeding quantities stated in the article and Annex-11, permits must be received from the Fire Authority.</p>	
<p><b>Regulation on the Emergency Cases in Workplaces</b> (Official Gazette Date/Number: 18.06.2013/28681)</p>	<p>The purpose of this regulation is to determine procedures and principles regarding the preparation of emergency response plans, prevention, protection, evacuation, fire fighting, first aid, employers to be assigned to these areas and similar issues.</p> <p>The regulation covers the workplaces within the scope of the Occupational Health and Safety Law.</p>	
<p><b>Regulation on the Use of Personal Protective Equipment in Workplaces</b> (Official Gazette Date/Number: 02.07.2013/28695)</p>	<p>The purpose of this regulation is to determine the principles regarding the properties, supply and use of personal protective equipments in cases when risks are not prevented or minimized sufficiently with collective protection based on technical measures or working methods. This regulation is applicable to those workplaces that are within the scope of Occupational Health and Safety Law.</p> <p>Article 8. The employer shall supply the necessary personal protective equipment defined in Appendix II to the workers when it is not possible to prevent or restrict risks by collective protection methods in works and relevant workplaces defined in Appendix III.</p> <p>Article 9. The employer shall inform the workers and/or their representatives on the necessary measures to be taken with respect to health and safety in the use of personal protective equipment.</p> <p>Article 10. The employer shall take the opinions of workers and/or their representatives and ensure their participation about the issues stated in this regulation.</p>	
<p><b>Regulation on Safety and Health Signs</b> (Official Gazette Date/Number: 11.09.2013/28762)</p>	<p>The regulation sets out the rules for the implementation of health and safety signs in workplaces.</p> <p>Article 5. The employer must supply and properly use the health and safety signs when risks can not be prevented or restricted by working methods, work organization and collective protective measures.</p> <p>Article 6. The employer shall inform workers and/or their representatives on health and safety signs and provide written instructions about the meaning of the signs and the required action of the sign.</p>	
<p><b>First Aid Regulation</b> (Official Gazette Date/Number: 22.05.2002/24762; Last amended on 04.04.2012)</p>	<p>The regulation sets forth the principles related to first-aid.</p> <p>Pursuant to article 16 of the regulation, one first-aider (holding a basic first aid certificate) per 10 employees should be present at the facilities that are considered as heavy and dangerous works and one first-aider (holding a basic first aid certificate) per 20 employees should be present at the all institutions and organizations. The first aider shall hold a certificate of “Basic First-Aid Training” that is taken by the authorized first-aid training body.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<p><b>Regulation on the Protection of the Workers against Risks Relevant to Noise</b> (Official Gazette Date/Number: 28.07.2013/28721)</p>	<p>The purpose of this regulation is to determine the necessary measures to protect the workers from health and safety risks, especially from risks associated with hearing due to exposure to noise.</p> <p>Article 5. Exposure limit values and exposure effective values for noise are set out. The personal exposure action values and limits are as follows;</p> <p>Min. exposure action values (LEX, 8h) = 80 dB(A) or (Ppeak) = 112 Pa [135 dB(C) re. 20 µPa] Max. exposure action values (LEX, 8h) = 85dB(A) or (Ppeak) = 140 Pa [137 dB(C) re. 20 µPa] Exposure limit values (LEX, 8h) = 87dB(A) or (Ppeak) = 200 Pa [140 dB(C) re. 20 µPa]</p> <p>Article 6 and Article 7. Exposure determination and risk assessment: The employer shall assess and, if necessary, measure the levels of noise to which workers are exposed.</p> <p>Article 8. Prevention and reducing exposure: Risks associated with the exposure to noise shall be prevented at source or reduced to a minimum level.</p> <p>Article 9. Personal protection: If the risks associated with noise can not be prevented, ear-protectors that exactly fit the worker will be given and these protectors will be used by the workers.</p> <p>Article 11. The employer is responsible for informing workers about these risks associated with noise and measures for their prevention, and training them on the appropriate use of ear protectors.</p> <p>Article 13. Medical Surveillance: Workers will be subject to medical surveillance when it is confirmed by the risk assessment that there is health risk.</p>	
<p><b>Regulation on the Protection of the Workers against Vibration Risks</b> (Official Gazette Date/Number: 22.08.2013/28743)</p>	<p>The purpose of this regulation is to determine the necessary measures to protect the workers from health and safety risks due to exposure to mechanical vibration.</p> <p>Article 5. Exposure limit values and exposure effective values for hand-arm and for whole body vibration are set.</p> <p>Article 6 and 7. Exposure Determination and Risk Assessment: The employer shall assess and, if necessary, measure the levels of mechanical vibrations to which workers are exposed. Risks associated with the exposure to mechanical vibration shall be prevented at source or reduced to a minimum level.</p> <p>Article 10. The employer is responsible for informing workers about these risks and measures for their prevention.</p> <p>Article 12. Workers will be subject to medical surveillance when it is confirmed by the risk assessment that there is health risk. To prevent the health problems due to exposure to mechanical vibration and for the purpose of early diagnosis, necessary protective measures will be taken by taking into account the medical surveillance results.</p>	
<p><b>Regulation on Working Duration Related to Labor Law</b> (Official Gazette Date/Number: 06.04.2004/25425)</p>	<p>Regulates the principles for the implementation of working duration.</p> <p>Article 4. The maximum working duration is 45 hours a week. The daily working duration cannot exceed 11 hours in any case</p> <p>Article 9. The employer should document the working durations of workers by appropriate means.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<b>Regulation on Excess Work and Work in Excess Periods</b>  (Official Gazette Date/Number: 06.04.2004/25425)	<p>The aim of this regulation is to set out the principles for works that are above the weekly working period set out in Labor Law. Excess work is defined as those works that exceed 45 hours per week.</p> <p>Work in excess periods is defined as those works that are lower than 45 hours per week according to a contract and when the work exceeds this working period set in the contract and becomes 45 hours per week.</p> <p>Pursuant to Article 4, the wage for each hour of the excess work is paid by increasing the hourly wage of normal working condition by 50%. The wage for each hour of the work in excess periods is paid by increasing the hourly wage of normal working condition by 25%.</p> <p>Pursuant to Article 5, the total time for excess work for a worker should not exceed 275 hours per year. In calculating the working periods for excess work and work in excess periods, periods that are less than half an hour is calculated as half an hour and periods that exceed half an hour are calculated as one hour.</p>	
<b>Regulation on Occupational Health and Safety in Temporary or Fixed Term Employment</b>  (Official Gazette Date/Number: 23.08.2013/28744 )	<p>The aim of this regulation is to ensure that workers with an employment relationship governed by a fixed-duration contract or on a temporary employment are afforded the same level of protection as that of other workers.</p> <p>This regulation is applicable to workers working under (i) an employment contract for a “fixed duration” that is made between the employer and the employee in written form, which has a specified term or which is based on objective conditions such as completion of a certain work and (ii) a temporary employment contract.</p> <p>Pursuant to Article 5, the employer shall provide protection to those workers specified above, the same conditions with regard to health and safety at work as other workers are afforded, and shall not treat the workers specified above differently particularly regarding access to personal protective equipment.</p> <p>According to Article 6, the employer shall provide information to workers specified above, beforehand of the work and any risks they may face. The information includes in particular occupational knowledge, skills and experience, medical surveillance required and additional specific risks that may arise due to the work.</p> <p>According to Article 7, the employer shall ensure that the workers receive sufficient training appropriate to the particular characteristics of their job, taking into account their qualification and experience.</p> <p>Pursuant to Article 8, the employer shall ensure that the workers are subject to special medical surveillance for works that are dangerous with regard to health and safety. The special medical surveillance specified above continues if required, after the employment contract ends.</p>	
<b>Regulation on Special Principles in Works Carried out by Employing Workers in Shifts</b>  (Official Gazette Date/Number: 07.04.2004/25426)	<p>Principles on work durations, night work, week holidays and breaks in works with shifts are set out in the regulation.</p> <p>Article 3. The employer is liable to announce the start and end time of each shift, the names and surnames of workers who are working in shifts, their breaks and week holidays in a way that is easily seen and readable by the workers.</p> <p>Article 4. Shifts are arranged in a manner that there are at least 3 shifts in duration of 24 hours.</p> <p>Article 12. The employer is liable to submit the list of night-shift workers as well as a copy of their health reports issued before starting work and those that are periodical, to the relevant regional directorate of labor.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<p><b>Regulation on the Minimum Wage</b> (Official Gazette Date/Number: 01.08. 2004/25540; last amended on 07.07.2012)</p>	<p>Establishes the purpose of the regulation, its scope, bases and definitions. According to the regulation a Commission under the authority of the Ministry of Labor and Social Security is entitled to determine the minimum wage most lately biennially. The minimum wage is defined for employees over 16 and under 16 According to the The Ministry of Labor and Social Insurance (<a href="http://www.csgeb.gov.tr/csgebPortal/cgm.portal?page=asgari">http://www.csgeb.gov.tr/csgebPortal/cgm.portal?page=asgari</a>), the gross minimum wage for the year 2014 is 1071 TL/month for the period between 01.01.2014-30.06.2014, respectively.</p>	
<p><b>Regulation on Suspension of Work in Workplaces</b> (Official Gazette Date/Number: 30.03.2013/28603)</p>	<p>Regulation specifies the conditions that may lead to the suspension of works in workplaces and procedures and principles on permission to resumption. This regulation is applicable to those workplaces that are within the scope of Occupational Health and Safety Law. Pursuant to Article 7, in case of life threatening situations, works shall be suspended until situation is avoided. Works shall be suspended if risk evaluation is not conducted in very dangerous work places like mines, metal, construction works, facilities that works with dangerous chemicals or likely to have major industrial accidents. Pursuant to Article 8, decision of suspension shall be put in force by local authority within 24 hours. Pursuant to Article 13, employer is obligated to pay wages of employees that can not work due to suspension of works or give any other job by considering their profession or conditions by paying pay same wage at least.</p>	
<p><b>Regulation on Health and Safety Measures in Works with Carcinogenic and Mutagenic Substances</b> (Official Gazette Date/Number: 06.08.2013/28730)</p>	<p>The regulation is to be applied to workplaces where the workers may be at risk to be exposed to carcinogenic and mutagenic substances. Article 5: Risk assessment will be conducted in work places with Carcinogenic and Mutagenic Substances based on the form, exposure amount and duration. Appropriate mitigation measures will be taken.</p>	
<p><b>Regulation on Health and Safety Measures in Works with Chemical Substances</b> (Official Gazette Date/Number: 12.08.2013/28733)</p>	<p>The aim of the regulation is to lay down minimum requirements to protect the health of workers from the dangers and adverse affects of chemical substances that are present, used or processes at workplaces, and to create a safe working environment. This regulation is applicable to all workplaces that are within the scope of Occupational Health and Safety Law. Pursuant to Article 5, the employer shall take all measures in works with chemical substances to prevent workers from exposure to chemical substances, and if this is not possible to minimize the exposure and to protect the workers from the dangers of chemical substances. According to Article 6, the employer shall determine whether there are dangerous chemical substances at the workplace and if there are, shall undertake a risk assessment to determine negative impacts with regard to the health and safety of the workers. It is not allowed to work with chemical substances without undertaking a risk assessment and without taking the measures specified in this regulation. The regulation sets forth protective and preventative measures and measures for accidents and emergency cases in Articles 7 and 8, respectively.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>Pursuant to Article 9, the employer shall inform and train the workers who are working with chemical substances on the results of the risk assessment, chemical substances that are present or can arise at the workplace and the health and safety risks of these substances, the occupational exposure limit values and other legal regulations, measures that must be taken and the material safety data sheets.</p> <p>If the risk assessment identifies workers at risk, these workers will be subject to proper medical surveillance according to article 12. Annex-1 of the regulation defines vocational exposure limit values for certain substances.</p>	
<p><b>Regulation on Protection of Workers from Dangers of Explosive Environments</b> (Official Gazette Date/Number: 30.04.2013/28633)</p>	<p>The regulation lays down the measures for the protection of health and safety of employees from the dangers of explosive environment that can be arise at workplaces. This regulation is applicable for the workplaces within the scope of the Occupational Health and Safety Regulation and having potential to cause explosive environment. However, workplaces for medical treatment for the patients and medical treatment applications are out of the scope of this regulation.</p> <p>Pursuant to Article 5, the employer is responsible to take technical and organizational measures for the prevention of explosions and protection from explosions by complying with the basic principles in in the order of priority as follows: (i) to prevent the occurrence of explosive environment, (ii) to prevent the ignition of the explosive environment in case it is not possible to prevent the occurrence of explosive environment due to the nature of the work, and(iii) to take measures to minimize the dangerous affects of explosion in order to provide health and safety to the workers. These measures shall be taken together with other measures, if required to prevent the spread of the explosion. These measures shall be reviewed regularly and also after significant changes in the workplace.</p> <p>According to Article 9, the employer shall categorize the areas that have explosion risks, according to the Annex-1 of the regulation, and implement the minimum requirements for protection of workers from dangers of explosive environments and equipment and protective system selection criteria to be followed, as set out in Annex-2 and Annex-3 of the regulation at these categorized areas. At areas where there is a risk of occurrence of explosive environment that can endanger the health and safety of the workers, the employer will place the sign given in Annex-4 of the regulation.</p>	
<p><b>Regulation on the Prevention of Exposure Risks from Biological Agents</b> (Official Gazette Date/Number: 15.06.2013/28678)</p>	<p>The purpose of this regulation is to regulate minimum provisions for the protection of the workers in workplaces against the biological factors to prevent health and safety risks.</p> <p>The regulation covers the workplaces and works within the Occupational Health and Safety Law, the works which potentially cause biological effects on workers, and works stated in Annex-1.</p> <p>Pursuant to Article 5, biological factors are classified as 4 risk groups based on the infection risk .Risk Identification and Assessment is conducted as follows: (i) Worker exposure type, level and duration need to be established for any type of work where risk to exposure to biological agent is present (ii) Where there is more than one group of biological agent, the cumulative risk should be assessed (iii) Risk assessments should be renewed in case there is a change in the exposure scenarios.</p> <p>Article 6 requires a Biological Risk Assessment to determine risks and assess them.In case there is no direct work with biologic agents, however the risk to exposure to workers may be present in the type of work given in Annex I, the conditions stated in Articles 7, 9, 10, 12, 13, 14, 15 and 16 will be applicable unless stated otherwise.</p>	<p><b>Determination of risk group</b></p> <p><b>Biological risk assessment</b></p> <p><b>Notification (if required)</b></p> <p><b>Periodical health control of workers</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>Pursuant to Article 9, if the Ministry of Labor and Social Security requests, employer is obliged to provide relevant information (i.e. Risk Assessment Results).</p> <p>Pursuant to Article 10 of the regulation, employers shall take relevant measures against personnel hygiene and health protection. Workers shall be educated regarding the potential risks, hygiene rules, measures to be taken etc. (Article 11).</p> <p>Pursuant to Article 13, employers shall record lists of the workers exposed to Group 3 and/or Group 4 biological factors.</p> <p>Pursuant to Article 15, employers make a preliminary notification to the Provincial Directorate of Labor Agency when they first start to use biological factors (Group 2, 3, and 4).</p> <p>Article 16. Health Surveillance: Health conditions of the workers potentially exposed to biological factors shall be periodically checked.</p> <p><i>Annex 1, 4- Work in healthcare, including isolation and post-mortem unit.</i></p> <p><i>Annex 1-5- Work in clinical, veterinary and diagnostic laboratories, excluding diagnostic microbiological laboratories.</i></p>	
<p><b>Regulation on the Works in Which Workers shall Work Maximum Seven Hours or Less in a Day in Terms of Health Rules</b></p> <p>(Official Gazette Date/Number: 16.07.2013/28709)</p>	<p>Article 4 of the regulation defines the works in which workers shall work maximum seven hours.</p> <p><i>The following categories of work listed under this article are potentially relevant to the works within the scope of the Project</i></p> <p><i>Works with radioactive and radioionisation</i></p> <p><i>Noisy works exceeding the highest level of effective noise exposure (8h=85 dB(A))</i></p>	
<p><b>Regulation on Radiation Safety</b></p> <p>(Official Gazette Date/Number: 24.03.2000/23999; last amended on 03.06.2010)</p>	<p>The purpose of this regulation is to ensure safety of people and environment against ionizing irradiation. The regulation covers measures and actions against radiation sources.</p> <p>Article 4. Definitions: Radiation officer: The person who is likely to be exposed to radiation over than the limits stated in Article 10 due to his/her job.</p> <p>Article 5 of the regulation indicates certain exemptions for the radioactive substances based on their radioactivity contents.</p> <p>Pursuant to Article 7, equivalent dosage and effective dosage on the relevant organ or tissue shall not exceed yearly dosage limits stated in Article 10, except the dosages caused by medical irradiations.</p> <p>Article 9 states recording level, survey level, response level, action level and guidance levels for the radiation exposures.</p> <p>Article 10 states yearly yearly dosage limits for society members and radiation officers.</p> <p>Article 21 states personal dosimeter obligation conditions.</p> <p>Pursuant to Article 22 sufficient personnel protective clothings and equipment shall be used.</p> <p>Article 23 gives details for preliminary and regular health control requirements for radiation officers.</p> <p>Article 24 to Article 32 set the provisions regarding the patient safety.</p>	<p><b>License for activities involving radiation and related Emergency Plan</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<p><b>Regulation on the Working Principles and Radiation Dosage Limits of the Personnel Working with Ionizing Radiation Resources in Health Services</b></p> <p>(Official Gazette Date/Number: 05.07.2012/28344)</p>	<p>Pursuant to Article 34, before the radioactive waste is disposed to the environment, permission of the Turkey Atomic Energy Agency shall be taken by license owner.</p> <p>Article 39 - An Emergency Plan is prepared in accordance with article 40 according to the features of the radioactive sources used in facilities by the license holder.</p> <p>Pursuant to Article 51 (License Application), the persons should pay a fee to the Turkish Atomic Energy Authority and apply to the Authority with the necessary application documents specific for each application determined by the Authority in order to acquire a license for the activities in the scope of the Article 50 of this regulation. If these activities require license, authorization or any document from other ministries and/or authorities, the license to be obtained from the Authority is a precondition for these. For the activities subject to EIA Regulation, licensing procedures cannot be started without the EIA positive decision.</p> <p>Article 52 - If the application materials are complete, an on-site radiation control is undertaken by Authority personnel and Control Report is furnished. If deemed appropriate the permit is issued, and if shortcomings are identified the applicant is given 3 months to correct them, which may be extended.</p> <p>The purpose of this regulation is to (i) protect all relevant personnel working in diagnosis, treatment or research works with radiation resources in health institutions against potential radiation risks (ii) determineradiation dosage limits (iii) determine principles of working conditions and (iv) determine measures to be taken in case of any limit excess.</p> <p>The regulation covers public and private health institutions in which diagnosis, treatment and researches are carried out with radiation resources and the personnel working with these resources.</p> <p>Pursuant to Article 5, buying, having and usage of the ionizing radiation sources intended for medical purposes are subject to a license given by Turkey Atomic Energy Authority.</p> <p>A written instruction is prepared and put into force for each radiation generating device for safe and optimum usage.</p> <p>Pursuant to Article 6, a radiation safety committee is established for the health institutions which involve at least two of the nuclear medicine, radiation oncology and radiology applications. Radiation Safety Committee reports to head physician.</p> <p>Article 7 of the regulation states the radiation dosage limits for relevant personnel (i) 5 years total effective dosage, and 1 year total effective dosage for eyepiece and whole body shall not exceed 100 mSv and 50 mSv, respectively (iii) If monthly effective dosage exceeds 2 mSv , monthly equivalent dosage exceeds 50 mSv for hands and teeth and monthly equivalent dosage for skin based on the most affected area of a 1 cm<sup>2</sup> exceeds mSv these levels are considered as research level dosage levels (iv) People under the age of 18 years shall not be employed in radiation works. 16-18 years-old students and interns can only enter managed areas for their mandatory educations. Limits for 16-18 years-old students and interns are: yearly effective dosage for eyepiece and whole body is 6mSv, monthly effective dosage is 0.6 mSv, monthly equivalent dosage for eyepiece is 0.6 mSv, monthly equivalent dosage for hand, footh and skin is 15 mSv. In case of exceeding these limits, these levels are considered as research levels.</p> <p>Article 8 gives the working principles and measures for employers.</p>	<p><b>License</b></p> <p><b>Written instruction</b></p> <p><b>Radiation Safety Committee (if required)</b></p>

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<p><b>Regulation on Safe Transportation of Radioactive Substances</b> (Official Gazette Date/Number: 08.07.2005/25869)</p>	<p>The purpose of this regulation is to provide environmental safety of society, radiation officers and environment during the transportation of the radioactive substances by road, railway, airway and seaway. The regulation covers loading, transport, unloading, temporary storage and delivery of the radioactive substance.</p>	
<b>HEALTH SECTOR</b>		
<p><b>Regulation on Improvement and Evaluation of Quality of Health Service</b> (Official Gazette Date/Number: 06.08.2013/ 28730)</p>	<p>The purpose is regulation is to regulate the procedures and principles related to quality standards based on patient safety, satisfaction of patients and employees; and application of these standards to ensure provision of good quality services in health facilities. This regulation covers governmental and private institutions and organizations providing diagnosis, treatment and rehabilitation services together with providing preventing health services.</p>	
<p><b>Regulation on Management of Inpatient Treatment Institutions</b> (Official Gazette Date/Number:13.01.1983/ 17927, last amended/changed on 05.02.2007)</p>	<p>The purpose of this regulation is to specify practice principles of various services; duties, authorizations and responsibilities of personnel; and to provide rapid, good quality and economic hospital management meeting with proper to necessities of modern age and realities of the country. The regulation covers mouth and dental health centers under the authority of the Ministry of Health and health facilities specified in the article 5 of this regulation. Article 5, specifies the health facilities in 5 different classes as district/town hospitals, Day hospitals, General Hospitals, special branch hospitals and education and research hospitals. General hospitals are defined as; health facilities with at least 50 bed capacity where examinations and outpatient and inpatient treatments of relevant patients are made without making discrimination on age and sex in special branches within the Hospital together with serving all emergency situations. Article 6 to 17 explains responsibilities and management on polyclinic, emergency, laboratory, surgery, sterilization, reanimation, intensive care, post surgery and pharmacy services. Article 58 specifies that it is essential to organize patient rooms as containing one or two beds and it is also possible to organize rooms with more beds by considering physical conditions. Article 109 to 186 defines duties and responsibilities of workers of medical services.</p>	
<p><b>Regulation on Control of Infection in Inpatient Treatment Institutions</b> (Official Gazette Date/Number: 11.08.2005/ 25903, last amended/changed on 25.06.2011)</p>	<p>The purpose of this regulation is to prevent and control infectious diseases generated due to health services and identify the problems associated with this subject and organize and perform solution activities, and to establish an infection control committee for conveying decisions to be taken at inpatient treatment institutions level to necessary authorities and to regulate the procedures and principles relating to the manner of work, duties, authorities and responsibilities of this committee. The regulation covers governmental institutions and organizations together with all private inpatient institutions and staff working in inpatient institutions.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<b>PATIENT'S RIGHTS</b>		
<b>Patient's Rights Regulation</b> (Official Gazette Date/Number: 01.08.1998/23420)	<p>The purpose of this regulation is to set “patient’s rights” as a reflection of “human rights” and regulate procedures and principles regarding the people benefiting from patient’s rights in all healthcare institutions and organizations. This regulation covers all official and private institutions and organizations and people in every status who contribute to the health services.</p> <p>Article 5 of the regulation defines the general principles: (i) Right of being physically, mentally and socially healthy is always considered as the most fundamental human right in every stages of the services. (ii) Patients are treated humanely with the awareness of their right for protection and improvement of their life together with their moral and material existence, which cannot be abolished by any individual or authority. (iii) Health services are provided indiscriminantly to any race, language, religion, sex, political opinion, philosophical belief, economic and social condition and miscellaneous differences. Health services are planned and organized in the way to be easily accessible for everybody. (iv) Intervention to the physical integrity and personal rights of an individual is not allowed except to medical necessities and cases provided by laws. (v) Nobody can be subjected to a medical research without their consent and permission of the Ministry of Health. (vi) Privacy of a patient cannot be interfered except the legally allowed cases and medical necessities.</p> <p>Section two and three of the regulation sets out the provisions regarding the rights of people receiving health services, such as health service obtaining right, information request right, selection and changing of the health institution and health personnel right.</p> <p>Section four sets out the provisions regarding the protection of patient rights and privacy. Section five sets out the provisions relevant to patient consent for medical treatment and specifically amputation of organs, abortion.</p> <p>Section six sets out the provisions regarding the patient right and consent in medical researches.</p> <p>Section seven sets out provisions for miscellaneous rights such as security, fulfillment of religious duties without causing health service impediments, respect to human values and accepting visitors and companions, providing health service outside the hospital buildings in force majeure.</p> <p>Article 37. Assurance of Security: Every individual has the right of expecting and requesting to feel safe in health institutions and organizations. All health institutions and organisations are obliged to take due precautions in order to ensure security of life and property of patients, visitors and companions.</p> <p>Special legislation provisions for protection of detainees and convicts within health institutions and organizations are reserved.</p> <p>Section eight identifies the responsibilities of health service providers and secure the legal protection and right to litigation of the patients.</p> <p>Section nine presents the final provisions, which includes ensuring the information of the patients on their rights.</p> <p>Article 48. Duties of Authorities: Health institution and organization officials are obliged and entitled to ensure that the patients can benefit from their rights properly by making the patients’ rights in this regulation available on lists, signs and leaflets in distinctly visible places of the health institutions and organizations for the patients, visitors and staff.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
<b>PUBLIC PRIVATE PARTNERSHIP MODEL</b>		
<p><b>Basic Law on Healthcare Services No. 3359</b> (Official Gazette Date/Number: 15.05.1987/ 19461; last amended on 15.07.2005)</p>	<p>The purpose of this law is to regulate general principles regarding the healthcare services. Pursuant to the Law, health institutions and organizations are planned, coordinated, financially supported and developed by the Ministry of Health by taking other relevant Ministries' opinions.</p>	
<p><b>Regulation on the Construction of New Healthcare Facilities against Lease and the Renovation of Existing Healthcare Facilities against Operation of Non-Medical Services and Functional Areas of Activity</b> (Official Gazette Date/Number: 22.07.2006/ 26236)</p>	<p>The purpose of this Regulation is to regulate the procedures and principles in regards with commissioning the real persons or private law legal entities to be selected via a tender for constructing the healthcare facilities deemed necessary by the Higher Planning Board, on the lands owned by such persons/entities or owned by the Treasury, within the framework of the preliminary projects and designs and the fundamental standards to be prepared by the Ministry of Health for each healthcare premise, in consideration for the lease of such facilities to the constructing persons/entities against a predetermined amount of lease and for a certain period which can not be more than forty-nine years; and transfer by the Ministry of Finance for this purpose of the real properties owned by the Treasury through establishing free of charge right of construction in favor of such real persons or private law legal entities for a period up to forty-nine years; and determining the amount and term of such lease; and renovation of the existing healthcare facilities against operation of the non-medical services and functional areas of activity in the facilities; and methods of the tender to be held for these purposes; and determination of the qualifications to be sought at the bidders; and the scope of the contracts and other pertinent issues.</p> <p>This regulation covers and is applicable on the healthcare facilities which are decided by the Higher Planning Board as needed to be constructed, and those existing healthcare facilities which are decided by the Health Ministry as needed to be renovated, within the framework of the Additional Article 7 of the Basic Law on Healthcare Services No. 3359.</p>	
<p><b>Law on Construction, Renewal and Service Procurement via Public-Private Sector Partnership Model by the Ministry of Health and Amendments of Certain Laws and Decrees No. 6428</b> (Official Gazette Date/Number: 09.03.2013/ 28582)</p>	<p>The purpose of this law is to determine procedures and principles regarding the following:</p> <ul style="list-style-type: none"> <li>• construction of the facilities considered as necessary by Ministry of Health and subsidiaries on treasury land by establishing independent and continuous right of construction for a period not exceeding 30 years excluding fixed investment period specified in the contract,</li> <li>• renewal of existing facilities,</li> <li>• obtaining consultancy, research and development services and certain services which require advanced technology and high financial resources for such projects.</li> </ul> <p>The procedures and principles are determined based on the provisions of tender and private law, within the framework of public-private cooperation model and within the framework of preliminary project, preliminary feasibility report and basic standards to be determined.</p> <p>Article 2 sets out the procedures and principles regarding the construction, renewal and service procurement. Article 3 defines the tendering procedures and principles.</p>	

Act, Regulation, Order (date and ref)	Brief summary of scope / key articles and relevance to the Project	Relevant permit requirements or other actions
	<p>Article 4 provides details regarding the principles for contracting process.</p> <p>Pursuant to article 8, zoning plans for the lands to be used to establish these facilities are prepared and approved by the Ministry of Environment and Urban Planning.</p>	
<b>OTHER LEGISLATION</b>		
<p><b>Regulation on Workplace Opening and Operating Licenses</b></p> <p>(Official Gazette Date/Number: 10.08.2005/25902; Last amended on 06.12.2012)</p>	<p>The regulation governs the principles and procedures in issuing opening and operation licenses required for workplaces. The regulation covers regulatory affairs (authorization) and auditing of sanitary and non-sanitary workplaces. The regulation designates the metropolitan municipalities, municipalities, provincial special administrations and organized industrial zone administrations as competent authorities for licensing. The type of opening and operation license an establishment has to possess depends on whether it is listed as a sanitary workplace (Annex-1) or non-sanitary workplace (Annex-2) under the regulation.</p> <p>Article 5. Any company employing more than 30 employees is required to obtain a report which proves that the precautions it has taken against fire in the workplace are sufficient.</p> <p>Article 6 of this regulation states that establishments cannot be operated without an “Opening and Operation License” from the relevant authority.</p> <p>Pursuant to the Article 10, based on the main area of activity, single license is prepared for the workplaces having more than one area of activity and located at same address and operated by same business administrator considering main area of activity. Other activities are separately indicated in the license.</p> <p>Pursuant to Article 16, establishing a health protection strip is mandatory in industrial zones, organized industrial zones and non-sanitary workplaces to be established in or outside these industrial zones. Health protection strips can not be established outside the boundaries of ownership and residential construction and human residence are not allowed in this area.</p> <p>Pursuant to article 18 of the regulation, facilities classified as first class non-sanitary establishments should obtain a “Location Selection and Facility Construction Permit”, which is valid for a period of five years. Pursuant to article 19, facilities with an environmental assessment report and an EIA Positive Certificate are exempt from obtaining this permit.</p> <p>Under article 20 of the regulation, first class non-sanitary workplaces may be issued a “Trial Permit” for a maximum period of one year if deemed necessary by the relevant authority or upon an application of the workplace owner. The Trial Permit temporarily replaces the Opening and Operation License.</p>	<p><b>Opening and Operating License</b> (<i>single license may be prepared for Hospitals and ancillary facilities</i>)</p> <p><b>Location Selection and Facility Construction Permit</b> (<i>for the first class non-sanitary workplaces</i>)</p> <p><b>Trial Permit</b> (<i>for non-sanitary workplaces</i>)</p> <p><b>Fire safety report</b></p>

**Table 2 - Comparison of Turkish and International Environmental Standards for Ambient Air Quality**

Parameter	Averaging Period	TURKISH	EU	IFC
		Air Quality Assessment and Management Regulation: Annex-I and Annex-IA and Industrial Air Pollution Control Regulation : Table 2.2 of Annex 2 Maximum Limit ( $\mu\text{g}/\text{m}^3$ ) [CO ( $\text{mg}/\text{m}^3$ )] [Settleable dust ( $\text{mg}/\text{m}^2$ day) ] [Ar, Cd, Ni and Benzo (a) pyren ( $\text{ng}/\text{m}^3$ )] [Pb, Cd, TI and their compounds in settleable dust ( $\mu\text{g}/\text{m}^2$ day)]	Directive 2008/50/EC Directive 2004/107/EC Maximum Limit ( $\mu\text{g}/\text{m}^3$ )	General EHS Guideline value ( $\mu\text{g}/\text{m}^3$ )
SO <sub>2</sub> -Sulphur Dioxide	10 minutes	-	-	500
	1 hour	900 (1.1.2014) (The limit value will be updated after 1.1.2014). 500-350 (2014-2019) (The limit value is 350 $\mu\text{g}.\text{m}^{-3}$ and a tolerance share of 150 $\mu\text{g}.\text{m}^{-3}$ is given starting at 1.1.2014 and this shall be reduced to zero by 1.1.2019 by decreasing it equally each 12 months)( <i>protection of human health</i> )	350 ( <i>protection of human health</i> )	-
	24 hours	250 (1.1.2014) (The limit value will be updated after 1.1.2014) 250-125 (2014-2019) (The limit value is 125 $\mu\text{g}.\text{m}^{-3}$ and a tolerance share of 125 $\mu\text{g}.\text{m}^{-3}$ is given starting at 1.1.2014 and this shall be reduced to zero by 1.1.2019 by decreasing it equally each 12 months)( <i>protection of human health</i> )	125 ( <i>protection of human health</i> )	20
	1 year	150 (1.1.2014) (The limit value will be updated after 1.1.2014)( <i>protection of human health</i> )	20( <i>protection of vegetation</i> )	-
	Winter mean (Oct 1-March 31)	125 (1.1.2014) ( <i>protection of human health</i> )	-	-
	Target limit Winter mean (Oct 1-March 31)	120	-	-
	Target limit (annual mean)	60 (1.1.2014) (The limit value will be updated after 1.1.2014)( <i>protection of human health</i> )	-	-
	1 year	20 (1.1.2014) (The limit value will be updated after 1.1.2014)( <i>protection of vulnerable animals, flora and objects</i> )	-	-
	1 year and winter season (Oct 1-March 31)	20 (1.1.2014)( <i>Ecosystem protection</i> )	-	-
NO <sub>2</sub> -Nitrogen Dioxide	1 hour	300-200 (2014-2024) (The limit value is 200 $\mu\text{g}.\text{m}^{-3}$ and a tolerance share of 100 $\mu\text{g}.\text{m}^{-3}$ is given starting at 1.1.2014 and this shall be reduced to zero by 1.1.2024 by decreasing it equally each 12 months) ( <i>protection of human health</i> )	200 ( <i>protection of human health</i> )	200
	24 hours	300 (1.1.2014) (The limit value will be updated after 1.1.2014) ( <i>protection of human health</i> )	-	-
	1 year	60 (1.1.2014) (The limit value will be updated after 1.1.2014)	-	40
	1 year	60-40 (2014-2024) (The limit value is 40 $\mu\text{g}.\text{m}^{-3}$ and a tolerance share of 20 $\mu\text{g}.\text{m}^{-3}$ is given starting at 1.1.2014 and this shall be reduced to zero by 1.1.2024 by decreasing it equally each 12 months). ( <i>protection of human health</i> )	40 ( <i>protection of human health</i> )	-
NOx	1 year	30 (1.1.2014) ( <i>protection of vegetation</i> )	30 Calendar year and winter (1 Oct-31 March)	-

Parameter	Averaging Period	TURKISH	EU	IFC
		<b>Air Quality Assessment and Management Regulation: Annex-I and Annex-IA and Industrial Air Pollution Control Regulation : Table 2.2 of Annex 2</b> Maximum Limit ( $\mu\text{g}/\text{m}^3$ ) [CO ( $\text{mg}/\text{m}^3$ )] [Settleable dust ( $\text{mg}/\text{m}^2$ day) ] [Ar, Cd, Ni and Benzo (a) pyren ( $\text{ng}/\text{m}^3$ )] [Pb, Cd, Tl and their compounds in settleable dust ( $\mu\text{g}/\text{m}^2$ day)]	<b>Directive 2008/50/EC Directive 2004/107/EC</b> Maximum Limit ( $\mu\text{g}/\text{m}^3$ )	<b>General EHS Guideline value</b> ( $\mu\text{g}/\text{m}^3$ )
			(protection of vegetation)	
Thoracic particles <10 $\mu\text{m}$ (PM10)	24 hours	100 (1.1.2014) (The limit value will be updated after 1.1.2014). 100-50 (2014-2019) (The limit value is 50 $\mu\text{g}.\text{m}^{-3}$ and a tolerance share of 50 $\mu\text{g}.\text{m}^{-3}$ is given starting at 1.1.2014 and this shall be reduced to zero by 1.1.2019 by decreasing it equally each 12 months) (protection of human health)	50 (protection of human health)	50
	Winter mean (Oct 1-March 31)	90 (1.1.2014) (protection of human health)	-	-
	1 year	60 (1.1.2014) (The limit value will be updated after 1.1.2014). 60-40 (2014-2019) (The limit value will be decreased equally each 12 months from 1.1.2014 to 1.1.2019) (protection of human health)	40 (protection of human health)	20
Fine particles <2.5 $\mu\text{m}$ (PM2.5)	24 hours	-	25	25
	1 year	-	25 (2015) 20 (2020)	10
CO	8 hours	16 000-10 000 (2014-2017) (The limit value is 10000 $\mu\text{g}.\text{m}^{-3}$ and a tolerance share of 6000 $\mu\text{g}.\text{m}^{-3}$ is given starting at 1.1.2014 and this shall be reduced to zero by 1.1.2017 by decreasing it equally each 12 months) (protection of human health)	10 000 (protection of human health)	-
	24 hours	10 000 (1.1.2014) (The limit value will be updated after 1.1.2014)(protection of human health)	-	-
	1 year	10000 (1.1.2014) (The limit value will be updated after 1.1.2014)(protection of human health)	-	-
Benzene	1 year	10-5 (2014-2017) (The limit value will be decreased equally each 12 months from 1.1.2014 to 1.1.2021)(protection of human health)	5 (protection of human health)	-
HCl	24 hours	150 (1.1.2014) (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
	1 year	60 (1.1.2014) (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
HF	1 hour	30 (1.1.2014) (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
	24 hours	5 (1.1.2014) (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
H <sub>2</sub> S	1 hour	100 (1.1.2014) (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
	24 hours	20 (1.1.2014) (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
Total Organic Compounds	1 hour	280 (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
	24 hours	70 (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
Settleable dust	24 hours	390 (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
	1 year	210 (The limit value will be updated after 1.1.2014) (protection of human health)	-	-
Pb (Lead) and its compounds in settleable dust	1 year	250 (The limit value will be updated after 1.1.2014) (protection of human health)	-	-

Parameter	Averaging Period	TURKISH	EU	IFC
		Air Quality Assessment and Management Regulation: Annex-I and Annex-IA and Industrial Air Pollution Control Regulation : Table 2.2 of Annex 2 Maximum Limit ( $\mu\text{g}/\text{m}^3$ ) [CO ( $\text{mg}/\text{m}^3$ )] [Settleable dust ( $\text{mg}/\text{m}^2$ day) ] [Ar, Cd, Ni and Benzo (a) pyren ( $\text{ng}/\text{m}^3$ )] [Pb, Cd, TI and their compounds in settleable dust ( $\mu\text{g}/\text{m}^2$ day)]	Directive 2008/50/EC Directive 2004/107/EC Maximum Limit ( $\mu\text{g}/\text{m}^3$ )	General EHS Guideline value ( $\mu\text{g}/\text{m}^3$ )
Cd (Cadmium) and its compounds in settleable dust	1 year	3.75 (The limit value will be updated after 1.1.2014)( <i>protection of human health</i> )	-	-
TI (Thallium) and its compounds in settleable dust	1 year	5 (The limit value will be updated after 1.1.2014)( <i>protection of human health</i> )	-	-
Pb-Lead	1 year	1 (1.1.2014) (The limit value will be updated after 1.1.2014). 1-0.5 (2014-2019) (The limit value will be decreased equally each 12 months from 1.1.2014 to 1.1.2019) ( <i>protection of human health</i> )	0.5 ( <i>protection of human health</i> )	-
As-Arsenic	1 year	6 (1.1.2020)	6	-
Cd-Cadmium	1 year	0.02 (1.1.2014) 5 (1.1.2020)	5	-
Ni-Nickel	1 year	20 (1.1.2020)	20	-
Benzo (a) Pyrene	1 year	1 (1.1.2020)	1	-
Ozone	8 hour daily max. (average of last three years)	120 (Target value for the year 2022) ( <i>protection of human health</i> )	120 ( <i>protection of human health</i> )	100
	May to July	-	18000 (calculated from 1 h values) ( <i>protection of vegetation</i> )	-

**Table 3 - Comparison of Turkish and International Environmental Standards for Stack Gas and Non-Stack Gas Emissions**

TRIGENERATION PLANT				
Parameter	TURKISH		EU	IFC
	Industrial Sourced Air Pollution Control Regulation: Table 5.2 of Annex 5 and Section 8 of Annex 5		Directive 2008/1/EC Directive 2010/75/EU	General EHS Guideline value
	Emission limits for the combustion plants Calorific value < 100 MW using natural gas (mg/Nm <sup>3</sup> )	Gas Turbines Calorific value ≥ 10 MW (mg/Nm <sup>3</sup> )	-	Turbine =15MWth to < 50 MWth using natural gas
O <sub>2</sub> content	3% volume of oxygen will be taken into consideration at stack gas	15% volume of oxygen will be taken into consideration at stack gas	-	15% (Dry gas excess O <sub>2</sub> Content)
SO <sub>2</sub>	100	60	-	-
CO	100	100 for continuous operation	-	-
NO <sub>2</sub>	800	300	-	-
NO <sub>x</sub>	-	-	-	25 ppm
Dust	10	-	-	-
Particulate Matter	-	Sootiness degree limits according to Bacharach scale are 3 during operation and 4 when starting the operation (if required).	-	-
<p><b>Note:</b> Efficiency Criteria: Engines with high primary combustion efficiency (thermal efficiency expressing fuel consumption per power in engine shaft or mechanical efficiency of the engine) and cogeneration technologies of combined cycle that re-provide mechanical or electrical production from the heat of the engine exhaust and of high total efficiency will be supported and limit values will be increased in proportion to K coefficient calculated with the below formula.</p> <p><u>Gas turbines or combined cycle mechanical efficiency:</u> Motors having mechanical (heating) or combined cycle efficiency above 35% K=Turbine mechanical efficiency/35 New emission limit value=K* Current emission limit value</p> <p><u>Cogeneration efficiency:</u> Cogeneration applications having mechanical and heat recycle efficiency above 75%. K=Power Plant Cogeneration efficiency/75 New emission limit value=K* Current emission limit value</p> <p>Combined closed circuit systems having total efficiency above 55% K=Combined circuit efficiency/55 New emission limit value=K* Current emission limit value</p>			-	-

CONCRETE PLANT										
Parameter	TURKISH							EU	IFC	
	Industrial Sourced Air Pollution Control Regulation: Section b (2.1, 2.2, 2.3) and Section g of Annex-1 Material Handling: production, processing, transport, loading, unloading, and sorting of the dusty substances							Directive 2008/1/EC Directive 2010/75/EU	General EHS Guideline value	
	Grain Size $\geq$ 5mm			1mm $\leq$ Grain Size < 5mm			Grain Size < 1 mm	-	-	
	Stack Gas Emission Flowrates (kg/h)			Non-Stack Gas Settlable (Montly Average)	At a distance of 3 m from the source (Hourly Average)	Stack Gas	Non-stack Settlable (Montly average)	Stack Gas	-	-
$\leq$ 1.5	1.5-2.5	$\geq$ 2.5								
Dust	200 mg/Nm <sup>3</sup>	150 mg/Nm <sup>3</sup>	100 mg/Nm <sup>3</sup>	450 mg/m <sup>2</sup> -day	3 mg/Nm <sup>3</sup> (as PM10)	75 mg/Nm <sup>3</sup>	450 mg/m <sup>2</sup> -day	75 mg/Nm <sup>3</sup>	-	-

**Table 4 - Comparison of Turkish and International Environmental Standards for Wastewater Discharges**

Parameter	WASTEWATER DISCHARGE to INFRASTRUCTURE FACILITIES			WASTEWATER DISCHARGE to RECEIVING ENVIRONMENT from INFRASTRUCTURE FACILITIES		WASTEWATER DISCHARGE to SURFACE WATER from TREATMENT FACILITIES	
	TURKISH		EU	IFC	TURKISH	EU	IFC
	Water Pollution Control Regulation: Table 25-Wastewater Quality Criteria for Connection to Wastewater Infrastructure Facilities (mg/L)		Directive 2000/60/EC Directive 91/271/EEC	General EHS Guideline value <sup>1</sup>	Urban Wastewater Treatment Regulation (mg/L)	Directive 91/271/EEC (mg/L)	General EHS Guideline value Discharge to surface water <sup>2</sup> (mg/L)
	Wastewater infrastructure facilities where sewer systems are subject to complete treatment	Wastewater infrastructure facilities where sewer systems end with deep sea discharge					
Temperature (°C)	40	40	-	-	-	-	-
pH	6.5-10	6-10	-	-	-	-	6-9
Total Suspended solids	500	350	-	-	35 (more than 10000 population equivalent) 60 (2000-10000 population equivalent)	35 (more than 10000 population equivalent) 60 (2000-10000 population equivalent)	50
Oil and grease	250	50	-	-	-	-	10
Tar and petroleum based oils	50	10	-	-	-	-	-
Chemical Oxygen Demand (COD)	4,000	600	-	-	125	125	125
Biological Oxygen Demand (BOD)	-	400	-	-	25	25	30
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	1,700	1,700	-	-	-	-	-
Total sulphur (S)	2	2	-	-	-	-	-
Phenol	20	10	-	-	-	-	-
Free chlorine	5	5	-	-	-	-	-
Total Nitrogen (N)	- (a)	40	-	-	-	-	10
Total Phosphorus (P)	- (a)	10	-	-	-	-	2
Arsenic (As)	3	10	-	-	-	-	-
Total Cyanide (CN <sup>-</sup> )	10	10	-	-	-	-	-

Parameter	WASTEWATER DISCHARGE to INFRASTRUCTURE FACILITIES			WASTEWATER DISCHARGE to RECEIVING ENVIRONMENT from INFRASTRUCTURE FACILITIES		WASTEWATER DISCHARGE to SURFACE WATER from TREATMENT FACILITIES	
	TURKISH		EU	IFC	TURKISH	EU	IFC
	Water Pollution Control Regulation: Table 25-Wastewater Quality Criteria for Connection to Wastewater Infrastructure Facilities (mg/L)		Directive 2000/60/EC Directive 91/271/EEC	General EHS Guideline value <sup>1</sup>	Urban Wastewater Treatment Regulation (mg/L)	Directive 91/271/EEC (mg/L)	General EHS Guideline value Discharge to surface water <sup>2</sup> (mg/L)
	Wastewater infrastructure facilities where sewer systems are subject to complete treatment	Wastewater infrastructure facilities where sewer systems end with deep sea discharge					
Total Lead (Pb)	3	3	-	-	-	-	-
Total Cadmium (Cd)	2	2	-	-	-	-	-
Total Chromium (Cr)	5	5	-	-	-	-	-
Total Mercury (Hg)	0.2	0.2	-	-	-	-	-
Total Copper (Cu)	2	2	-	-	-	-	-
Total Nickel (Ni)	5	5	-	-	-	-	-
Total Zinc (Zn)	10	10	-	-	-	-	-
Total Tin (Sn)	5	5	-	-	-	-	-
Total Silver (Ag)	5	5	-	-	-	-	-
Chloride (Cl <sup>-</sup> )	10,000	-	-	-	-	-	-
Surface active agents reacting with methylene blue (MBAS)	In principle, dumping of substances whose biological degradation is not in line with Turkish Standards Institute's standards is prohibited.		-	-	-	-	-
Total Coliform Bacteria (MPN/100) <sup>3</sup>	-	-	-	-	-	-	400

a) These parameters will not be measured in the evaluation of wastewaters.

b) For strong organic wastewaters that contain inert COD that is more than %2 and that have a total COD of above 5000 mg/L, BOD5 value is considered instead of the COD value.

<sup>1</sup>Discharges of industrial wastewater, sanitary wastewater, wastewater from utility operations or storm water into public or private wastewater treatment systems should (i) Meet the pretreatment and monitoring requirements of the sewer treatment system into which it discharges (ii)Not interfere, directly or indirectly, with the operation and maintenance of the collection and treatment systems, or pose a risk to worker health and safety, or adversely impact characteristics of residuals from wastewater treatment operations (iii)Be discharged into municipal or centralized wastewater treatment systems that have adequate capacity to meet local regulatory requirements for treatment of wastewater generated from the project. Pretreatment of wastewater to meet regulatory requirements before discharge from the project site is required if the municipal or centralized wastewater treatment system receiving wastewater from the project does not have adequate capacity to maintain regulatory compliance (General EHS Guidelines (April 30, 2007)).

<sup>2</sup>The indicative guideline values applicable to treated sanitary wastewater discharges to surface water in the absence of national or local standards for sanitary wastewater discharges.

<sup>3</sup>MPN=Most Probable Number

**Table 5 - Comparison of Turkish and International Environmental Standards for Environmental Noise, Vibration and Internal Noise**

Receptor (Environmental Noise)	TURKISH	EU	IFC
	Regulation on the Assessment and Management of Environmental Noise: Table 4 of Annex-7 Noise criteria for businesses, facilities and workplaces	Directive 2002/49/EC	General EHS Guideline value
Sensitive areas especially educational, cultural and health areas and seaside resorts and camping sites	Ldaytime: 60 dBA, Levening: 55 dBA and Lnight: 50 dBA	-	-
The areas involving commercial areas and noise-sensitive areas (especially residences) together	Ldaytime: 65 dBA, Levening: 60 dBA and Lnight: 55 dBA	-	-
The areas involving commercial areas and noise-sensitive areas (especially workplaces) together	Ldaytime: 68 dBA, Levening: 63 dBA and Lnight: 58 dBA	-	-
-	<b>Regulation on the Assessment and Management of Environmental Noise: Annex 7 Table-5 Environmental Noise Limit Values for Construction Sites</b>	-	-
-	Ldaytime: 70 dBA (construction, demolition and repair of buildings	-	-
Residential; institutional; educational	-	-	Ldaytime: 55 dBA and Lnighttime: 45 Dba (or a maximum increase in background levels of 3 dBA at the nearest receptor location off-site)
Industrial; commercial	-	-	Ldaytime: 70 dBA and Lnighttime: 70 dBA (or a maximum increase in background levels of 3 dBA at the nearest receptor location off-site)
Receptor (Vibration)	Regulation on the Assessment and Management of Environmental Noise: Annex 7 Table-7 Maximum ground vibration values allowed for driven pile and construction machines (peak value-mm/s)	Directive 2002/49/EC	General EHS Guideline value
Residential areas	Continuous :5 Discontinuous: 10	-	-
Commercial and Industrial areas	Continuous :15 Discontinuous: 30	-	-
Type of Area (Internal Noise/Noise Limits For Various Working Environments)	Regulation on the Assessment and Management of Environmental Noise: Annex7 Table-9 Noise limits for planned buildings	Directive 2002/49/EC	General EHS Guideline value
Treatment institutions and organizations, dispensary, polyclinics, nurseries, nursing homes and similar	Closed Window: 35 Leq (dBA) Open Window: 45 Leq (dBA)	-	-
Treatment and resting rooms	Closed Window: 25 Leq (dBA) Open Window: 35 Leq (dBA)	-	-
Hospitals	-	-	Equivalent level $LA_{eq,8h}$ =30-35 dBA Maximum $LA_{max, fast}$ = 40 dBA

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## **ANNEX C**

### **Environmental and Social Management Plan (ESMP)**

## CONSTRUCTION PHASE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
<b>GENERAL</b>					
C.1	Management system	Construction phase Environmental and Social Management System (ESMS) will be developed in line with international good practice and guidelines (i.e. ISO 9001: 2008 – Quality Management System, ISO 14001: 2004 – Environmental Management System, OHSAS 18001: 2007 – Occupational Health and Safety Management System).	IHIC	Prior to construction phase	<ul style="list-style-type: none"> <li>Check ESMS documentation</li> <li>Ensure that necessary management plans (as explained below) are in place</li> </ul>
C.2	Permitting	Necessary permits/consents/approvals (including construction permit) will be obtained in accordance with the national legislation before starting construction and during construction as appropriate for a specific work activity.	IHIC	Prior to and during construction phase	<ul style="list-style-type: none"> <li>Ensure that permits/consents/approvals are in place.</li> </ul>
<b>LAND USE AND ZONING</b>					
C.3	Zoning	<ul style="list-style-type: none"> <li>IHIC will follow the requirements of Istanbul Gas Distribution Industry and Trade Inc. (IGDAS) about the natural gas pipeline buried under the road as indicated in the official response letter of IGDAS which provides information on the minimum clear distance required between any structure and the pipeline infrastructure, and requires developing a protocol with the Basaksehir Network Directorate prior to start of the excavation works.</li> <li>Undertake necessary communication with TEDAS related to the 9 m<sup>2</sup> area that needs to be used for a substation to be installed, in order to identify a suitable location that will not interfere with the Project design.</li> </ul>	IHIC	Prior to construction phase	<ul style="list-style-type: none"> <li>Check communication records</li> </ul>
<b>GEOLOGY, SOILS AND CONTAMINATED LAND</b>					
C.4	Seismic risk	<ul style="list-style-type: none"> <li>The Project will be designed, constructed and operated in accordance with Turkish regulations and standards for protection against seismic activity. Regarding design and construction of the buildings, the Regulation on Buildings to be constructed in Seismic Zones will be complied with, and defined parameters that need to be used in the design of structures located in 2<sup>nd</sup> degree seismic zone where the Project site is located will be taken into account.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Contract with a Construction Inspection Company</li> <li>Check construction inspection records</li> </ul>
C.5	Protection of soils and groundwater	<ul style="list-style-type: none"> <li>All contractors will be required to adopt good construction site practices for the protection of soils and to follow the IFC General Environmental, Health and Safety (EHS) Guidelines.</li> <li>Provisions will be taken for the protection of newly exposed soil surfaces from</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Periodic (e.g. weekly) site inspections</li> <li>Check that hazardous and non-hazardous waste</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>rainfall and wind erosion such as silt fences.</p> <ul style="list-style-type: none"> <li>Procedures will be set up for identifying and dealing with contaminated materials when encountered during construction, including treatment and disposal of contaminated soils. Contaminated soils will be disposed of in an appropriately licensed disposal site.</li> <li>The use of cement and wet concrete in or close to any exposed areas will be carefully controlled.</li> <li>Hazardous and non-hazardous materials and waste during construction will be handled according to the Integrated Quality, Environment, Health and Safety Management System to be prepared and where needed, further site-specific management plans will be developed.</li> <li>Hazardous materials will be handled according to the Hazardous Material Management Plan that is to be developed.</li> <li>Hazardous and non-hazardous waste will be handled according to the Waste Management Plan that will be updated based on the final design and site layout plan.</li> </ul>			disposal records are kept properly
C.6	Spills/accidents and contaminated land	<ul style="list-style-type: none"> <li>Fuels, oils and chemicals will be stored on an impervious base protected by bunds to 110% of capacity. Drip trays will be used for fuelling mobile equipment.</li> <li>Any spillages from handling fuel and liquids will be immediately contained on site and the contaminated soil removed from the site for suitable treatment and disposal.</li> <li>Spoil and other surplus material arising from the works which is classed as "acceptable fill" shall, wherever practicable, be recovered and used in the construction works.</li> <li>Surplus construction material will be made available to third parties for reuse on local development projects if it cannot be utilized on site.</li> <li>Operation of a closed drainage system and implementation of Emergency Preparedness and Response Plan in the event of spills, fire etc. will prevent significant impacts on soils during construction.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Control whether appropriate designated storage areas are constructed for fuel, oils, chemicals</li> <li>Check the records of contaminated soil (if any occurred) disposal</li> <li>Check records of surplus material reuse</li> <li>Ensure that the Emergency Preparedness and Response Plan is prepared and implemented as needed.</li> </ul>
<b>HYDROLOGY AND HYDROGEOLOGY</b>					
C.7	Protection of surface water and groundwater	<ul style="list-style-type: none"> <li>Good construction site practices (i.e. measures as described below such as using designated areas for storing materials, regular inspections at construction</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Regular inspection of construction activities and</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>sites, training of construction workers, placement of sediment traps and/or oil/water, etc.) will be adopted to minimize risks of water pollution.</p> <ul style="list-style-type: none"> <li>• Stockpiles of soil will be stored as needed at designated areas.</li> <li>• Construction activities will be regularly inspected on site.</li> <li>• Construction workers and relevant staff will be trained related to the implementation of good construction site practices and on spill response and prevention measures.</li> <li>• No fuelling of vehicles or equipment will take place within excavated areas; and no hazardous materials will be stored in excavated areas and all handling of hazardous materials will be under special supervision.</li> <li>• Fuelling shall only be carried out in designated areas away from surface drainage pathways exiting the site.</li> <li>• Suitably sized impervious bunds or other containment will be installed where hazardous materials are handled (such as fuel stores and loading areas, concrete mixing, hazardous material stores) to prevent hazardous materials entering the site drainage.</li> <li>• Regular periodic integrity testing for hazardous material storage equipment (i.e. underground storage tanks and lines) will need to be conducted and appropriate leak detection systems will be in place.</li> <li>• A Hazardous Material Management Plan should be developed to ensure proper handling of hazardous materials during construction.</li> <li>• “The mitigation measures discussed under the title <i>Material Resources and Waste Management</i> in Ref No: C.9 through C.11 will be implemented. The mitigation measures are specific to the management of wastes including storage, transport and disposal of waste materials generated during construction.</li> </ul>			<p>training of relevant staff</p> <ul style="list-style-type: none"> <li>• Check inspection and training records</li> <li>• Check necessary measures (i.e. bunds) are in place at areas where hazardous materials are handled</li> <li>• Check the records of regular integrity testing of underground storage tanks and lines</li> <li>• Ensure that the Hazardous Material Management Plan is prepared and implemented.</li> </ul>
C.8	Spill Response	<ul style="list-style-type: none"> <li>• All staff and subcontractors will be required to report any incidents and these will be subject to investigation and remedial and preventive actions will be taken as needed.</li> <li>• Spill response kits including absorbent materials suitable for the materials will be present on site. These will be kept at designated areas with specific instructions for their use. Site staff will be trained on the use of spill kits.</li> <li>• An Emergency Preparedness and Response Plan should be developed to ensure</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>• Ensure that spill response materials and kits are in place.</li> <li>• Ensure that the Emergency Preparedness and Response Plan is prepared and implemented as needed.</li> <li>• Check whether the</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>mitigation of spills from hazardous materials during construction.</p> <ul style="list-style-type: none"> <li>Response to the spill will be made as fast as possible. Contaminated materials will be collected and sent to appropriate disposal facilities.</li> </ul>			contaminated materials are properly disposed of.
<b>MATERIAL RESOURCES AND WASTE MANAGEMENT</b>					
C.9	Supply of Materials	<p>The following mitigation measures will be implemented related to the supply of materials:</p> <ul style="list-style-type: none"> <li>Materials will be sourced from as close as possible to the Project site so as to minimize the impact of transport;</li> <li>Aggregates and materials will be sourced from quarries, borrow pits, crushing plants and asphalt plants operating with valid environmental and other permits and licenses and where the sites are managed in full compliance with all applicable environmental standards and specifications.</li> <li>Recycled materials and materials certified as “green” and low carbon will be used to the extent possible.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Check records of construction material supply sources.</li> <li>Identification of opportunities for use of recycled or low carbon sources.</li> </ul>
C.10	Waste Generation and Management	<ul style="list-style-type: none"> <li>All wastes during construction will be managed in line with the updated Waste Management Plan (WMP).</li> <li>Necessary permits related with disposal of excavated earth material during construction phase will be obtained from the local environmental authorities. An appropriate disposal facility and/or alternative options should be identified prior to the excavation process.</li> <li>The excavation waste will be disposed in line with Regulation on Control of the Excavated Soil, Construction and Demolition Wastes.</li> <li>All waste will be collected, segregated, labeled and stored on site according to the WMP. The WMP addresses waste minimization, segregation, labeling, storage, transportation and recycling/disposal to meet the national and international standards.</li> <li>All wastes must be segregated according to their category and will be disposed of at relevant licensed facilities in accordance with regulatory requirements.</li> <li>Record keeping about waste generation, storage and transportation to third party waste management facilities will be maintained according to the details given in the WMP.</li> <li>Periodic inspections will be conducted in the waste recycling/ disposal facilities to ensure proper disposal practices are implemented.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure that updated WMP is implemented during construction phase.</li> <li>Check consents/permits from local authorities for the disposal of excavated soils.</li> <li>Periodic site inspections to ensure that all wastes are separately collected, segregated, labeled and stored in designated areas.</li> <li>Check disposal records of all types of wastes</li> <li>Check waste disposal contracts</li> <li>Check copies of haulers’ and disposal facilities’ licenses.</li> <li>Check declaration records made to the Ministry of</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
					<p>Environment and Urban Planning (MEUP).</p> <ul style="list-style-type: none"> <li>• Ensure that all waste manifests are in order and ready for review during the audits of the Provincial Directorate of Environment.</li> <li>• Check training records of staff and awareness during site audits.</li> </ul>
C.11	Wastewater	<p>Domestic wastewater will be collected in septic tank during construction phase of the Project. The septic tank will be emptied by vacuum trucks periodically and the wastewater will be sent to the nearest ISKI domestic wastewater treatment plant.</p> <p>Permission for septic tank construction and operation will need to be obtained prior to implementation</p>	IHIC	<p>Construction phase</p> <p>Prior to construction phase</p>	<ul style="list-style-type: none"> <li>• Check records of disposal by vacuum trucks</li> <li>• Check approval documentation for the septic tank</li> </ul>
<b>AIR QUALITY</b>					
C.12	Dust emissions during construction	<p>An Air Quality Control and Monitoring Plan will be prepared to include mitigation measures that will be taken to reduce the dust emissions during construction:</p> <ul style="list-style-type: none"> <li>• Minimal particulate emission from the construction activities will be maintained by good site management and housekeeping practices and use of dust suppression methods. Water spraying will be performed at dust generating areas inside the Project area especially during dry weather conditions.</li> <li>• Turkish Regulation on the Control of Excavated Soils, Construction and Demolition Wastes (Official Gazette Date/No: 18.03.2004/25406) will be followed which requires taking necessary measures to minimize dust emissions during excavations.</li> <li>• Excavated soils will be stockpiled (as necessary) at designated areas and will be placed as far as possible from the settlements in the west. Dusty and loose materials will be properly covered or top layers will be kept moist.</li> <li>• Screens will be placed as necessary at the construction site to reduce dust emissions.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>• Ensure that Air Quality Control and Monitoring Plan is prepared and implemented.</li> <li>• Check results of air quality monitoring.</li> <li>• Visual site inspections to check construction site practices.</li> <li>• Training of workers and drivers to raise awareness.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>The following mitigation measures will be implemented to minimize dust emissions related to transport of materials during construction:</p> <ul style="list-style-type: none"> <li>• Vehicle speed limits will be applied inside the Project area. Truck operators will be trained to comply with speed limits and good construction site practices.</li> <li>• Trucks carrying excavated soils will be covered before leaving the construction area.</li> <li>• Transfer roads will be sprayed with water as necessary (for example using mobile bowsers) to prevent significant dust emissions especially in dry weather conditions.</li> </ul>			
C.13	Exhaust emissions during construction	<ul style="list-style-type: none"> <li>• The construction equipment and trucks will be maintained regularly to keep them in good working condition to minimize exhaust emissions caused by poor performance.</li> <li>• Low sulphur fuel will be preferred as far as possible.</li> <li>• Engines of the equipment/trucks will be prevented from idling and running unnecessarily.</li> <li>• A Construction Traffic Management Plan will be prepared and implemented which will decrease the impacts of the traffic load resulting from the construction activities. This, in turn, will lower the exhaust emissions from the truck movements.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>• Ensure that Construction Traffic Management Plan is prepared and implemented.</li> <li>• Training of workers and drivers to raise awareness.</li> </ul>
<b>NOISE</b>					
C.14	Noise	<p>A Noise Control and Monitoring Plan will be developed to cover the following mitigation measures during the construction phase in order to ensure that the standard values set in the regulations are met:</p> <ul style="list-style-type: none"> <li>• 'Low-noise' equipment will be used during construction phase, as far as possible. Where construction equipment is provided with sealed acoustic covers or enclosures, these will be kept closed whenever the machines are in use.</li> <li>• Machines will be shut down or throttled down to a minimum when not in operation.</li> <li>• Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize extraneous noise caused by poor performance.</li> <li>• Construction activities will be carried out during daytime and will continue throughout the night time as necessary.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>• Check that Noise Control and Monitoring Plan is in place.</li> <li>• Check consent for night time work</li> <li>• Check results of noise monitoring and vibration-if needed- monitoring.</li> <li>• Site inspections to check construction site practices.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<ul style="list-style-type: none"> <li>Necessary consent from Istanbul Provincial Directorate of Environment and Urban Planning and other relevant authorities (i.e. municipalities) as needed, will be obtained for night time activities.</li> <li>Noise related to daytime traffic during construction will be properly managed.</li> <li>On site structures such as containers, offices, hoardings will be used to screen sensitive receptors from noise sources as far as possible.</li> <li>Awareness among construction workers will be increased regarding noise mitigation.</li> <li>Noise levels will be measured at the closest sensitive receptors according to the Noise Control and Monitoring Plan. If levels at receptors exceed the standards, measures will be taken to reduce emissions so that the limit values are met.</li> <li>Vibration levels will be monitored upon a grievance is made by the nearby residents and if the standards are exceeded, measures will be taken to reduce vibration.</li> </ul>			
<b>ECOLOGY</b>					
C.15	Flora	<p>It is recommended that at least one of the approaches described below are adopted as mitigation so that populations of the two critically endangered local endemic species are preserved and results in no net loss of their populations over time. These approaches are as follows:</p> <ul style="list-style-type: none"> <li>to preserve the two species <i>Cirsium polycephalum</i> and <i>Cephalaria tuteliana</i> in-situ within the specific areas they grow at the Project site by preserving these areas,</li> <li>to plant the seeds of <i>Cephalaria tuteliana</i> and <i>Cirsium polycephalum</i> in pre-determined natural habitat and to monitor their status as the Project proceeds through the upcoming seasons,</li> <li>to collect seeds of both species during September-October and to transfer them to the Gene Bank for further conservation.</li> </ul> <p>Further mitigation measures include implementing a monitoring program to include biological monitoring of populations of the two endemic species at the preservation areas within the project site, and using native species during landscaping activities. The most suitable species for landscaping can be listed as <i>Arbutus unedo</i>, <i>Erica manipuliflora</i>, <i>Cistus creticus</i>, <i>Cistus salviifolius</i>, <i>Quercus infectoria</i> and <i>Spartium junceum</i>.</p>	IHIC	<p>Prior to construction phase</p> <p>Post-construction (for landscaping)</p>	<ul style="list-style-type: none"> <li>Check the records of monitoring</li> <li>Site inspections</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
C.16	Fauna	<ul style="list-style-type: none"> <li>It is suggested that tortoise specimens are collected and transferred to safe places prior to the start of construction activities. To protect this species in the Project area, some semi natural parts need to be left in the area which is also useful for other species in the field.</li> <li>Measures can be taken to mitigate potential impacts on birds that may include leaving semi natural areas inside the Project area to the extent possible, implanting plants with fruit and/or seed as food sources for birds, creating water sources such as small lakes or ponds in the Project area.</li> </ul>	IHIC	<p>Prior to construction phase</p> <p>Post-construction phase</p>	<ul style="list-style-type: none"> <li>Site inspections</li> </ul>
<b>ARCHAEOLOGY</b>					
C.17	Liason with authorities	<ul style="list-style-type: none"> <li>The official views of the relevant authorities should be obtained and necessary investigations related to archaeology need to be undertaken as required by the authorities.</li> <li>No construction activity should start until decisions are obtained from the relevant authorities and studies are conducted as per the requirements of the relevant authorities.</li> </ul>	IHIC and Museums Directorate (for investigations)	Prior to construction phase	<ul style="list-style-type: none"> <li>Ensure obtaining authority decisions</li> </ul>
C.18	Chance find during construction	<p>An Archaeological Chance Find Management Plan will be prepared to be applied in the event of an archaeological discovery during construction activities. The plan will include the following measures:</p> <ul style="list-style-type: none"> <li>In case any chance find is encountered, the construction activity will cease immediately and the construction site responsible will be contacted immediately.</li> <li>The nearest Museum Directorate will be notified at the latest within three days after the chance find is encountered,</li> <li>The construction site responsible will fill up an "Archaeological Chance Find Report Form" that records the date and time of discovery, coordinates of the location of the chance find, description of the chance find, contacts made with the authorities and decisions taken, and the date of recommencement of work.</li> <li>Further steps to be followed and proper plan to be implemented for the management of the finds will be decided and reported in writing by the authorities in charge.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure that Archaeological Chance Find Management Plan is in place.</li> </ul>
<b>SOCIO-ECONOMY</b>					
C.19	Economy and employment	<ul style="list-style-type: none"> <li>Construction worker accommodation compounds will be located to minimize adverse effects on the existing population. A Construction Camp Management</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Check relevant records with regard to local employment</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>Plan will be prepared and implemented.</p> <ul style="list-style-type: none"> <li>Recruitment procedures will be in line with IHIC Human Resources Policy that is to be developed for the Project. This will include the aim to provide opportunities for employment of local workforce to the extent possible considering unskilled, semi-skilled and skilled workforce.</li> <li>The Project will seek to maximize the benefits from the project to local communities in terms of direct and indirect employment, and purchasing of local good and services during construction. This will include measures such as adopting local employment and purchasing policies, to the extent possible establish tenders for procurement of subcontracted goods and services at a scale that local businesses can respond to, ensuring opportunities are advertised locally.</li> <li>Transportation impacts will be minimized as far as possible with the establishment of a Construction Traffic Management Plan.</li> </ul>			and local purchasing policies.
<b>COMMUNITY HEALTH, SAFETY AND SECURITY</b>					
C.20	Community health, safety and security (general)	<p>A Community Health and Safety Management Plan will be developed and implemented by IHIC to manage risks and impacts to the community and will cover the following:</p> <ul style="list-style-type: none"> <li>All relevant health and safety regulations will be followed during the development and construction of the Project in order to minimize accidents that may have impacts on the community and to control potential Project related releases and/or emissions.</li> <li>A grievance management system will be in place that will enable the community to raise concerns during the construction of the Project.</li> <li>All employees will be trained on health and safety, and Emergency Preparedness and Response Plan to respond timely to the incidents.</li> <li>All relevant mitigation measures described for the construction phase will be implemented.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure that the Community Health and Safety Management Plan is in place.</li> <li>Ensure that the grievances are handled appropriately and in a timely manner.</li> <li>Check records of health and safety training of employees.</li> </ul>
C.21	Dust and noise impacts on the nearby community	<p>Specific impacts related to dust and noise will be managed through the implementation of the following measures:</p> <ul style="list-style-type: none"> <li>Necessary measures (covering materials, water suppression, etc.) will be taken to avoid and/or minimize dust emissions during the construction phase.</li> <li>IHIC will prepare and implement an Air Quality Control and Monitoring Plan during the construction phase of the Project.</li> <li>Construction activities will be planned in a way considering the nearby</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure Air Quality Control and Monitoring Plan is in place.</li> <li>Ensure Noise Control and Monitoring Plan is in place.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>communities and noise generating activities will continue throughout the night time as necessary.</p> <ul style="list-style-type: none"> <li>IHIC will prepare and implement a Noise Control and Monitoring Plan during the construction phase of the Project.</li> <li>Drivers of trucks and vehicles will adhere to defined speed limits and will be warned against creating unnecessary noise by using horns during the construction phase.</li> <li>All vehicles and work machinery will be subject to periodic maintenance with the aim of reducing noise, dust and gas emissions from vehicles.</li> </ul>			
C.22	Influx of workers and management of workforce	<p>IHIC intends to recruit construction workers locally to the extent possible and provide appropriate on-site pre-fabricated facilities to those employees who need accommodation and to provide onsite medical facilities which will minimize introduction of diseases, anti-social behavior and demand for health-related services.</p> <p>A Construction Camp Management Plan will be developed and implemented by IHIC to cover the following measures:</p> <ul style="list-style-type: none"> <li>All the workforce will comply with specified rules and code of conduct within and outside the Project area.</li> <li>Disciplinary process will be applied in the event that a worker exhibits behavior in non-compliance with the rules and code of the conduct.</li> <li>Training will be provided to the workforce on camp rules.</li> <li>All workforce residing at the construction camp will undergo medical surveillance.</li> <li>Illegal substances, firearms, fighting and alcohol will be prohibited.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure that the Construction Camp Management Plan is in place.</li> </ul>
C.23	Road traffic	<ul style="list-style-type: none"> <li>Transportation impacts will be minimized as far as possible with the establishment of a Construction Traffic Management Plan.</li> <li>Traffic signs will be placed at appropriate locations in order to prevent any accidents during construction phase of the Project.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure that the Construction Traffic Management Plan is in place.</li> <li>Ensure that traffic signs are placed sufficiently.</li> </ul>
C.24	Infrastructure safety	<ul style="list-style-type: none"> <li>The structural elements and components of the Project will be designed and built according to national regulations and international best practice. All structures will be built taking into account the regulatory requirements to be implemented at 2<sup>nd</sup> degree earthquake zones. Regarding the design of the buildings within the project area, the Regulation on Buildings to be constructed in Seismic Zones (Official Gazette date/no: 06.03.2007/26454) will be complied with.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Check contract with a Construction Inspection Company.</li> <li>Check construction inspection records.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
C.25	Fire Safety	<p>Fire safety measures will be taken by performing the following steps at a minimum:</p> <ul style="list-style-type: none"> <li>The IHC will be designed and constructed in full compliance with the "Regulation on the Protection of Buildings from Fire" (Official Gazette Date/Number: 19.12.2007/26735).</li> <li>The IHC will also satisfy internationally accepted life and fire safety standards such as Life Safety Code82. IHIC will demonstrate that the buildings as well as life and fire safety systems and equipment will have been designed and installed appropriately at the facilities.</li> <li>"Regulation on Protection of Buildings from Fire (Official Gazette Date/Number: 19.12.2007/26735) brings forward detailed requirements for the design and operation of the facilities that takes into account fire prevention issues (i.e. fuel load and control of combustibles), means of egress, detection of alarm systems, compartmentalization, fire suppression and control as are required by IFC EHS Guidelines for Health Care Facilities.</li> <li>A Life and Fire Safety Master Plan will be prepared identifying major fire risks, applicable codes, standards and regulations, and mitigation measures. This plan will need to be approved by a third party acceptable to IFC, prior to the construction of the facilities to ensure compliance with local and international standards.</li> </ul>	IHIC	<p>Construction phase</p> <p>Prior to construction</p>	<ul style="list-style-type: none"> <li>Ensure that Life and Fire Safety Master Plan is prepared and approved by a third party.</li> <li>Check third party audit report</li> </ul>
C.26	Security	<ul style="list-style-type: none"> <li>A Security Plan will be developed to be implemented during the construction of the Project. Security will be provided in a manner that does not jeopardize the community's safety or IHIC's relationship with the community and that is consistent with national requirements.</li> <li>International best practice will be applied to hiring, training and mobilizing security staff. IHIC will ensure that security personnel have not been involved in past abuses and are adequately trained.</li> <li>Force will only be sanctioned in preventive or defensive circumstances in proportion to the threat and security will operate within the law.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure that the Security Plan is in place.</li> <li>Check credentials of security staff.</li> <li>Check training records of security staff.</li> </ul>
C.27	Hazardous materials	<ul style="list-style-type: none"> <li>All hazardous materials will be stored in designated areas having secondary containment and handled with care by authorized staff in order to prevent potential spills in accordance with the Hazardous Material Management Plan to be prepared.</li> </ul> <p>The Hazardous Material Management Plan will cover the following general measures:</p> <ul style="list-style-type: none"> <li>An inventory of hazardous materials will be maintained including a summary</li> </ul>	IHIC	Construction phase	Ensure that Hazardous Material Management Plan is in place.

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>of the physical and chemical properties of the materials held or generated, to ensure that these are understood and that appropriate measures are in place to mitigate the potential hazards posed by them both to humans and the environment. Material Safety Data Sheets (MSDSs) for all stored materials and details on the segregation of potentially reactive materials will be kept. MSDSs will be held in both English and Turkish.</p> <ul style="list-style-type: none"> <li>• Appropriate Personal Protective Equipment (PPE) will be made available to personnel involved in fuel and hazardous material handling; all relevant personnel will be trained in the use and maintenance of protective equipment.</li> <li>• Hazardous material storage areas will be protected from rainfall and direct sunlight.</li> <li>• Materials will be clearly labeled, segregated, protected from general access and stored on pallets to prevent the contamination of runoff.</li> <li>• Suitable fire-fighting equipment will be located close to hazardous material storage areas.</li> <li>• All personnel will be trained in the use of fire extinguishers.</li> <li>• The overall volume of hazardous materials purchased and present on site will be minimized through careful stock control and materials inventory.</li> </ul>			
<b>LABOR AND WORKING CONDITIONS</b>					
C.28	General	<ul style="list-style-type: none"> <li>• An Environmental and Social Management System (ESMS) covering construction activities and OHSAS 18001:2007 certificate requirements will be developed.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>• Ensure establishment and implementation of ESMS.</li> </ul>
C.29	Human resources (HR)	<p>The following measures will be implemented related to recruitment and management of labor:</p> <ul style="list-style-type: none"> <li>• An HR policy for IHIC will be developed.</li> <li>• An HR manager will be appointed to ensure implementation of the HR policy.</li> <li>• Child and forced labor will be prohibited.</li> <li>• Workers will have contracts in place prior to commencement setting out working conditions, terms of employment and environmental, health and safety (EHS) responsibilities.</li> <li>• All workers will be insured under Social Security Institution.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>• Ensure implementation of the HR Policy.</li> <li>• Check records of personnel files.</li> </ul>
C.30	Grievances	<ul style="list-style-type: none"> <li>• A grievance mechanism will be developed for employees and included in the ESMS. Employees will be informed about this mechanism at the time of hiring.</li> <li>• Grievance mechanism will be extended to non-employee workers in future.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>• Ensure grievances are managed appropriately.</li> <li>• Check relevant records.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
C.31	Occupational health and safety	<p>The following mitigation measures will be applied to manage the health and safety of the employees:</p> <ul style="list-style-type: none"> <li>All applicable national health and safety legislation and international regulations will be followed.</li> <li>All the risks of each activity during construction will be identified followed by identification of the appropriate mitigation measures/personal protective equipment.</li> <li>Dust emissions will be minimized to the extent possible with the implementation of mitigation measures mentioned under the title <i>Air Quality</i> (Ref No. C.12).</li> <li>Workers (including sub-contractors) will be provided safety briefings every day before the work starts and provided with necessary personal protective equipment.</li> <li>Method statements and risk assessments will be required for high risk activities such as working at heights, operation of heavy equipment and similar.</li> <li>All accidents and incidents will be recorded.</li> <li>The efficiency of health and safety practices will be monitored through internal and external audits, and corrective actions will be taken if required.</li> <li>All employees (including sub-contractors) will be trained on health and safety, and EPRP to respond timely to the incidents.</li> <li>IHIC will develop and implement a detailed management plan to mitigate immediate health and safety hazards on site.</li> <li>There will be a medical unit at the Project area that will meet the requirements under national legislation.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure implementation of ESMS</li> <li>Checks records of internal and external audits</li> <li>Check training records of workers</li> </ul>
C.32	Subcontractors and suppliers	<ul style="list-style-type: none"> <li>Subcontractors will be encouraged to follow the requirements of IFC PS2 Labor and Working Conditions). Contracts to be signed with sub-contractors will include EHS requirements.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Check contracts with subcontractors.</li> <li>Ensure that ESMS includes necessary environmental, health and safety provisions for subcontractors and suppliers.</li> </ul>
C.33	Workers' accommodation	<p>Workers' accommodation will be managed in line with the provisions of IFC PS2 provisions and the guidance note on worker's accommodation published by IFC and EBRD (Worker's Accommodation: Processes and Standards), and a relevant</p>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Audit of accommodation facilities to check whether appropriate conditions are</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>procedure will be set out in the ESMS. Special attention will be given to the following issues with regard to housing:</p> <ul style="list-style-type: none"> <li>• Minimum space allocated per person (floor area; cubic volume; or size and number of rooms),</li> <li>• Supply of safe water in the workers' dwelling in such quantities as to provide for all personal and household uses,</li> <li>• Adequate sewage and garbage disposal systems,</li> <li>• Appropriate protection against heat, cold, damp, noise, fire, and disease-carrying animals, and, in particular, insects,</li> <li>• Adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting,</li> <li>• A minimum degree of privacy both between individual persons within the household and for the members of the household against undue disturbance by external factors.</li> <li>• Necessary provisions for any health, fire safety or other hazards or disturbances and local facilities as well as the provision of first aid and medical facilities.</li> <li>• Workers freedom of movement to and from the employer-provided accommodation shall not be unduly restricted.</li> </ul>			<p>provided to the workers.</p>

## OPERATION PHASE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
<b>GENERAL</b>					
O.1	Environmental and Social Management system	Operation phase Environmental and Social Management System (ESMS) will be developed in line with international good practice and guidelines (i.e. ISO 9001: 2008 – Quality Management System, ISO 14001: 2004 – Environmental Management System, OHSAS 18001: 2007 – Occupational Health and Safety Management System). Necessary consultation will be made with the Ministry of Health (MoH) during the development of the ESMS.	IHIC and MoH (as necessary)	Prior to operation phase	<ul style="list-style-type: none"> <li>• Check ESMS documentation</li> <li>• Ensure that necessary management plans (as explained below) are in place</li> </ul>
O.2	Health Care Waste Management System	A Health Care Management System (HWMS) will be established and implemented as per IFC Requirements. Necessary consultation will be made with the Ministry of Health (MoH) during the development of the ESMS.	IHIC and MoH (as necessary)	Prior to operation phase	<ul style="list-style-type: none"> <li>• Check HWMS documentation</li> </ul>
O.3	Permitting	All necessary permits/consents/approvals will be obtained in accordance with the national legislation before starting operation.	IHIC and MoH	Prior to operation phase	<ul style="list-style-type: none"> <li>• Ensure that permits/consents/approvals are in place.</li> </ul>
O.4	Life and Fire Safety Audit	A Life and Fire Safety Audit will be made by qualified professionals in accordance with the requirements of IFC.	IHIC	Prior to operation phase	<ul style="list-style-type: none"> <li>• Check audit report</li> </ul>
O.5	Accreditation	Consultation will be made with the MoH to discuss obtaining a Joint Commission International (JCI) Accreditation for improved quality of services and patient safety.	IHIC and MoH	During operation	<ul style="list-style-type: none"> <li>• Check records of consultation and discussions made with the MoH</li> </ul>
<b>GEOLOGY, SOILS AND CONTAMINATED LAND</b>					
O.6	Spills/accidents and contaminated land	<ul style="list-style-type: none"> <li>• Hazardous materials will be handled according to the Hazardous Material Management Plan that is to be developed.</li> <li>• Hazardous and non-hazardous waste will be handled according to the Waste Management Plan (WMP) that has been developed for the Project and will be updated prior to operation.</li> <li>• Fuels, oils and chemicals will be stored on an impervious base protected by bunds to 110% of capacity. Drip trays will be used for fuelling mobile equipment.</li> <li>• Any spillages from handling fuel and liquids will be immediately contained on site and the contaminated soil removed from the site for suitable treatment and disposal.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>• Ensure that Hazardous Material Management Plan is in place.</li> <li>• Ensure implementation of the updated WMP.</li> <li>• Control whether appropriate designated storage areas are constructed for fuel, oils, chemicals, and hazardous and dangerous containers.</li> <li>• Ensure implementation of</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<ul style="list-style-type: none"> <li>Operation of a closed drainage system and implementation of Emergency Preparedness and Response Plan (EPRP) in the event of spills, fire etc. will prevent significant impacts on soils during operation.</li> </ul>			the EPRP
<b>HYDROLOGY AND HYDROGEOLOGY</b>					
O.7	Protection of surface water and groundwater	<ul style="list-style-type: none"> <li>Regular periodic integrity testing for hazardous material storage equipment (i.e. underground storage tanks and lines) will need to be conducted and appropriate leak detection systems will be in place.</li> <li>A Hazardous Material Management Plan should be developed to ensure proper handling of hazardous materials during operation of the IHC.</li> <li>The mitigation measures discussed under the title <i>Material Resources and Waste Management</i> Ref No: O.9 through O.11) will be implemented. The mitigation measures are specific to the management of wastes including storage, transport and disposal of waste materials generated during operation.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Check the records of regular integrity testing of underground storage tanks and lines</li> <li>Ensure that the Hazardous Material Management Plan is prepared and implemented.</li> </ul>
O.8	Spill response	<ul style="list-style-type: none"> <li>All staff and subcontractors will be required to report any incidents and these will be subject to investigation and remedial and preventive actions will be taken as needed.</li> <li>Spill response kits including absorbent materials suitable for the materials will be present on site. These will be kept at designated areas with specific instructions for their use. Site staff will be trained on the use of spill kits.</li> <li>An Emergency Preparedness and Response Plan should be developed to ensure mitigation of spills from hazardous materials during operation.</li> <li>Response to the spill will be made as fast as possible. Contaminated materials will be collected and sent to appropriate disposal facilities.</li> </ul>	IHIC	Construction phase	<ul style="list-style-type: none"> <li>Ensure that spill response materials and kits are in place.</li> <li>Ensure that the Emergency Preparedness and Response Plan is prepared and implemented as needed.</li> <li>Check whether the contaminated materials are properly disposed of.</li> </ul>
<b>MATERIAL RESOURCES AND WASTE MANAGEMENT</b>					
O.9	Supply of materials	Recycled materials and materials certified as eco-friendly and low carbon will be used to the extent possible.	IHIC and MoH	Operation phase	Identification of opportunities for use of recycled or low carbon sources.
O.10	Waste generation and management	<ul style="list-style-type: none"> <li>All wastes during operation will be managed in line with the Waste Management Plan that has been developed for the Project and will be updated prior to operation.</li> <li>The Integrated Health Campus (IHC) will establish, operate and maintain a Health Care Waste Management System (HWMS) adequate for the scale and</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure that updated WMP is implemented during operation phase.</li> <li>Update WMP every three years in accordance with the</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<p>type of activities and identified hazards.</p> <ul style="list-style-type: none"> <li>The waste management practices given in the IFC EHS guidelines for Health Care Facilities will be implemented.</li> <li>All waste will be collected, segregated, labeled and stored on site according to the WMP. The WMP addresses waste minimization, segregation, labeling, storage, transportation and recycling/disposal to meet the National and International standards.</li> <li>All wastes must be segregated according to their category and will be disposed of at relevant licensed facilities in accordance with regulatory requirements.</li> <li>Record keeping about waste generation, storage and transportation to third party waste management facilities will be maintained according to the details given in the updated WMP.</li> <li>Periodic inspections will be conducted in the waste recycling/ disposal facilities to ensure proper disposal practices are implemented.</li> <li>Turkish Atomic Energy Authority (TAEK) should be informed due to the radioactive waste generation and the radioactive waste disposal should be undertaken in accordance with relevant legislation of TAEK.</li> </ul>			<p>relevant regulations.</p> <ul style="list-style-type: none"> <li>Ensure that HWMS is implemented.</li> <li>Periodic inspections to ensure that all wastes are separately collected, segregated, labeled and stored in designated areas.</li> <li>Check disposal records of all types of wastes</li> <li>Check waste disposal contracts.</li> <li>Check copies of haulers' and disposal facilities' licenses.</li> <li>Check declaration records made to the Ministry of Environment and Urban Planning (MEUP).</li> <li>Ensure that all waste manifests are in order and ready for review during the audits of the Provincial Directorate of Environment.</li> <li>Check training records of staff and awareness during site audits.</li> </ul>
O.11	Wastewater	<ul style="list-style-type: none"> <li>Domestic wastewater discharge will be done to the municipality infrastructure and the necessary permits and protocols will be maintained for connection to the municipal sewer system.</li> <li>Procedures and mechanisms will need be in place for the separate collection of urine, feces, blood, and vomit from patients treated with geno-toxic drugs to avoid their entry into the wastewater stream.</li> <li>Appropriate treatment system will be installed, if needed for the treatment of contaminated wastewater during the operation of the IHC to meet the</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Check municipal sewer system connection certificate obtained from the relevant authority</li> <li>Check effluent analysis results to ensure they met discharge criteria</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		discharge limits for connection to municipal sewer line.			
<b>AIR QUALITY</b>					
O.12	General	<ul style="list-style-type: none"> <li>An Air Quality Control and Monitoring Plan will be developed to include mitigation measures that will be taken to minimize emissions during operation.</li> <li>Air Quality Control and Monitoring Plan will include details of sampling locations, monitoring frequency, methods of sampling for each parameter, applicable regulatory limits and will require analysis of samples by accredited laboratories.</li> <li>Direct and indirect greenhouse gas emissions will be quantified annually.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure that Air Quality Control and Monitoring Plan is prepared and implemented.</li> <li>Check results of air quality monitoring.</li> <li>Check records of greenhouse gas emission quantification</li> </ul>
O.13	Cogeneration System	<ul style="list-style-type: none"> <li>In order to reduce stack emission from the cogeneration system, a catalytic converter system or equivalent will be used.</li> <li>Efficiency of the reduction system will be monitored periodically.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Check results of stack gas emissions.</li> </ul>
O.14	Traffic	<ul style="list-style-type: none"> <li>An IHC Traffic Management Plan will be prepared and implemented which will decrease the impacts of the traffic load resulting from the operation activities.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure that IHC Traffic Management Plan is established and implemented.</li> </ul>
<b>NOISE</b>					
O.15	Noise	<ul style="list-style-type: none"> <li>'Low-noise' equipment will be used during operation phase as far as possible.</li> <li>All noise generating equipment and machinery during operation will be placed in buildings with isolated walls, and the design of the cogeneration buildings and the technical unit building and selection of silencers are made such that the indoor noise levels at the hospitals do not exceed the regulatory standards.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure use of noise silencers as needed.</li> <li>Perform indoor noise measurements</li> </ul>
<b>TRAFFIC IMPACT</b>					
O.16	General	<p>The following actions will need to be conducted to minimize the impacts created by the increased traffic during the operation phase of the IHC:</p> <ul style="list-style-type: none"> <li>IHC Traffic Management Plan: develop and implement a management plan within the campus that will take into account vehicular traffic, emergency conditions, pedestrian traffic entering, exiting and internal traffic.</li> </ul>	IHIC and Istanbul Metropolitan Municipality (as necessary)	Prior to operation phase	<ul style="list-style-type: none"> <li>Ensure that necessary traffic studies are conducted</li> <li>Ensure that IHC Traffic Management Plan is in place.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<ul style="list-style-type: none"> <li>Address potential noise and air pollutant loads that may be generated from the traffic loads predicted by the traffic study.</li> </ul>			
<b>SOCIO-ECONOMY</b>					
O.17	Economy and employment	<ul style="list-style-type: none"> <li>Recruitment procedures will be in line with IHIC Human Resources Policy that is to be developed for the Project. This will include the aim to provide opportunities for employment of local workforce to the extent possible considering unskilled, semi-skilled and skilled workforce.</li> <li>The Project will seek to deliver long term local community benefits through promoting local employment and purchasing local goods and services during the operation of the project to the extent possible.</li> <li>Transportation impacts will be minimized as far as possible with the establishment of an IHC Traffic Management Plan.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Check relevant records with regard to local employment and local purchasing policies.</li> </ul>
<b>COMMUNITY HEALTH AND SAFETY</b>					
O.18	Community health, safety and security (general)	<p>A Community Health and Safety Management Plan to be developed and implemented by IHIC to manage risks and impacts to the community and will cover the following:</p> <ul style="list-style-type: none"> <li>All relevant health and safety regulations will be followed during the operation of the Project in order to minimize accidents that may have impacts on the community and to control potential Project related releases and/or emissions.</li> <li>A grievance management system will be in place that will enable the community to raise concerns during the operation of the Project.</li> <li>All employees will be trained on health and safety, and Emergency Preparedness and Response Plan to respond timely to the incidents.</li> <li>All relevant mitigation measures described for the construction phase will be implemented.</li> </ul>	IHIC and MoH	Operation phase	<ul style="list-style-type: none"> <li>Ensure that the Community Health and Safety Management Plan is in place.</li> <li>Ensure that the grievances are handled appropriately and in a timely manner.</li> <li>Check records of health and safety training of employees.</li> </ul>
O.19	Air quality impacts on the nearby community	<ul style="list-style-type: none"> <li>IHIC will prepare and implement an Air Quality Control and Monitoring Plan during the operation phase of the Project.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure Air Quality Control and Monitoring Plan is in place.</li> </ul>
O.20	Road traffic	<ul style="list-style-type: none"> <li>Traffic signs will be placed at appropriate locations in order to prevent any accidents during construction and operation phases of the Project.</li> <li>An IHC Traffic Management Plan will be prepared to manage the internal traffic in the IHC.</li> </ul>	IHIC and Istanbul Metropolitan Municipality (as necessary)	Operation phase	<ul style="list-style-type: none"> <li>Ensure that the IHC Traffic Management Plan is in place.</li> <li>Ensure that traffic signs are placed sufficiently.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
O.21	Exposure to disease	<ul style="list-style-type: none"> <li>Potential disease risks to the community health and safety will be minimized with the implementation of the Waste Management Plan, Health Care Waste Management System and other mitigation measures as described under the title <i>Material Resources and Waste Management</i> Ref No: O.9 through O.11, and following all the applicable regulatory requirements related to waste management during the operation phase.</li> <li>IHIC will prepare and implement Exposure Control Plan for blood-borne pathogens.</li> <li>All mitigation measures described under the title <i>Labor and Working Conditions</i> Ref No: O.25 through O.29 will be implemented.</li> </ul>	IHIC and Ministry of Health (as necessary)	Operation phase	<ul style="list-style-type: none"> <li>Ensure that Exposure Control Plan is in place.</li> </ul>
O.22	Life and fire safety	<p>Fire safety measures will be taken by performing the following steps at a minimum:</p> <ul style="list-style-type: none"> <li>The IHC will be operated in full compliance with the "Regulation on the Protection of Buildings from Fire" Official Gazette 26735 Date 19.12.2007.</li> <li>IHIC will demonstrate that the buildings as well as life and fire safety systems and equipment will have been designed and installed appropriately at the facilities according to national requirements and internationally accepted life and fire safety standards such as Life Safety Code82.</li> <li>Maintenance of all fire safety systems in proper working order, including self-closing doors in escape routes and ventilation ducts with fire safety flaps.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure that Life and Fire Safety Master Plan is approved and implemented.</li> </ul>
O.23	Security	<ul style="list-style-type: none"> <li>A Security Plan will be developed to be implemented during the operation of the Project. Security will be provided in a manner that does not jeopardize the community's safety or IHIC's relationship with the community and that is consistent with national requirements.</li> <li>International best practice will be applied to hiring, training and mobilizing security staff. IHIC will ensure that security personnel have not been involved in past abuses and are adequately trained.</li> <li>Force will only be sanctioned in preventive or defensive circumstances in proportion to the threat and security will operate within the law.</li> </ul>	IHIC and MoH (as necessary)	Operation phase	<ul style="list-style-type: none"> <li>Ensure that the Security Plan is in place.</li> <li>Check credentials of security staff.</li> <li>Check training records of security staff.</li> </ul>
O.24	Hazardous materials	<ul style="list-style-type: none"> <li>All hazardous materials will be stored in designated areas having secondary containment and handled with care by authorized staff in order to prevent potential spills in accordance with the Hazardous Material Management Plan to be prepared.</li> </ul> <p>The Hazardous Material Management Plan will cover the following general measures:</p>	IHIC	Operation phase	<p>Ensure that Hazardous Material Management Plan is in place.</p>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
		<ul style="list-style-type: none"> <li>An inventory of hazardous materials will be maintained including a summary of the physical and chemical properties of the materials held or generated, to ensure that these are understood and that appropriate measures are in place to mitigate the potential hazards posed by them both to humans and the environment. Material Safety Data Sheets (MSDSs) for all stored materials and details on the segregation of potentially reactive materials will be kept. MSDSs will be held in both English and Turkish.</li> <li>Appropriate Personal Protective Equipment (PPE) will be made available to personnel involved in fuel and hazardous material handling; all relevant personnel will be trained in the use and maintenance of protective equipment.</li> <li>Hazardous material storage areas will be protected from rainfall and direct sunlight.</li> <li>Materials will be clearly labeled, segregated, protected from general access and stored on pallets to prevent the contamination of runoff.</li> <li>Suitable fire-fighting equipment will be located close to hazardous material storage areas.</li> <li>All personnel will be trained in the use of fire extinguishers.</li> <li>The overall volume of hazardous materials purchased and present on site will be minimized through careful stock control and materials inventory.</li> </ul>			
<b>LABOR AND WORKING CONDITIONS</b>					
O.25	General	<ul style="list-style-type: none"> <li>An Environmental and Social Management System (ESMS) covering operation activities and OHSAS 18001:2007 certificate requirements will be developed.</li> </ul>	IHIC and MoH (as necessary)	Operation phase	<ul style="list-style-type: none"> <li>Ensure establishment and implementation of ESMS.</li> </ul>
O.26	Human resources (HR)	<p>The following measures will be implemented related to recruitment and management of labor:</p> <ul style="list-style-type: none"> <li>An HR policy for IHIC will be developed.</li> <li>An HR manager will be appointed to ensure implementation of the HR policy.</li> <li>Employees will have contracts in place prior to commencement setting out working conditions, terms of employment and environmental, health and safety (EHS) responsibilities.</li> <li>All employees will be insured under Social Security Institution.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure implementation of the HR Policy.</li> <li>Check records of personnel files.</li> </ul>
O.27	Grievances	<ul style="list-style-type: none"> <li>A grievance mechanism will be developed for employees and included in the ESMS. Employees will be informed about this mechanism at the time of hiring.</li> <li>Grievance mechanism will be extended to non-employee workers in future.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>Ensure grievances are managed appropriately.</li> <li>Check relevant records.</li> </ul>

Ref No.	Subject	Mitigation measures	Responsible party	Timing	Monitoring and evaluation criteria
O.28	Occupational health and safety	<p>The following mitigation measures will be applied to manage the health and safety of the employees:</p> <ul style="list-style-type: none"> <li>• All applicable national health and safety legislation and international regulations will be followed.</li> <li>• All employees (including sub-contractors) will be trained on health and safety, and EPRP to respond timely to the incidents.</li> <li>• All the health and safety risks of each activity during operations will be identified followed by identification of the appropriate mitigation measures/personal protective equipment. This will be conducted as part of the OHSAS 18001:2007 certification process within the scope of ESMS. The risk and mitigation measures will ensure that the following items are considered at a minimum: <ul style="list-style-type: none"> <li>○ Development of a comprehensive plan to control radiation exposure</li> <li>○ Formulation of an Exposure Control Plan for blood-borne pathogens. In addition, staff members will be informed on infection control policies.</li> <li>○ Minimization of risks from hazardous material and hazardous wastes by appropriately following the Hazardous Material Management Plan, Waste Management Plan and Health Care Waste Management System (HWMS). These plans will be developed, implemented and monitored.</li> <li>○ Immunization for staff members, provision of necessary personal protection equipment for personnel involved in waste management, provision of necessary hand washing facilities.</li> </ul> </li> <li>• All accidents and incidents will be recorded.</li> <li>• The efficiency of health and safety practices will be monitored through internal and external audits, and corrective actions will be taken if required.</li> <li>• Fire safety measures at a minimum are described under <i>Community Health and Safety O.22</i>.</li> </ul>	IHIC and MoH	Operation phase	<ul style="list-style-type: none"> <li>• Ensure implementation of ESMS</li> <li>• Checks records of internal and external audits</li> <li>• Check training records of workers</li> <li>• Ensure Radiation Exposure Control Plan is in place.</li> <li>• Ensure Exposure Control Plan for Blood-borne Pathogens is in place.</li> <li>• Ensure Hazardous Material Management Plan is in place.</li> <li>• Ensure HWMS is established and implemented.</li> <li>• Check immunization records</li> <li>• Check records of accidents</li> </ul>
O.29	Subcontractors and suppliers	<ul style="list-style-type: none"> <li>• Subcontractors will be encouraged to follow the requirements of IFC PS2 (Labor and Working Conditions). Contracts to be signed with sub-contractors will include EHS requirements.</li> </ul>	IHIC	Operation phase	<ul style="list-style-type: none"> <li>• Check contracts with subcontractors.</li> <li>• Ensure that ESMS includes necessary environmental, health and safety provisions for subcontractors and suppliers.</li> </ul>

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## **ANNEX D**

### **Stakeholder Engagement Activities**

Annex D-1: List of Stakeholders

Annex D-2: Cover Letters, Project Information Documents and Public Consultation Meeting Information

D-2.1 Examples of Cover Letters Sent to Governmental Authorities, NGOs and Muhtars

D-2.2 Project Information Document

D-2.3 Project Information Leaflet

D-2.4 Comment/Complaint Form

D-2.5 Public Consultation Meeting Newspaper Advertisement and Photographs

Annex D-3: Stakeholder Register

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## **ANNEX D-1**

### **List of Stakeholders**

## List of Governmental Authorities contacted during the ESIA Study

GOVERNMENTAL BODIES		
Level	Organization	Relation to the Project
National	Ministry of Health (MoH), General Directorate of Health Investments	The Project has been proposed by MoH. MoH will be responsible for the provision of medical services during operation phase of the Project.
	MoH, General Directorate of Management Services	
	MoH, Public Hospitals Institution	
	MoH, General Directorate of Health Services	
	MoH, General Directorate of Emergency Health Services	
	MoH, Public Health Agency of Turkey	
	Ministry of Environment and Urban Planning (MEUP), General Directorate of EIA, Permit and Audit	MEUP has regulatory functions relating to the Project such as environmental impact assessment permits and environmental permitting.
	MEUP, General Directorate of Environmental Management	
	MEUP, General Directorate of Spatial Planning	
	MEUP, General Directorate of Protection of Natural Assets	These organizations may have specific views on protected sites, lakes and dams close to the Project site.
	Ministry of Forestry and Water Affairs (MoWA), General Directorate of State Hydraulics Works (DSI)	
	MoWA, General Directorate for Nature Protection and National Parks	
Ministry of Labor and Social Security (MoLSS), General Directorate of Labor	MoLSS may have specific views on labor and working conditions, and health and safety of healthcare personal.	
MoLSS, General Directorate of Occupational Health and Safety		
MoLSS, Social Security Institution		
Regional	Istanbul 14 <sup>th</sup> Regional Directorate of State Hydraulic Works	This organization may have specific views about the creek located at the east boundary of the project site.
	Istanbul 1 <sup>st</sup> Regional Directorate of Ministry of Forestry and Water Affairs	This organization may have specific views on the protected areas close to the Project area.
	Istanbul Regional Directorate of Labor and Social Security	Specific views may be given related to regional healthcare labor.
Provincial	The Governorship of Istanbul	The governorship is the highest authority in the province representing national government.
	The Metropolitan Municipality of Istanbul	The municipality and its relevant departments will have responsibilities relevant to the Project.
	Department of Istanbul Transport Coordination	The organization may have specific views on management of traffic related to Project and any planned road projects that may be important for the hospital.
	Istanbul Governorship Provincial Directorate of Health	These organizations are relevant in terms of provision of health services and healthcare labor in the province.
	Istanbul Governorship Provincial Directorate of Public Health	
	Istanbul Province General Secretariat of Public Hospitals	
	Istanbul Provincial Directorate of Social Security Institution	
Istanbul Provincial Directorates of Environment and Urbanization (PDEUP)	PDEUP has regulatory functions relating to the Project such as environmental impact assessment permits and environmental permitting.	

GOVERNMENTAL BODIES		
Level	Organization	Relation to the Project
Provincial	Istanbul Disaster and Emergency Management Directorate	This organization has a function to manage and respond to emergency cases.
	Istanbul Provincial Directorates of Culture and Tourism	These organizations are important stakeholders to identify and clarify the archaeological potential of the Project site.
	Istanbul 1st Regional Board Directorate of Cultural Assets Protection	
District	The Local Governorship of Adalar, The Municipality of Adalar	The Project site is located in Başakşehir District, and both the Local Governorship and the Municipality of Başakşehir are stakeholders regarding obtaining relevant permits, approvals and consents during planning, construction and operation of the Project. The other local governorships and municipalities are relevant as the Project covers several hospitals which are important for the community of all the other districts as well.
	The Local Governorship of Arnavutkoy, The Municipality of Arnavutkoy	
	The Local Governorship of Atasehir, The Municipality of Atasehir	
	The Local Governorship of Avcilar, The Municipality of Avcilar	
	The Local Governorship of Bagcilar, The Municipality of Bagcilar	
	The Local Governorship of Bahcelievler, The Municipality of Bahcelievler	
	The Local Governorship of Bakirkoy, The Municipality of Bakirkoy	
	The Local Governorship of Basaksehir, The Municipality of Basaksehir	
	The Local Governorship of Bayrampasa, The Municipality of Bayrampasa	
	The Local Governorship of Besiktas, The Municipality of Besiktas	
	The Local Governorship of Beykoz, The Municipality of Beykoz	
	The Local Governorship of Beylikduzu, The Municipality of Beylikduzu	
	The Local Governorship of Beyoglu, The Municipality of Beyoglu	
	The Local Governorship of Buyukcekmece, The Municipality of Buyukcekmece	
	The Local Governorship of Catalca, The Municipality of Catalca	
	The Local Governorship of Cekmekoy, The Municipality of Cekmekoy	
	The Local Governorship of Esenler, The Municipality of Esenler	
	The Local Governorship of Esenyurt, The Municipality of Esenyurt	
	The Local Governorship of Eyup, The Municipality of Eyup	
	The Local Governorship of Fatih, The Municipality of Fatih	
	The Local Governorship of Gaziosmanpasa, The Municipality of Gaziosmanpasa	
	The Local Governorship of Gungoren, The Municipality of Gungoren	
	The Local Governorship of Kadikoy, The Municipality of Kadikoy	
	The Local Governorship of Kagithane, The Municipality of Kagithane	
	The Local Governorship of Kartal, The Municipality of Kartal	
	The Local Governorship of Kucukcekmece, The Municipality of Kucukcekmece	
	The Local Governorship of Maltepe, The Municipality of Maltepe	
	The Local Governorship of Pendik, The Municipality of Pendik	
	The Local Governorship of Sancaktepe, The Municipality of Sancaktepe	
	The Local Governorship of Sariyer, The Municipality of Sariyer	
	The Local Governorship of Silivri, The Municipality of Silivri	
	The Local Governorship of Sultanbeyli, The Municipality of Sultanbeyli	
	The Local Governorship of Sultangazi, The Municipality of Sultangazi	
The Local Governorship of Sile, The Municipality of Sile		
The Local Governorship of Sisli, The Municipality of Sisli		
The Local Governorship of Tuzla, The Municipality of Tuzla		
The Local Governorship of Umraniye, The Municipality of Umraniye		
The Local Governorship of Uskudar, The Municipality of Uskudar		
The Local Governorship of Zeytinburnu, The Municipality of Zeytinburnu		

List of Non-Governmental Organizations contacted during the ESIA Study

NON-GOVERNMENTAL BODIES		
Level	Organization	Relation to the Project
National	Turkish Medical Association	Turkish Medical Association has previously filed a lawsuit for other three hospitals that are planned to be built through a public-private partnership (PPP) model and in general to the PPP model. It is important to engage with this association to understand their concerns.
	Trade Union of Public Employees in Health and Social Services	These associations together with the Turkish Medical Association has published a notice on negatives aspects of PPPs.
	Trade Union of Revolutionary Health Workers	
	Association of Social Service Specialists	
	Association of All Technicians of Radiology	
	Turkish Dental Association	
	Turkey Trade Union of Health Workers	
	Trade Union of Employees of Health and Social Services	
	Trade Union of All Employees of Health and Social Services	
	White Coat Trade Union of Health and Social Services	
	Trade Union of Medical Workers	
	Trade Union of Health and Social Services' Employees Rights	Trade unions are important stakeholders representing the labor rights of health sector personnel.
	Trade Union of Public Employees in Health and Social Service Branch in Turkey	
	Trade Union of Anatolian Health	
	Trade Union of Active Health	
	Independent Trade Union of Public Workers in Health and Social Services	
	Trade Union of Democratic Employees of Health and Social Services	
	United Trade Union of Public Workers in Health and Social Services	
	Turkish Red Crescent	
	Turkish Nurses Association	
	Pediatric Nurse Association	
	Oncologic Nurse Association	These associations are relevant social organizations working on different aspects of healthcare sector and may provide specific views on their areas of specialization.
	Urology Nurse Association	
	Obstetricians and Nurses Association	
	Turkish Intensive Care Nurses Association	
	Doctors' Rights Association	
	Doctors Association	
	Contemporary Pharmacist's Association	
	Association of Patient's and Patients' Relatives' Rights	
	Association of Health Employees	
	The Health Foundation of Turkey	
	Foundation of Hope in Health	Views of these associations are important to understand their expectations.
Health Tourism Association of Turkey		
Turkey Confederation of Disabled	Views of these associations are important to understand their expectations.	
Turkey Handicaped Association		

NON-GOVERNMENTAL BODIES		
Level	Organization	Relation to the Project
Provincial	Turkish Medical Association Istanbul Chamber of Medical Doctors	These organizations are representatives of similar national organizations and may provide specific views related to the issues in the province.
	Trade Union of Employees of Health and Social Services Istanbul Office	
	Trade Union of Health Workers Istanbul Office	
	Trade Union of Public Employees in Health and Social Services Istanbul Office	
	Trade Union for Service of Health and Social Services' Employees	
	Trade Union of Public Employees in Health and Social Services Branch Istanbul Office Number 5 (Closest to the Project Location)	
	Trade Union of All Employees of Health and Social Services Istanbul Representative	
	Trade Union of Anatolian Health Istanbul Representative	
	Trade Union of Active Health Istanbul Representative	
	Trade Union of Democratic Employees of Health and Social Services Istanbul	
	Association of Social Service Specialists Istanbul Office	
	Turkish Nurses Association Istanbul Office	
	Contemporary Pharmacist's Association Istanbul Office	
	Turkey Handicapped Association Istanbul Office	
	Turkish Red Crescent Istanbul Office	
	Chamber of Environmental Engineers (Istanbul Provincial Representative Office)	These chambers may provide provincial-specific and or site-specific views related to the project.
	Chamber of Urban Planners (Istanbul Office)	
	Chamber of Civil Engineers (Istanbul Office)	
	Chamber of Forest Engineers (Istanbul Office)	
	Chamber of Architects (Istanbul Office)	
Chamber of Geology Engineers (Istanbul Office)		

### List of Settlements contacted during the ESIA Study

SETTLEMENTS
<p>All neighbourhoods belonging to the Basaksehir, Kucukcekmece and Sultangazi are considered which are located within a diameter of approximately 5 km to the Project area:</p> <ul style="list-style-type: none"> <li>• Basaksehir District: Basaksehir, Basak, Ziyagokalp, Kayabasi, Guvercintepe, Sahintepe, Samlar Village, Altinsehir</li> <li>• Kucukcekmece District: Atakent, Ataturk, Mehmet Akif, Yarimburgaz</li> <li>• Sultangazi District: Habibler</li> </ul>

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## **ANNEX D-2**

### **Cover Letters, Project Information Documents and Public Consultation Meeting Information**

D-2.1 Examples of Cover letters Sent to Governmental Authorities, NGOs and Muhtars

D-2.2 Project Information Document

D-2.3 Project Information Leaflet

D-2.4 Comment/Complaint Form

D-2.5 Public Consultation Meeting Newspaper Advertisement and Photographs

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## **ANNEX D-2.1**

### **Examples of Cover Letters Sent to Governmental Authorities, NGOs and Headmen (Muhtars)**



İstanbul İkitelli Uluslararası  
Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.

Sayı: ISH0001-M

25.12.2013

**Konu: İkitelli Entegre Sağlık Kampüsü Projesi**

T.C. SAĞLIK BAKANLIĞI

Türkiye Kamu Hastaneleri Kurumu

Nahsur Akar Mah. Ziyabey Cad. 1407. Sok. Balgat/ANKARA

T.C. Sağlık Bakanlığı tarafından 2003 yılında başlatılan Sağlıkta Dönüşüm Programı çerçevesinde Türkiye genelinde kamu özel ortaklığı modeli ile Sağlık Kampüslerinin kurulması planlanmıştır. Bu kapsamda önerilen İkitelli Entegre Sağlık Kampüsü Projesi için T.C. Sağlık Bakanlığı tarafından ihale açılmış; ihaleyi kazanan ortak girişim grubu IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. adındaki özel amaçlı şirketi kurmuşlardır. Proje ile ilgili olarak T.C. Sağlık Bakanlığı ve IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. arasında 25 Mart 2013 tarihinde anlaşma imzalanmıştır. Anlaşma şartları uyarınca IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş., 28 yıllık bir proje süresi boyunca Projenin detaylı tasarımı, inşaatı, ekipmanların tedarigi, finansmanı ve Entegre Sağlık Kampüsü'nün bakım işlerinden sorumlu olacak; sağlık hizmetlerinin sunulması T.C. Sağlık Bakanlığı'nın sorumluluğunda olacaktır. 28 yıllık proje süresinin sonunda İkitelli Entegre Sağlık Kampüsü T.C. Sağlık Bakanlığı'na devredilecektir.

Projenin gerçekleşmesi için IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından uluslararası finansman kredisi kullanılması planlanmaktadır. Uluslararası finans kuruluşlarının gereklilikleri uyarınca, Projenin çevresel ve sosyal etkilerini inceleyecek olan bir Çevresel ve Sosyal Etki Değerlendirmesi (ÇSED) çalışmasının hazırlanması gerekmektedir. Bu bağlamda, IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından ÇSED çalışmasının hazırlanması amacıyla ELC Group Müşavirlik ve Mühendislik A.Ş. (ELC) görevlendirilmiştir. ÇSED çalışması, 2013 yılı Eylül ayında başlatılmış ve ÇSED kapsamında incelenecek olası çevresel ve sosyal etkilerin belirlenmesi amacıyla kapsam belirleme çalışması yapılmıştır. ÇSED çalışmalarının 2014 yılının ilk çeyreğinde tamamlanması planlanmaktadır.

ÇSED çalışmalarının bir parçası olarak, Proje'nin paydaşları ile iletişime geçmek uluslararası standartlar uyarınca önemli ve temel bir gerekliliktir. Bu çerçevede, kurumunuz açısından önem arz eden ve ÇSED çalışmaları kapsamında ele alınmasını gerekli gördüğünüz çevresel ve sosyal hususları anlamak Proje'nin planlama ve yapım sürecine olumlu katkı sağlayacaktır. Proje'nin potansiyel etkileri ile ilgili bilgi vermesi amacıyla, Projenin genel özellikleri ile olası çevresel ve sosyal etkileri özetleyen Proje Bilgilendirme Dokümanı ekte bilgilerinize sunulmaktadır. Bu itibarla, Proje ve ÇSED çalışmaları için değerlendirilmesi gerekli görülen hususların kurumunuz tarafından 20.01.2014 tarihine kadar aşağıda belirtilen iletişim bilgileri aracılığı ile ELC'ye iletilmesini arz ederiz.



İstanbul İkitelli Uluslararası  
Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.

Proje ile ilgili görüşlerinizi almaktan memnun olacağımızı belirtir, şimdiden ayıracağınız zaman ve katkılarınız için teşekkür ederiz.

Saygılarımızla,



Ek: Proje Bilgilendirme Dokümanı

İletişim Bilgileri:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20

KAVACIK/ İSTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)

Number: ISH00001-M

25.12.2013

Subject: İkitelli Integrated Health Campus Project

REPUBLIC OF TURKEY MINISTRY OF HEALTH  
Public Hospitals Institution  
Nahsur Akar Mah. Ziyabey Cad. 1407. Sok. Balgat/Ankara

Health Campuses are proposed to be developed across Turkey with public-private partnership in the scope of the Health Transformation Program which was initiated by the Ministry of Health (MoH) in 2003. A bid was tendered by the MoH for the İkitelli Integrated Health Campus Project, and awarded to a joint venture whose members built the current partnership structure in time and established a Special Purpose Vehicle named IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC). The Project's agreement has been signed between MoH and IHIC on March 25<sup>th</sup>, 2013. Under the terms of the agreement, IHIC will be responsible for the detailed design, construction, equipping, financing and maintenance of the IHC during the 28-year project period, while the provision of medical services will be the responsibility of the MoH. At the end of 28-year project period, the IHC will be transferred to the MoH.

IHIC is planning to use international finance credit for the development of the Project. In order to meet the requirements of international financial institutions, an Environmental and Social Impact Assessment (ESIA) study is required to be prepared for the assessment of the environmental and social impacts of the Project. In this regard, IHIC has appointed ELC Group Consulting and Engineering Inc. to undertake an ESIA study. The ESIA process started in September 2013 and a scoping study was conducted in order to identify potential environmental and social impacts to be covered in the ESIA. The ESIA studies are planned to be completed by first quarter of 2014.

As part of the ESIA studies, engagement with the Project's stakeholders is an essential and fundamental requirement according to the international standards. Within this context, understanding the environmental and social topics that are important for your authority and are required to be considered within the scope of the ESIA studies, will contribute positively to the planning and construction phases of the Project. In order to provide information on the Project, a Project Information Document summarizing the general characteristics of the Project and its potential environmental and social impacts is presented in the Annex. In this respect, it is requested that ELC is informed until 20.01.2014 through the contact information provided below about the issues that are considered necessary for the ESIA Studies.

We will be pleased to receive your opinions on the Project and would like to thank you in advance for your time and contribution.

Yours Sincerely,

Annex: Project Information Document

Contact Information:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20

KAVACIK/İSTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)



İstanbul İkitelli Uluslararası  
Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.

Sayı: ISH0002-M

25.12.2013

Konu: İkitelli Entegre Sağlık Kampüsü Projesi

#### TÜRK TABİPLER BİRLİĞİ

GMK Bulvarı Ş. Daniş Tunalıgil Sok. No:2/17-23 Maltepe/ANKARA

T.C. Sağlık Bakanlığı tarafından 2003 yılında başlatılan Sağlıkta Dönüşüm Programı çerçevesinde Türkiye genelinde kamu özel ortaklığı modeli ile Sağlık Kampüslerinin kurulması planlanmıştır. Bu kapsamda önerilen İkitelli Entegre Sağlık Kampüsü Projesi için T.C. Sağlık Bakanlığı tarafından ihale açılmış; ihaleyi kazanan ortak girişim grubu IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. adındaki özel amaçlı şirketi kurmuşlardır. Proje ile ilgili olarak T.C. Sağlık Bakanlığı ve IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. arasında 25 Mart 2013 tarihinde anlaşma imzalanmıştır. Anlaşma şartları uyarınca IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş., 28 yıllık bir proje süresi boyunca Projenin detaylı tasarımı, inşaatı, ekipmanların tedariki, finansmanı ve Entegre Sağlık Kampüsü'nün bakım işlerinden sorumlu olacak; sağlık hizmetlerinin sunulması T.C. Sağlık Bakanlığı'nın sorumluluğunda olacaktır. 28 yıllık proje süresinin sonunda İkitelli Entegre Sağlık Kampüsü T.C. Sağlık Bakanlığı'na devredilecektir.

Projenin gerçekleşmesi için IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından uluslararası finansman kredisi kullanılması planlanmaktadır. Uluslararası finans kuruluşlarının gereklilikleri uyarınca, Projenin çevresel ve sosyal etkilerini inceleyecek olan bir Çevresel ve Sosyal Etki Değerlendirmesi (ÇSED) çalışmasının hazırlanması gerekmektedir. Bu bağlamda, IHC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından ÇSED çalışmasının hazırlanması amacıyla ELC Group Müşavirlik ve Mühendislik A.Ş. (ELC) görevlendirilmiştir. ÇSED çalışması, 2013 yılı Eylül ayında başlatılmış ve ÇSED kapsamında incelenecek olası çevresel ve sosyal etkilerin belirlenmesi amacıyla kapsam belirleme çalışması yapılmıştır. ÇSED çalışmalarının 2014 yılının ilk çeyreğinde tamamlanması planlanmaktadır.

ÇSED çalışmalarının bir parçası olarak, Proje'nin paydaşları ile iletişime geçmek uluslararası standartlar uyarınca önemli ve temel bir gerekliliktir. Bu çerçevede, kurumunuz açısından önem arz eden ve ÇSED çalışmaları kapsamında ele alınmasını gerekli gördüğünüz çevresel ve sosyal hususları anlamak Proje'nin planlama ve yapım sürecine olumlu katkı sağlayacaktır. Proje'nin potansiyel etkileri ile ilgili bilgi vermesi amacıyla, Projenin genel özellikleri ile olası çevresel ve sosyal etkileri özetleyen Proje Bilgilendirme Dokümanı ekte bilgilerinize sunulmaktadır. Bu itibarla, Proje ve ÇSED çalışmaları için değerlendirilmesi gerekli görülen hususların kurumunuz tarafından 20.01.2014 tarihine kadar aşağıda belirtilen iletişim bilgileri aracılığı ile ELC'ye iletilmesini arz ederiz.



**İstanbul İkitelli Uluslararası  
Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.**

Proje ile ilgili görüşlerinizi almaktan memnun olacağımızı belirtir, şimdiden ayıracağınız zaman ve katkılarınız için teşekkür ederiz.

Saygılarımızla,



Ek: Proje Bilgilendirme Dokümanı

İletişim Bilgileri:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacak Mah. Şehit Mustafa Yazıcı Sok. No:20

KAVACIK/ İSTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)

Number: ISH00002-M

25.12.2013

Subject: İkitelli Integrated Health Campus Project

TURKISH MEDICAL ASSOCIATION

GMK Bulvarı Ş. Daniş Tunalıgil Sok. No:2/17-23 Maltepe/Ankara

Health Campuses are proposed to be developed across Turkey with public-private partnership in the scope of the Health Transformation Program which was initiated by the Ministry of Health (MoH) in 2003. A bid was tendered by the MoH for the İkitelli Integrated Health Campus Project, and awarded to a joint venture whose members built the current partnership structure in time and established a Special Purpose Vehicle named IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC). The Project's agreement has been signed between MoH and IHIC on March 25<sup>th</sup>, 2013. Under the terms of the agreement, IHIC will be responsible for the detailed design, construction, equipping, financing and maintenance of the IHC during the 28-year project period, while the provision of medical services will be the responsibility of the MoH. At the end of 28-year project period, the IHC will be transferred to the MoH.

IHIC is planning to use international finance credit for the development of the Project. In order to meet the requirements of international financial institutions, an Environmental and Social Impact Assessment (ESIA) study is required to be prepared for the assessment of the environmental and social impacts of the Project. In this regard, IHIC has appointed ELC Group Consulting and Engineering Inc. to undertake an ESIA study. The ESIA process started in September 2013 and a scoping study was conducted in order to identify potential environmental and social impacts to be covered in the ESIA. The ESIA studies are planned to be completed by first quarter of 2014.

As part of the ESIA studies, engagement with the Project's stakeholders is an essential and fundamental requirement according to the international standards. Within this context, understanding the environmental and social topics that are important for your authority and are required to be considered within the scope of the ESIA studies, will contribute positively to the planning and construction phases of the Project. In order to provide information on the Project, a Project Information Document summarizing the general characteristics of the Project and its potential environmental and social impacts is presented in the Annex. In this respect, it is requested that ELC is informed until 20.01.2014 through the contact information provided below about the issues that are considered necessary for the ESIA Studies.

We will be pleased to receive your opinions on the Project and would like to thank you in advance for your time and contribution.

Yours Sincerely,

Annex: Project Information Document

Contact Information:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20

KAVACIK/İSTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)



İstanbul İkitelli Uluslararası  
Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.

Sayı: ISH00003-M

25.12.2013

Konu: İkitelli Entegre Sağlık Kampüsü Projesi

#### GÜVERCİNTEPE MAHALLESİ MUHTARLIĞI

Güvercintepe Mah. Ahmet Yesevi Cad. Malazgirt Sok. Başakşehir/ İSTANBUL

T.C. Sağlık Bakanlığı tarafından 2003 yılında başlatılan Sağlıkta Dönüşüm Programı çerçevesinde Türkiye genelinde kamu özel ortaklığı modeli ile Sağlık Kampüslerinin kurulması planlanmıştır. Bu kapsamda önerilen İkitelli Entegre Sağlık Kampüsü Projesi için T.C. Sağlık Bakanlığı tarafından ihale açılmış; ihaleyi kazanan ortak girişim grubu IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. adındaki özel amaçlı şirketi kurmuşlardır. Proje ile ilgili olarak T.C. Sağlık Bakanlığı ve IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. arasında 25 Mart 2013 tarihinde anlaşma imzalanmıştır. Anlaşma şartları uyarınca IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş., 28 yıllık bir proje süresi boyunca Projenin detaylı tasarımı, inşaatı, ekipmanların tedarigi, finansmanı ve Entegre Sağlık Kampüsü'nün bakım işlerinden sorumlu olacak; sağlık hizmetlerinin sunulması T.C. Sağlık Bakanlığı'nın sorumluluğunda olacaktır. 28 yıllık proje süresinin sonunda İkitelli Entegre Sağlık Kampüsü T.C. Sağlık Bakanlığı'na devredilecektir.

Projenin gerçekleşmesi için IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından uluslararası finansman kredisi kullanılması planlanmaktadır. Uluslararası finans kuruluşlarının gereklilikleri uyarınca, Projenin çevresel ve sosyal etkilerini inceleyecek olan bir Çevresel ve Sosyal Etki Değerlendirmesi (ÇSED) çalışmasının hazırlanması gerekmektedir. Bu bağlamda, IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından ÇSED çalışmasının hazırlanması amacıyla ELC Group Müşavirlik ve Mühendislik A.Ş. (ELC) görevlendirilmiştir. ÇSED çalışması, 2013 yılı Eylül ayında başlatılmış ve ÇSED kapsamında incelenecek olası çevresel ve sosyal etkilerin belirlenmesi amacıyla kapsam belirleme çalışması yapılmıştır. ÇSED çalışmalarının 2014 yılının ilk çeyreğinde tamamlanması planlanmaktadır.

ÇSED çalışmalarının bir parçası olarak, Proje'nin paydaşları ile iletişime geçmek uluslararası standartlar uyarınca önemli ve temel bir gerekliliktir. Bu çerçevede, muhtarlığınız sorumluluk bölgesi açısından önem arz eden ve ÇSED çalışmaları kapsamında ele alınmasını gerekli gördüğünüz çevresel ve sosyal hususları anlamak Proje'nin planlama ve yapım sürecine olumlu katkı sağlayacaktır. Proje'nin potansiyel etkileri ile ilgili bilgi vermesi amacıyla, Projenin genel özellikleri ile olası çevresel ve sosyal etkileri özetleyen Proje Bilgilendirme Dokümanı ekte bilgilerinize sunulmaktadır. Buna ilaveten, görev alanınız dahilinde Proje ve olası etkileri ile ilgilenen halkla paylaşılmak üzere



İstanbul İkitelli Uluslararası  
Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.

hazırlanan broşürler ve görüş formları yazımız ekinde sunulmaktadır. Bu bilgiler doğrultusunda, Muhtarlığınız görev alanı dahilindeki (i) Halkın, Proje'ye ilişkin başlıca görüşleri, endişeleri ve/veya beklentileri ile ilgili öngörüleriniz, (ii) Halkınız içerisinde, varsa, bilgilendirilme çalışmaları kapsamında özel olarak ulaşılmasını gerekli gördüğünüz hassas gruplar/kişiler (örneğin; kadınlar, fakirler, engelli ve yaşlı vatandaşlar) olup olmadığı ile ilgili görüşlerinizi almaktan memnuniyet duyarız.

Bu itibarla, Proje ve ÇSED çalışmaları için değerlendirilmesi gerekli görülen hususların tarafınızca 20.01.2014 tarihine kadar aşağıda belirtilen iletişim bilgileri aracılığı ile ELC'ye iletilmesini arz ederiz. Proje ile ilgili görüşlerinizi almaktan memnun olacağımızı belirtir, şimdiden ayracağınız zaman ve katkılarınız için teşekkür ederiz.

Saygılarımızla,



Ek 1: 5 adet Proje Bilgilendirme Dokümanı

Ek 2: 25 adet Proje Bilgilendirme Broşürü

Ek 3: 25 adet Görüş Formu

İletişim Bilgileri:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20

KAVACIK/ İSTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)

Number: ISH00003-M

25.12.2013

Subject: İkitelli Integrated Health Campus Project

GÜVERCİNTEPE NEIGHBORHOOD MUHTAR OFFICE  
Güvercintepe Mah. Ahmet Yesevi Cad. Malazgirt Sok. Başakşehir/ İstanbul

Health Campuses are proposed to be developed across Turkey with public-private partnership in the scope of the Health Transformation Program which was initiated by the Ministry of Health (MoH) in 2003. A bid was tendered by the MoH for the İkitelli Integrated Health Campus Project, and awarded to a joint venture whose members built the current partnership structure in time and established a Special Purpose Vehicle named IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC). The Project's agreement has been signed between MoH and IHIC on March 25<sup>th</sup>, 2013. Under the terms of the agreement, IHIC will be responsible for the detailed design, construction, equipping, financing and maintenance of the IHC during the 28-year project period, while the provision of medical services will be the responsibility of the MoH. At the end of 28-year project period, the IHC will be transferred to the MoH.

IHIC is planning to use international finance credit for the development of the Project. In order to meet the requirements of international financial institutions, an Environmental and Social Impact Assessment (ESIA) study is required to be prepared for the assessment of the environmental and social impacts of the Project. In this regard, IHIC has appointed ELC Group Consulting and Engineering Inc. to undertake an ESIA study. The ESIA process started in September 2013 and a scoping study was conducted in order to identify potential environmental and social impacts to be covered in the ESIA. The ESIA studies are planned to be completed by first quarter of 2014.

As part of the ESIA studies, engagement with the Project's stakeholders is an essential and fundamental requirement according to the international standards. Within this context, understanding the environmental and social topics that are important for the jurisdiction area of your muhtar office and are required to be considered within the scope of the ESIA studies, will contribute positively to the planning and construction phases of the Project. In order to provide information on the Project, a Project Information Document summarizing the general characteristics of the Project and its potential environmental and social impacts is presented in the Annex. In addition, leaflets and opinion forms are provided in the annexes to be shared with the interested public within your jurisdiction area. Based on this information, we would be pleased to get your thoughts on (i) opinions, concerns and/or expectations of the Public in your neighborhood, (ii) whether there are any vulnerable groups/people (e.g. women, poor, disabled and old people) that you think are required to be consulted within the scope of consultation activities.

In this respect, it is requested that ELC is informed until 20.01.2014 through the contact information provided below about the issues that are considered necessary for the ESIA Studies.

We will be pleased to receive your opinions on the Project and would like to thank you in advance for your time and contribution.

Yours Sincerely,

Annex 1: 5 Project Information Documents

Annex 2: 25 Project Information Leaflets

Annex 3: 25 Opinion Forms

Contact Information:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20

KAVACIK/İSTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)

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## **ANNEX D-2.2**

### **Project Information Document**



# **Proje Bilgilendirme Dokümanı**

## **İkitelli Entegre Sağlık Kampüsü Projesi**

**Aralık 2013**

**IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri  
Yatırım ve İşletme A.Ş.**

## Giriş

Bu Proje Bilgilendirme Dokümanı, İkitelli Entegre Sağlık Kampüsü Projesi (Proje) ile ilgili bilgiler içermektedir. Bu doküman, Projeye ait paydaş katılım süreci kapsamında Proje ile ilgilenen kurum ve kişilere Proje ile ilgili bilgi sağlamak ve bu kurum ve kişilerin görüşlerini almak amacıyla hazırlanmıştır. Böylelikle, alınan görüşler Çevresel ve Sosyal Etki Değerlendirmesi (ÇSED) çalışmasında dikkate alınabilecektir.

Türkiye’de sağlık sistemi, 2003 yılında başlatılan Sağlıkta Dönüşüm Programı kapsamında geliştirilmektedir. Bu programın amacı, bir takım reformlar gerçekleştirilerek sağlık sisteminin kalitesini, verimini ve sağlık tesislerine erişimi arttırmaktır. Sağlıkta Dönüşüm Programı kapsamında T.C. Sağlık Bakanlığı; bölgenin sağlık hizmeti ihtiyacı, coğrafi yapısı, hasta akışı, ulaşılabilirliği ve sosyo-ekonomik yapısı dikkate alınarak belirlenmiş olan 29 sağlık bölgesine hizmet vermek üzere 22 ilde farklı büyüklük ve kapasitelerde 30 Sağlık Kampüsü kurmayı planlamıştır. Şimdiye kadar, şu anda farklı planlama aşamasında olan 20 Sağlık Kampüsü projesi önerilmiştir. İkitelli Entegre Sağlık Kampüsü Projesi, bu 20 projeden biri olup, T.C. Sağlık Bakanlığı tarafından Kamu Özel Ortaklığı modeli ile gerçekleştirilecek ve 29. sağlık bölgesini oluşturan İstanbul’un Büyükçekmece, Küçükçekmece, Beylikdüzü, Başakşehir, Silivri, Çatalca Esenyurt ve Avcılar ilçelerine hizmet verecektir.

İkitelli Entegre Sağlık Kampüsü Yapım İşleri ile Ürün ve Hizmetlerin Temin Edilmesi İşi için T.C. Sağlık Bakanlığı tarafından ihale açılmış; bu ihaleyi Emsaş İnşaat Turizm Ticaret ve Sanayi A.Ş. (“EMSAŞ”), Sürat Bilişim Teknolojileri Sanayi Ticaret A.Ş. (“SÜRAT”) ve Sağlık Kentleri İnşaat Ticaret ve Hizmet Yönetimleri A.Ş. (PBK Architects Inc., Ascension Group Architects L.P., Allen Shariff Corporation, Meinhardt Group Pte. Ltd., May Eczanesi, Forcimsa Empresa Constructora, S.A., Consortio Intenational Engineering Consultants and Şahin Tıp Sanayi ve Ticaret Ltd. Şti ortaklığı) tarafından kurulmuş olan konsorsiyum kazanmış ve bu firmalar tarafından özel amaçlı şirket olan IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC) kurulmuştur. Proje ile ilgili olarak IHIC ile T.C. Sağlık Bakanlığı arasında 25 Mart 2013’te anlaşma imzalanmıştır.

T.C. Sağlık Bakanlığı ile yapılan anlaşmaya göre IHIC, 28 yıllık proje süresi boyunca detaylı tasarım, inşaat, ekipmanların tedariği, finansman ve Entegre Sağlık Kampüsünün bakım işlerinden sorumlu olacak olup, sağlık hizmetlerinin sunulması T.C. Sağlık Bakanlığı'nın sorumluluğunda olacaktır. 28 yıllık proje süresi sonunda Entegre Sağlık Kampüsü T.C. Sağlık Bakanlığı'na devredilecektir.

Proje, İstanbul ilinin Başakşehir ilçesinde yer almakta olup toplam 789.031 m<sup>2</sup> alanı kaplamaktadır. Projenin yeri Şekil 1’de gösterilmektedir.



Şekil 1. İkitelli Entegre Sağlık Kampüsü Konumu

### Projenin Ana Bileşenleri

Proje, toplam 2.682 yatak kapasiteli sekiz farklı hastaneyi kapsayan bir entegre sağlık kampüsü projesidir. Bu hastaneler:

- 443 yatak kapasiteli Genel Hastane
- 451 yatak kapasiteli Çocuk Hastanesi
- 451 yatak kapasiteli Kadın Doğum Hastanesi
- 359 yatak kapasiteli Onkoloji Hastanesi
- 347 yatak kapasiteli Nörolojik ve Ortopedik Bilimler Hastanesi
- 303 yatak kapasiteli Kalp Hastalıkları Hastanesi
- 128 yatak kapasiteli Psikiyatri Hastanesi
- 200 yatak kapasiteli Fizik Tedavi ve Rehabilitasyon Hastanesi'dir.

Sağlık kampüsü arasından geçen bir yolla ayrılan iki kısımdan oluşacaktır. Proje sahasının kuzey kısmında altı hastane binası, bir teşhis ve tedavi kütesi, bir teknik merkez binası, idari bölüm ve konferans salonları bulunacaktır. Bu kısımda ayrıca bir meydan ve trijenerasyon ünitesi de yer alacaktır. Proje sahasının güney kısmında ise Psikiyatri Hastanesi ve Fizik Tedavi ve Rehabilitasyon Hastanesi bulunacaktır.

Hastanelerin kuzey ve güney kısımlarını gösteren vaziyet planları Şekil 2 ve Şekil 3'te verilmektedir.



Şekil 2. Proje sahasının kuzeyinde yer alan hastanelerin vaziyet planı



Şekil 3. Proje sahasının güneyinde yer alan hastanelerin vaziyet planı

Hastanelerin toplam yatak kapasiteleri Tablo 1’de verilmiştir.

Tablo 1. Her bir hastanenin ünitelerinin yatak dağılımları

Hastane	Klinik Servis	Yoğun Bakım Ünitesi	Diğer Üniteler	VIP Yataklar	Toplam Yatak Kapasitesi
Genel Hastane	352	48	24	19	443
Çocuk Hastanesi	352	48	32	19	451
Kadın Doğum Hastanesi	256	48	128	19	451
Onkoloji Hastanesi	256	48	36	19	359
Nörolojik ve Ortopedik Bilimler Hastanesi	256	60	12	19	347
Kalp Hastalıkları Hastanesi	192	48	44	19	303
Psikiyatri Hastanesi	128	-	-	-	128
Fizik Tedavi ve Rehabilitasyon Hastanesi	200	-	-	-	200
<b>Total</b>	<b>1.992</b>	<b>300</b>	<b>276</b>	<b>114</b>	<b>2.682</b>

Projenin günde 100.000 kişiye hizmet vermesi planlanmaktadır. Hastaneye ulaşım metro hattı (Proje sahasının kuzey kesimine devlet tarafından bir metro istasyonu inşa edilmesi planlanmaktadır), otobüs ve hususi araçlarla sağlanacaktır. Öngörülen günlük olarak hastaneye gelecek kişi sayısı Tablo 2’de verilmiştir.

Tablo 2. Hastanelere günlük olarak gelecek kişi sayısı

Tanım	İnsan Sayısı/ Gün
Polikliniklere gelecek insan sayısı	57.760
Acil kliniğine gelecek hasta sayısı	14.440
Hastaneye günlük olarak gelecek ziyaretçi sayısı	5.364
Yönetim için çalışan personel sayısı	4.300
IHC için çalışan personel sayısı	3.011
Ticari alanlara gelen insan sayısı	15.125
<b>Toplam</b>	<b>100.000</b>

### Projenin Mevcut Durumu ve Önerilen Faaliyetler

Proje, şu anda planlama aşamasındadır. İnşaat aşamasının yaklaşık olarak 36 ay süreceği öngörülmektedir. Önerilen projenin bir parçası olarak aşağıdaki ana faaliyetler planlanmaktadır:

- Detaylı tasarım çalışmaları
- Mobilizasyon ve zemin işleri
- Hastane ve diğer ünitelerin inşası
- Altyapı (tıbbi altyapı, elektrik, su, atıksu)
- Peyzaj ve düzenleme çalışmaları
- Genel temizlik ve dezenfeksiyon çalışmaları
- Test, başlangıç ve işletme aşaması.

## Çevresel ve Sosyal Etki Değerlendirmesi (ÇSED) Süreci

IHIC, Projenin gelişimini desteklemek üzere uluslararası finans kuruluşlarından finansman kredisi kullanmayı planlamaktadır. Uluslararası finans kuruluşlarının kredi sağlama şartlarından biri ÇSED Raporunun hazırlanması olup, mevcut durumda bu rapor hazırlanmaktadır. Uluslararası finans kuruluşlarının gerekliliklerini yerine getirmek amacıyla, projenin çevresel ve sosyal etkilerinin belirlenmesi ve inşaat ve işletme aşamalarında önemli etkilerin nasıl azaltılacağı, yönetileceği ve izleneceğini belirleyen bir Çevresel ve Sosyal Yönetim Planının hazırlanması için IHIC tarafından ELC Group Müşavirlik ve Mühendislik A.Ş. (ELC) firması görevlendirilmiştir. ÇSED çalışması, 2013 yılı Eylül ayında başlatılmış ve ÇSED kapsamında incelenecek olası çevresel ve sosyal etkilerin belirlenmesi amacıyla kapsam belirleme çalışması yapılmıştır. ÇSED çalışmalarının 2014 yılının ilk çeyreğinde tamamlanması planlanmaktadır.

IHIC, Projenin farklı aşamaları ve paydaş grupları için paydaş katılım faaliyetleri gerçekleştirecektir. Proje'nin paydaşlarını; ülke, bölge, il, ilçe ve mahalle düzeyindeki resmi kurumlar; sivil toplum kuruluşları ve yerel halk oluşturmaktadır. Paydaşlar ile iletişime geçmede kullanılacak olan ana yöntemler arasında Proje Bilgilendirme Dokümanının gönderilmesi, temel paydaşlar ile toplantılar, halk toplantıları, yerel gazeteler ile yapılan duyurular ve proje bilgilerinin projeye ait web sitesinde sunulması bulunmaktadır.

Değerlendirme çalışmalarının sonunda bir taslak ÇSED raporu hazırlanacak ve incelenip yorum yapılabilmesi için Türkçe olarak sunulacaktır. Etki değerlendirme çalışmasının sonuçları ve uygulanacak olan hafifletici önlemler ile ilgili olarak halkın bilgilendirilmesi için en az iki hafta öncesinden ilan edilecek olan bir halk toplantısı düzenlenecektir. Uygun olan görüşler, ÇSED çalışmanın sonlandırılması sırasında dikkate alınacaktır.

Bununla birlikte, ÇSED çalışmasının ilgili tüm hususları ele almasını sağlamak amacıyla bu proje bilgilendirme dokümanı, önemli olan ve ÇSED kapsamında ele alınması gerektiği düşünülen çevresel ve sosyal konular ile ilgili görüş alabilmek amacıyla çeşitli kuruluşlara gönderilmekte ve halka ulaştırılmaktadır.

## Projenin Olası Çevresel ve Sosyal Etkileri

Proje'nin olası temel çevresel ve sosyal etkileri, ÇSED kapsam belirleme çalışması sırasında belirlenmiştir. Belirlenen bu etkiler, ÇSED çalışması sırasında daha detaylı olarak incelenecektir. Söz konusu temel konular aşağıda özetlenmiştir:

- **Hava Kalitesi:** İnşaat sürecinde inşaat faaliyetleri, inşaat malzemelerinin nakliyesi ve hafriyat toprağının proje sahası dışına taşınması, asfaltlanmamış yollar ve yardımcı tesisler (100 m<sup>3</sup>/saat kapasitede beton santrali vb.) nedeniyle toz ve egzoz emisyonlarının oluşmasından dolayı etkiler oluşabilir. İşletme aşamasındaki etkiler, yol trafiğinde artış; ısınma ve havalandırma sistemlerinden kaynaklanan egzoz gazları; tıbbi atık depolama alanları, tıbbi teknoloji alanları ve izole alanlar gibi alanlardan kaynaklanan tıbbi gazlar ile kaçak emisyonların havalandırılması; ve enerji üretimi kaynaklı emisyonları içermektedir.
- **Gürültü ve Titreşim:** Proje inşaat aşamasında; kullanılan ekipmanlar, çalışan araçlar ve inşaat trafiğinden kaynaklanabilecek gürültüden dolayı yakın yerleşim birimlerini etkileme potansiyeline

sahiptir. İşletme aşamasındaki olası gürültü kaynakları ise artan yol trafiği ve trijenerasyon sistemi ve jeneratörlerin işletilmesidir.

- **Atıksu:** İnşaat aşamasında çalışan işçilerden, işletme aşamasında çalışan işçi/sağlık personeli ve hastalardan kaynaklanan evsel atıksu oluşumu söz konusu olacaktır. Hasta odaları, ameliyathaneler, laboratuvarlar, ilaç ve kimyasal depoları, temizlik faaliyetleri ve röntgen alanlarından kontamine olmuş atıksu meydana gelebilir. Otoklavlama ve mikrodalga ışınlarının kullanıldığı alanlardan ve kimyasal dezenfeksiyondan kaynaklanan atıksu oluşumu da söz konusu olabilir.
- **Atık Yönetimi:** Projenin inşaat aşamasında hafriyat toprağı, katı atıklar, inşaat atıkları (çelik, kablo vb.) ve tehlikeli atıklar (atık yağ, yağlı bezler gibi) gibi bertaraf edilmesi gereken atıklar oluşacaktır. İşletme aşamasında evsel atıklar, genel tehlikeli atıklar ve tıbbi atıklar oluşacaktır. Sağlık tesislerinden kaynaklanan atıklar arasında patojen içeren enfeksiyöz atıklar; iğne ve bıçak gibi kesici-delici atıklar; ilaç atıkları; mutajenik, teratojenik veya karsinojenik özellik taşıyabilecek genotoksik/sitotoksik atıklar; tedaviler/deneyler, temizlik ve dezenfeksiyon işlerinde kullanılan kimyasallardan kaynaklanan kimyasal atıklar; görüntüleme, radyoterapi, araştırma laboratuvarları gibi kaynaklardan oluşabilecek radyoaktif atıklar; pil, termometre, kan basıncı ölçme cihazları gibi yüksek miktarda ağır metal içeren atıklar; basınçlı kaplar bulunmaktadır.
- **Kültürel Miras:** ÇSED kapsam belirleme çalışması sırasında proje sahası arkeoloji uzmanları tarafından ziyaret edilmiştir. İnceleme sonucunda proje sahasının arkeolojik potansiyele sahip olabileceği belirlenmiş ve bu durum daha detaylı bir araştırma gerekliliğini ortaya koymuştur. Daha detaylı bilgi edinmek amacıyla proje sahasında jeofizik çalışması yapılacaktır.
- **Trafik ve Ulaşım:** Proje, işletme aşamasında hastane trafiğinden kaynaklı yerel yollarda trafik artışına sebep olabilir ve ilgili önlemlerin alınmasını gerekebilir.
- **Sosyo-ekonomik Etkiler:** Proje, inşaat ve işletme aşamalarında istihdam olanakları yaratacak olup yerel iş yerlerine pozitif katkı sağlayabilir.
- **İşçi Sağlığı ve Güvenliği:** İnşaat süresince gerçekleştirilecek çalışmalarda çalışanların yaralanma veya zarar görme riski bulunmaktadır. İşletme aşaması ile ilgili olarak enfeksiyona, hastalıklara, tehlikeli maddelere/atıklara ve radyasyona maruz kalma; kimyasal ve yanıcı maddelerin depolanması, taşınması ve bulunmasına bağlı olarak yangın riskinden kaynaklı etkilerin oluşması söz konusu olabilir.
- **Toplum Sağlığı, Güvenliği ve Emniyeti:** İnşaat süresince çevredeki yerleşim birimlerini de etkileyebilecek olan toz, gürültü ve titreşim meydana gelecektir. İşletme aşamasındaki etkiler ise yol trafiğindeki artış ve tıbbi atıkların yönetilmesi ile ilgilidir.

## **Görüş Bildirme Fırsatı**

Bu doküman, Projeden etkilenebilecek ya da Proje ve etkileri ile ilgilenen kurum ve kişilerle (Paydaşlar olarak anılmaktadır) iletişime geçerek Proje ile ilgili bilgi vermek ve görüşlerini almak amacıyla hazırlanmıştır. Böylelikle, alınan görüşler ÇSED çalışmasında dikkate alınabilecektir. Proje'nin paydaşlarını ülke, bölge, il, ilçe ve mahalle düzeyindeki resmi kurumlar; sivil toplum kuruluşları ve yerel halk oluşturmaktadır.

Bu Proje Bilgilendirme Dokümanı ile sizi Proje'nin temel çevresel ve sosyal konuları ve alınması gereken önlemler ile ilgili görüşlerinizi sunmaya davet ediyoruz. Proje bilgilendirme dokümanlarına IHIC'in internet adresinden de ulaşabilirsiniz:

[www.ikitellisehirhastanesippp.com](http://www.ikitellisehirhastanesippp.com)

Lütfen görüşlerinizi e-posta yolu ile ya da aşağıda verilen posta adresine yazılı olarak gönderiniz:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok.

No:20 Kavacık/İSTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)



**Project Information Document**  
**İkitelli Integrated Health Campus Project**

December 2013

**IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri**  
**Yatırım ve İşletme A.Ş.**

## Introduction

This Project Information Document describes the Ikitelli Integrated Health Campus Project (Project). It has been prepared within the scope of Stakeholder Engagement process for the Project in order to inform and get the views of the interested organizations and individuals so that these views can be taken into account in undertaking the Environmental and Social Impact Assessment (ESIA) for the Project.

The healthcare system in Turkey is being developed under the Health Transformation Program which was initiated in 2003. The purpose of this program is to increase the quality and efficiency of the healthcare system and enhance access to healthcare facilities with the introduction of a number of reforms. Within the scope of the Health Transformation Program, Ministry of Health (MoH) has planned to develop 30 Health Campuses in 22 provinces with different sizes and bed capacities to serve 29 health regions among Turkey, which were determined based on the need for health services, geographical structure, patient flow, accessibility and socioeconomic conditions. Until now, 20 Health Campus projects have been introduced which are currently at different stages of planning. Ikitelli Integrated Health Campus Project is one of these 20 projects, which has been proposed by the MoH as part of the public private partnership projects to serve to the 29<sup>th</sup> health region that covers Büyükçekmece, Küçükçekmece, Beylikdüzü, Başakşehir, Silivri, Çatalca, Esenyurt and Avcılar districts of Istanbul.

A bid was tendered by the MoH for the Construction Works and the Provision of Products and Services for Ikitelli Integrated Health Campus, and awarded to a joint venture of ten companies, including Emsaş İnşaat Turizm Ticaret ve Sanayi A.Ş. (“EMSAS”), Sürat Bilişim Teknolojileri Sanayi Ticaret A.Ş. (“SURAT”) and Sağlık Kentleri İnşaat Ticaret ve Hizmet Yönetimleri A.Ş. (founded by eight companies including PBK Architects Inc., Ascension Group Architects L.P., Allen Shariff Corporation, Meinhardt Group Pte. Ltd., May Eczanesi, Forcimsa Empresa Constructora, S.A., Consortio Intenational Engineering Consultants and Şahin Tıp Sanayi ve Ticaret Ltd. Şti). The joint venture has established a Special Purpose Vehicle named “Istanbul İkitelli International Healthcare Investments Incorporation (IHIC)” and the Project’s agreement has been signed between MoH and IHIC in 25<sup>th</sup> March 2013.

Under the terms of the agreement with MoH, IHIC will be responsible for the detailed design, construction, equipping, financing, maintenance and operation of the Integrated Health Campus for a 28-year project period (covering a construction period of 3 years and an operation period of 25 years), while the provision of medical services will be the responsibility of the MoH. At the end of the project period, the Ikitelli Integrated Health Campus will be transferred to the MoH.

The Project is located in the Başakşehir District of Istanbul Province and covers an area of 789,031m<sup>2</sup>. The Project location is provided in Figure 1.



Figure 1. Location of the Ikitelli Integrated Health Campus Project

### Main Components of the Project

The Project comprises of an integrated health campus with a total capacity of 2,682 beds consisting of eight hospitals which are listed below:

- 443-bed General Hospital
- 451-bed Children's Hospital
- 451-bed Women's Hospital
- 359-bed Oncology Hospital
- 347-bed Neurological Sciences & Orthopedic Hospital
- 303-bed Cardiovascular Hospital
- 128-bed Psychiatric Hospital
- 200-bed Physical Therapy and Rehabilitation Hospital.

The campus will consist of two lands which are separated by a road. The northern part of the Project area will include 6 hospital buildings, a diagnostic and treatment block, one central plant, administration area and conference hall. This part will also include a ceremonial square and a trigeneration unit building. The Southern part of the Project area will consist of Psychiatric Hospital and Physical Therapy and Rehabilitation Hospital.

The layout of the hospitals in the northern and southern part is shown in Figure 2 and Figure 3.



Figure 2. Layout of the Hospitals in the North Part of the Project Area



Figure 3. Layout of the Hospitals and Other Units in the Southern Part of the Project Area

Total bed capacities of each hospital is given in Table 1.

Table 1. Bed Distribution of Each Hospital Unit

Hospital	Clinical Services	Intensive Care Unit	Other Units	VIP Beds	Total Bed Capacities
General Hospital	352	48	24	19	443
Children’s Hospital	352	48	32	19	451
Women’s Hospital	256	48	128	19	451
Oncology Hospital	256	48	36	19	359
Neurological Sciences & Orthopedic Hospital	256	60	12	19	347
Cardiovascular Hospital	192	48	44	19	303
Psychiatric Hospital	128	-	-	-	128
Physical Therapy and Rehabilitation Hospital	200	-	-	-	200
<b>Total</b>	<b>1,992</b>	<b>300</b>	<b>276</b>	<b>114</b>	<b>2,682</b>

The plan is to serve total of 100,000 people per day. The transportation will be provided by a metro line (which is planned to be built and located inside the northern part of the project area by the state) together with bus lines and private cars, as projected. The projected daily people circulation is given in Table2.

Table 2. Daily Person Circulation of Hospitals

Definition	Number of People/Day
People who will come to polyclinic	57,760
Patients who will come to emergency clinics	14,440
Visitors who will come to the hospital daily	5,364
Staff who is working for administration	4,300
Staff who is working for IHIC	3,011
People who are coming to commercial area	15,125
<b>Total</b>	<b>100,000</b>

### Current Status of the Project and Proposed Activities

The Project is currently in planning phase. Construction is estimated to take approximately 36 months. The following key activities are planned as part of the proposed project:

- Detailed design works
- Mobilization and groundworks
- Construction of hospitals and other units
- Infrastructure (medical infrastructure electricity, water, wastewater)
- Landscaping and reclamation works
- General cleaning and disinfection works
- Start up and commissioning phase.

## **Environmental and Social Impact Assessment (ESIA) Process**

IHIC is seeking finance from multinational financial institutions (FIs) including export credit agencies to fund the development of the Project. One of the requirements of these FIs for granting loans is the preparation of an ESIA Report which is currently being prepared. In order to meet the requirements of FIs, IHIC has commissioned ELC Group Engineering and Consultancy Inc. (ELC) to undertake an ESIA study that will identify the environmental and social impacts of the project and be accompanied by an Environmental and Social Management Plan (ESMP) that identifies how significant impacts will be mitigated, managed and monitored during the construction and operation phases of the Project. The ESIA process for the project has started in September 2013 with initiation of a scoping study. The ESIA studies are planned to be completed within the first quarter of 2014.

IHIC will use consultation approaches and methods for different stages of the Project activities and stakeholder groups. Stakeholders for the Project will include governmental authorities at national, regional, provincial, district and neighbourhood levels; and non-governmental organizations and the wider community. The main communication methods and mechanisms to be used to consult with key stakeholders will include sending out this Project Information Document, meetings with key stakeholders, public meetings, announcements through local newspapers, and disclosure of project information at the project website.

At the end of the assessment studies, a draft ESIA report will be prepared and disclosed in Turkish language for review and comment. A public meeting to be announced at least two weeks ago will be held to inform the public about the results of the impact assessment study and on which mitigation measures will be implemented. Appropriate comments will be taken into account in finalizing the ESIA.

In the meantime, to ensure that the ESIA studies address all the relevant issues, this Project Information Document is being sent to a range of different organizations and provided to the public, with a request for comments on the environmental and social topics that are considered to be of concern and deemed to be addressed in the ESIA.

## **Potential Environmental and Social Issues of the Project**

Based on the scoping study undertaken during ESIA studies, key potential environmental and social impacts of the Project are identified which will be investigated in more detail in the ESIA study. These key issues are outlined below:

- **Air quality:** Impacts during construction may occur as a result of dust and exhaust emissions caused by construction activities, transportation of construction materials and resources, transport of excavated soils outside the Project area, vehicles movement, stockpiles, unpaved surfaces, ancillary facilities (such as concrete plant operation up to 100 m<sup>3</sup>/h). The operational phase impacts include increase in emissions from road traffic; exhaust air from heating, ventilation and air conditioning systems; ventilation of medical gases and fugitive emissions released from sources such as medical waste storage areas, medical technology areas and isolation wards; emissions related to the power generation.

- **Noise and vibration:** The Project has the potential to cause noise during construction by equipments, working vehicles and construction traffic which may affect nearby residential areas. Potential noise during operation is related with the increase in road traffic and operation of trigeneration system and generators.
- **Wastewater:** Sanitary wastewater will be generated by the workers during construction and by workers/healthcare personnel and patients during operation. Contaminated wastewater may result from discharges from medical wards and operating theatres, laboratories, pharmaceutical and chemical stores, cleaning activities and X-ray development facilities. Wastewater may also result from autoclaving, microwave irradiation and chemical disinfection.
- **Waste management:** There will be waste generation during construction activities that include excavated soils, solid wastes, construction wastes (such as steel, cables) and hazardous wastes (such as waste oil, oily rags) which will require disposal. During operation, there will be generation of domestic wastes, general hazardous wastes and healthcare wastes (such as infectious wastes containing pathogens; sharps such as needles, scalpels, knives; pharmaceutical wastes; genotoxic/cytotoxic wastes that may have mutagenic, teratogenic or carcinogenic properties; and chemical wastes generated through the use of chemicals during diagnostic/experimental work, cleaning, housekeeping and disinfection; radioactive wastes that may be generated by activities such as imaging, radiotherapy, and research laboratory procedures; waste with high content of heavy metals such as batteries, broken thermometers, blood pressure gauges; pressurized containers).
- **Cultural heritage:** A project area specific cultural heritage walkover survey has been conducted during the scoping phase of ESIA by archaeology experts. It was found that the project area might bear archaeological potential which has required further investigation. A geophysical study will be conducted at the project area to obtain further information at the site.
- **Traffic and transport:** The Project may have the potential to result in a traffic increase in local roads used by hospital traffic during operation which may require specific management measures.
- **Socio-economic impacts:** The Project will create employment opportunities and may affect positively the local businesses during construction and operation phases.
- **Worker/Healthcare personnel health and safety:** Activities during construction carry the risk of injury or damage to workers. Related to operation, impacts may occur through exposure to infections, diseases, hazardous materials/waste, radiation; and through fire risks related to storage, handling and presence of chemicals and flammable substances.
- **Community health, safety and security:** There will be dust, noise and vibration generation during construction activities which may affect nearby communities. Impacts during operation phase are related to the increase in road traffic, management of healthcare wastes.

### Your Opportunity to Comment

This document is prepared for the purpose of engaging with organizations and people who may be affected by the Project or who may be interested in the Project (so-called Stakeholders), in order to inform them and get their views so that these views can be taken into account in undertaking the ESIA study. Stakeholders for the Project will include governmental authorities at national, regional,

provincial, district and neighbourhood levels; and non-governmental organizations and the wider community.

With this Project Information Document, we would like to invite you to present your views on what you think the key environmental and social issues are and the mitigation measures to be considered. You can also reach project information documents from the website of IHIC:

[www.ikitellisehirhastanesippp.com](http://www.ikitellisehirhastanesippp.com)

Please email or send your written comment to:

*Ikitelli Integrated Health Campus Project*

ELC Group Consulting and Engineering Inc.

Kavacık Mah. Şehit Mustafa Yazıcı Sok.

No:20 Kavacık/ISTANBUL

Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)

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## **ANNEX D-2.3**

### **Project Information Leaflet**

# İKİTELLİ ENTEGRE SAĞLIK KAMPÜSÜ PROJESİ

## Halk Bilgilendirme Broşürü

İkitelli Entegre Sağlık Kampüsü Projesi, 2003 yılında başlatılan Sağlıkta Dönüşüm Programı kapsamında T.C. Sağlık Bakanlığı tarafından Kamu Özel Ortaklığı modeli ile gerçekleştirilmesi önerilmiş olan 20 Entegre Sağlık Kampüsü Projesinden biri olup toplam 2.682 yatak kapasitesine sahip olacaktır. İkitelli Entegre Sağlık Kampüsü, 29. sağlık bölgesini oluşturan İstanbul'un Büyükçekmece, Küçükçekmece, Beylikdüzü, Başakşehir, Silivri, Çatalca Esenyurt ve Avcılar ilçelerine hizmet verecektir.



Proje, İstanbul ilinin Başakşehir ilçesinde yer almakta olup toplam 789.031 m<sup>2</sup> alanı kaplamaktadır.

Proje IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC) tarafından gerçekleştirilecektir. 28 yıllık proje süresi boyunca detaylı tasarım, inşaat, ekipmanların tedariği, finansman ve Entegre Sağlık Kampüsünün bakım işlerinden sorumlu olacak, sağlık hizmetlerinin sunulması T.C. Sağlık Bakanlığının sorumluluğunda olacaktır. 28 yıllık proje süresi sonrasında Entegre Sağlık Kampüsü T.C. Sağlık Bakanlığı'na devredilecektir.

Proje; 443 yatak kapasiteli Genel Hastane, 451 yatak kapasiteli Çocuk Hastanesi, 451 yatak kapasiteli Kadın Doğum Hastanesi, 359 yatak kapasiteli Onkoloji Hastanesi, 347 yatak kapasiteli Nörolojik ve Ortopedik Bilimler Hastanesi, 303 yatak kapasiteli Kalp Hastalıkları Hastanesi, 128 yatak kapasiteli Psikiyatri Hastanesi ve 200 yatak kapasiteli Fizik Tedavi ve Rehabilitasyon Hastanesi'nden meydana gelmektedir.



Proje sahasının kuzeyinde yer alan hastanelerin vaziyet planı



Proje sahasının güneyinde yer alan hastanelerin vaziyet planı

Sağlık kampüsü, arasından bir yol ile ayrılan iki kısımdan oluşacaktır. Proje sahasının kuzey kısmında bir hastane binası, bir teşhis ve tedavi kütlesi, bir teknik merkez binası, idari bölüm ve konferans salonları bulunacaktır. Bu kısımda ayrıca bir meydan ve trijenerasyon ünitesi de yer alacaktır. Proje sahasının güney kısmında ise Psikiyatri Hastanesi ve Fizik Tedavi ve Rehabilitasyon Hastanesi bulunacaktır.

#### **Projenin Mevcut Durumu**

Proje şu anda planlama aşamasındadır. İnşaat aşamasının 2014 yılının Mayıs ayında başlayacağı ve yaklaşık olarak 36 ay süreceği öngörülmektedir.

IHIC, Projenin gelişimini desteklemek üzere uluslararası finans kuruluşlarından finansman kredisi kullanmayı planlamaktadır. Uluslararası finans kuruluşlarının gerekliliklerinden biri, projenin çevresel ve sosyal etkilerinin belirlendiği bir Çevre ve Sosyal Etki Değerlendirmesi (ÇSED) çalışmasının yapılması ve inşaat ve işletme aşamalarında önemli etkilerin nasıl azaltılacağını, yönetileceğini ve izleneceğini belirten bir Çevresel ve Sosyal Yönetim Planının hazırlanmasıdır.

Uluslararası finans kuruluşlarının gerekliliklerini yerine getirmek amacıyla Proje için ÇSED çalışmasının yapılması için IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından ELC Group Müşavirlik ve Mühendislik A.Ş. (ELC) firması görevlendirilmiştir.

ÇSED çalışması, 2013 yılı Eylül ayında kapsam belirleme çalışması ile başlatılmıştır. ÇSED çalışmalarının 2014 yılının ilk çeyreğinde tamamlanması planlanmaktadır.

Bu broşür; halkı bilgilendirmek, ÇSED çalışmasının ilgili tüm konuları ele almasını sağlamak, önemli olan ve ÇSED kapsamında ele alınması gerektiği düşünülen çevresel ve sosyal konular ile ilgili görüş alabilmek amacıyla hazırlanmıştır.

#### **Olası Çevresel ve Sosyal Etkiler**

Proje'nin olası temel çevresel ve sosyal etkileri, ÇSED kapsam belirleme çalışması sırasında belirlenmiştir. Belirlenen bu etkiler, ÇSED çalışması sırasında daha detaylı olarak incelenecektir. Söz konusu temel konular aşağıda özetlenmiştir:

- Atık yönetimi
- Karayolu trafiğinde artış
- Gürültü ve Hava kalitesi

- Atıksu oluşumu
- Sosyo-ekonomik etkiler
- İşçi / Sağlık personeli sağlığı ve güvenliği
- Toplum sağlığı, güvenliği ve emniyeti
- Kültürel miras

#### **Görüş Bildirme Fırsatı**

Bu doküman, Projeden etkilenebilecek ya da Proje ve etkileri ile ilgilenen kurum ve kişilerle (Paydaşlar olarak anılmaktadır) iletişime geçerek Proje ile ilgili bilgi vermek ve görüşlerini almak amacıyla hazırlanmıştır. Böylelikle, alınan görüşler ÇSED çalışmasında dikkate alınabilecektir. Proje'nin paydaşlarını ülke, bölge, il, ilçe ve mahalle düzeyindeki resmi kurumlar; sivil toplum kuruluşları ve yerel halk oluşturmaktadır.

ÇSED çalışmalarının tamamlanmasının ardından, incelenip görüş verilebilmesi için taslak ÇSED raporu Türkçe olarak hazırlanıp halka sunulacaktır.

Yerel halkın önerilen Proje ile ilgili görüşlerini almak amacıyla İstanbul'da halkın katılımı toplantısı düzenlenecektir.

Bu proje bilgilendirme dokümanı ile sizi Proje'nin temel çevresel ve sosyal konuları ve alınması gereken önlemler ile ilgili görüşlerinizi sunmaya davet ediyoruz.

Lütfen görüşlerinizi e-posta yolu ile ya da aşağıda verilen posta adresine yazılı olarak gönderiniz:

*İkitelli Entegre Sağlık Kampüsü Projesi*

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok.No:20 KAVACIK/ İSTANBUL

Email:

[ikitelisehirhastanesi@elcgroup.com.tr](mailto:ikitelisehirhastanesi@elcgroup.com.tr)

[www.ikitelisehirhastanesippp.com](http://www.ikitelisehirhastanesippp.com)

**IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.**

## İKITELLI INTEGRATED HEALTH CAMPUS PROJECT Public Consultation Leaflet

Ikitelli Integrated Health Campus Project (Project) with a total capacity of 2,682 beds, is one of 20 projects that has been proposed by the Ministry of Health (MoH) as part of the public private partnership projects within the scope of the Health Transformation Program which was initiated by the MoH in 2003. The Project will serve to the 29<sup>th</sup> health region of Turkey that covers Büyükçekmece, Küçükçekmece, Beylikdüzü, Başakşehir, Silivri, Çatalca, Esenyurt and Avclar districts of Istanbul.



The Project is located in Başakşehir District of Istanbul Province and covers an area of 789,031m<sup>2</sup>.

The Project will be developed by HIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC) who will be responsible for the detailed design, construction, equipping, financing and maintenance of the Integrated Health Campus within a project period of 28 years, while the provision of medical services will be the responsibility of the MoH. At the end of 28-year project period, Ikitelli Integrated Health Campus will be transferred to the MoH.

The Project comprises of 443-bed General Hospital, 451-bed Children's Hospital, 451-bed Women's Hospital, 359-Bed Oncology Hospital, 347-bed Neurological Sciences & Orthopedic Hospital, 303-bed Cardiovascular Hospital, 128-bed Psychiatric Hospital and 200-bed Physical Therapy and Rehabilitation Hospital.

The campus will consist of two lands which are separated by a road. The northern part of the Project area will include 6 hospital buildings, a diagnostic and treatment block, one service building, administration area and conference hall. This part will also include a ceremonial square and a trigeneration unit building. The Southern part of the Project area will consist of Psychiatric Hospital, Physical Therapy and Rehabilitation Hospital.

The campus will consist of two lands which are separated by a road. The northern part of the Project area will include 6 hospital buildings, a diagnostic and treatment block, one service building, administration area and conference hall. This part will also include a ceremonial square and a trigeneration unit building. The Southern part of the Project area will consist of Psychiatric Hospital, Physical Therapy and Rehabilitation Hospital.



Layout of Hospitals in the Northern Part of the Project Area



Layout of Hospitals and Other Units in the Southern Part of the Project Area

## Current Status of the Project

The Project is currently on planning phase and construction is estimated to start in May 2014 and take approximately 36 months.

IHIC is seeking finance from multinational financial institutions (FIs) to fund the development of the Project. One of the requirements of these FIs for granting loans is to undertake an Environmental and Social Impact Assessment (ESIA) Study which will identify the environmental and social impacts of the Project and be accompanied by an Environmental and Social Management Plan that identifies how significant impacts will be mitigated, managed and monitored during the construction and operation phases of the Project.

In order to meet the requirements of FIs, IHIC has commissioned ELC Group Engineering and Consultancy Inc. (ELC) to undertake an ESIA study for the Project.

The ESIA process for the project has started in September 2013 with initiation of a scoping study. The ESIA studies are planned to be completed within the first quarter of 2014.

In the meantime, to ensure that the ESIA studies address all the relevant issues, this Project Leaflet is prepared to provide information to the public, with a request for comments on the environmental and social topics that are considered to be of concern and deemed to be addressed in the ESIA.

## Potential Environmental and Social Issues

Based on the scoping study undertaken during ESIA studies, key potential environmental and social impacts of the Project are identified which will be investigated in more detail in the ESIA study. These key issues are outlined below:

- **Waste management**
- **Increase in road traffic**
- **Noise and air emissions**
- **Wastewater generation**
- **Socioeconomic impacts**
- **Worker/ healthcare personnel health and safety**
- **Community health, safety and security**
- **Cultural heritage**

## Your opportunity to Comment

This document is prepared for the purpose of engaging with organizations and people who may be affected by the Project or who may be interested in the Project (so-called Stakeholders), in order to provide information and get their views so that these views can be taken into account in undertaking the ESIA study. Stakeholders for the Project will include governmental authorities at national, regional, provincial, district and neighbourhood levels; and non-governmental organizations and the wider community.

After the completion of the ESIA studies, a draft ESIA report will be prepared and disclosed in Turkish language for review and comment.

Public meetings will be held in Istanbul to gather the views of the local public on the proposed Project.

With this Project Information Leaflet, we would like to invite you to present your views on what you think the key environmental and social issues are and the mitigation measures to be considered.

Please email or send your written comment to:

*İkitelli Integrated Health Campus Project*

ELC Group Consulting and Engineering Inc.

Kavacık Mah. Şehit Mustafa Yazıcı Sok.No:20 KAVACIK/ ISTANBUL

Email:

[ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)

[www.ikitellisehirhastanesippp.com](http://www.ikitellisehirhastanesippp.com)

**IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.**

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## **ANNEX D-2.4**

### **Comment/Complaint Form**

## İKİTELLİ ENTEGRE SAĞLIK KAMPÜSÜ PROJESİ - GÖRÜŞ/ŞİKAYET FORMU

**GÖRÜŞ VE/VEYA ŞİKAYET BİLDİREN KİŞİYE AİT BİLGİLER** (Eğer görüşlerinizi isimsiz olarak bildirmeyi tercih ediyorsanız bu bölümü boş bırakınız. İsminizi ve iletişim bilgilerinizi bildirmesiniz dahi görüşleriniz/şikayetleriniz IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından dikkate alınacaktır)

İsim:

Tarih:

İletişim bilgileri: (Tercih ettiğiniz iletişim türüne göre doldurunuz)

Posta .....

Telefon .....

E-posta.....

**Amaç:**  Görüş  Şikayet  
**Kaydeden:**  Görüş/şikayet bildiren kişi  
 Diğer (İsim belirtiniz)

**Doldurulmuş Görüş/Şikayet Formunu aldığına dair görüş ve/veya şikayet bildiren kişinin imzası:**

.....

**PROJE HAKKINDA GÖRÜŞLER** (Gerekirse arka sayfayı kullanarak devam ediniz)

### ŞİKAYET HAKKINDA BİLGİLER

**Şikayetinizi belirtiniz:** (Gerekirse arka sayfayı kullanarak devam ediniz)

**Şikayet konusunun meydana geldiği tarih ve sıklığı:**

Bir kez (Tarih .....

Birden fazla (Kaç kez? .....

Devam ediyor (Sorun halen yaşanıyor)

**Sorunun giderilebilmesi için önerileriniz nelerdir?** (Gerekirse arka sayfayı kullanarak devam ediniz)

**Bu bölüm IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından doldurulacaktır.**

### GÖRÜŞÜN DURUMU

Görüş kaydedildi (E/H)

Görüşün sunulduğu tarih:

Kaydeden:

Cevaplanması gerekiyor (E/H)

Görüşün cevaplandığı tarih:

### ŞİKAYETİN DURUMU

Şikayet kaydedildi (E/H)

Şikayet kaydedildi (E/H)

Şikayet kaydedildi (E/H)

Şikayetin cevaplandığı tarih:

Şikayetin cevaplandığı tarih:

Şikayetin cevaplandığı tarih:

Görüş formunu aşağıda verilen posta veya e-posta adresine gönderebilirsiniz:

İkitelli Entegre Sağlık Kampüsü Projesi

ELC Group Müşavirlik ve Mühendislik A.Ş.

Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20 Kavacık/İSTANBUL

Email: [ikitelleshirhastanesi@elcgroup.com.tr](mailto:ikitelleshirhastanesi@elcgroup.com.tr)

IKITELLI INTEGRATED HEALTH CAMPUS PROJECT- COMMENT/COMPLAINT FORM		
<b>INFORMATION ABOUT THE PERSON SUBMITTING COMMENT AND/OR COMPLAINT (Please leave blank if you wish to remain anonymous. Your comments/complaints will still be considered by IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.)</b>		
Full Name:		
Date:		
<b>Contact Information: (Please provide necessary information based on how you wish to be contacted)</b> By mail ..... By phone ..... By e-mail.....		
<b>Indicate your purpose:</b> <input type="checkbox"/> Comment <input type="checkbox"/> Complaint <b>Recorded by:</b> <input type="checkbox"/> Person submitting comment/complaint <input type="checkbox"/> Other (please specify who)	<b>Signature confirming receipt of completed Comment/Complaint Form copy</b> .....	
<b>YOUR COMMENTS ON THE PROJECT (Continue on the back of the sheet if required)</b>		
<b>INFORMATION ABOUT YOUR COMPLAINT</b>		
<b>Describe the Complaint (Continue on the back of the sheet if required)</b>		
<b>Date of Incident Regarding Complaint</b> <input type="checkbox"/> One time incident/grievance (Date .....) <input type="checkbox"/> Happened more than once (how many times? .....) <input type="checkbox"/> On-going (currently experiencing problem)		
<b>What would you propose to resolve the problem? (Continue on the back of the sheet if required)</b>		
<b>This section will be filled by IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.</b>		
<b>STATUS OF COMMENT</b>		
Comment Logged (Y/N)	Date of submission:	Logged by:
Response Required (Y/N)	Date of response sent:	
<b>STATUS OF COMPLAINT</b>		
Complaint Logged (Y/N)	Date of submission:	Logged by:
Date of Response sent:	Complaint closed (Y/N):	Close out date and signature:

You can send your written comment to the following mail or e-mail address:  
 İkitelli Entegre Sağlık Kampüsü Projesi  
 ELC Group Müşavirlik ve Mühendislik A.Ş.  
 Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20 Kavacık/İSTANBUL  
 Email: [ikitellisehirhastanesi@elcgroup.com.tr](mailto:ikitellisehirhastanesi@elcgroup.com.tr)

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## **ANNEX D-2.5**

### **Public Consultation Meeting Newspaper Advertisement and Photographs**

## Newspaper Advertisement for Public Consultation Meeting

**İKİTELLİ ENTEGRE SAĞLIK KAMPÜSÜ PROJESİ  
HALKIN BİLGİLENDİRİLMESİ TOPLANTISINA DAVET**

IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. tarafından Kamu Özel Ortaklığı modeli ile gerçekleşmesi planlanan İkitelli Entegre Sağlık Kampüsü Projesi'ne ait yürütülen uluslararası Çevresel ve Sosyal Etki Değerlendirmesi çalışmaları kapsamında proje ile ilgili halkı bilgilendirmek, halkın görüş ve önerilerini almak üzere aşağıda detayları verilen "Halkın Bilgilendirmesi Toplantısı" düzenlenecektir.

İkitelli Entegre Sağlık Kampüsü Projesi; 433 yatak kapasiteli Genel Hastane, 451 yatak kapasiteli Çocuk Hastanesi, 451 yatak kapasiteli Kadın Doğum Hastanesi, 359 yatak kapasiteli Onkoloji Hastanesi, 347 yatak kapasiteli Nörolojik ve Ortopedik Bilimler Hastanesi, 303 yatak kapasiteli Kalp Hastalıkları Hastanesi, 128 yatak kapasiteli Psikiyatri Hastanesi ve 200 yatak kapasiteli Fizik Tedavi ve Rehabilitasyon Hastanesi olmak üzere toplam 2.682 yatak kapasitesine sahip olacaktır. IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. 28 yıllık proje süresi boyunca Projenin detaylı tasarımı, inşaatı, donatımı, finansmanı ve bakımından sorumlu olacak; tıbbi hizmetlerin verilmesi T.C. Sağlık Bakanlığı'nın sorumluluğunda olacaktır. 28 yıllık proje süresi sonunda İkitelli Entegre Sağlık Kampüsü T.C. Sağlık Bakanlığı'na devredilecektir.

Toplantı Tarihi: 03.01.2014 Cuma  
Toplantı Saati: 13:30  
Toplantı Yeri: İstanbul Büyükşehir Belediyesi Başakşehir Kültür Merkezi  
Başakşehir 2.Etap, Mimar Sinan Caddesi, Ilgaz Sok. Başakşehir - İSTANBUL

Tüm halkımıza saygılarımızla duyurulur.  
IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.

ÇSED Raporunu Hazırlayan Kuruluş:  
ELC Group Müşavirlik ve Mühendislik Anonim Şti.  
Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20  
Kavacık/ İSTANBUL

## **Newspaper Advertisement for Public Consultation Meeting for the İkitelli Integrated Health Campus Project**

The proposed İkitelli Integrated Health Campus Project will be implemented by IHIC İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. under a Public Private Partnership model. Within the scope of Environmental and Social Impact Assessment being conducted for the Project, a **“Public Consultation Meeting”**, with details given below, will be held to inform the public about the Project and to obtain their views and suggestions.

İkitelli Integrated Health Campus Project comprises of an integrated health campus with a total capacity of 2,682 beds consisting of 443-bed General Hospital, 451 bed Children’s Hospital, 451-bed Women’s Hospital, 359-bed Oncology Hospital, 347-bed Neurological Sciences and Orthopedic Hospital, 303-bed Cardiovascular Hospital, 128-bed Psychiatric Hospital and 200-bed Physical Therapy and Rehabilitation Hospital. IHIC İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. will be responsible for the detailed design, construction, equipping, financing, maintenance and operation of the Project for a 28-year project period and at the end of this period, the İkitelli Integrated Health Campus will be transferred to the Ministry of Health.

**Meeting date** : 03.01.2014 Friday

**Meeting Time** : 13:30

**Meeting Location** : Istanbul Metropolitan Municipality Başakşehir Cultural Centre, Başakşehir 2. Etap, Mimar Sinan Caddesi, Ilgaz Sokak Başakşehir – İstanbul

**Respectfully announced to all public.**

**IHIC İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.**

The Company Preparing the ESIA Report:  
ELC Group Müşavirlik ve Mühendislik Anonim Şti.  
Kavacık Mah. Şehit Mustafa Yazıcı Sok. No:20  
Kavacık/İstanbul

## Photographs from the Public Consultation Meeting



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## **ANNEX D-3**

### **Stakeholder Register**

### Governmental Organizations

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
G1	Basaksehir Municipality (District Government)	Face-to-face meeting	Mayor Mevlüt Uysal	<p>Meeting date: 15.01.2014</p> <p>The following information is provided by the Mayor:</p> <ul style="list-style-type: none"> <li>• There is an excavation material disposal area at the north of the Project site, which will potentially be filled in the near future. The area will then be recreated. Currently, there is no traffic problem caused by the trucks carrying excavated materials to this area.</li> <li>• There are excavated materials dumped inside the Project site which are known to have been generated during the metro construction in the vicinity of the Project area and the disposal works were followed by the Istanbul Metropolitan Municipality (IMM) at the time.</li> <li>• It was mentioned by the mayor that IMM is responsible for the disposal of excavated materials, chemical wastes and medical wastes. Domestic solid wastes are being collected by Basaksehir Municipality.</li> <li>• It was mentioned by the mayor that there is a sewer infrastructure around the Project area that may be used during construction. Wastewater collected by this sewer line is transferred to a treatment plant which provides biological treatment.</li> <li>• Istanbul Water and Sewerage Administration (ISKI) and IMM are both responsible for the rehabilitation of the creek flowing at the east of the Project site. After the rehabilitation works, Basaksehir Municipality will develop recreational areas around the creek for public use.</li> <li>• Basaksehir district is accessed through one entrance which passes through the Ikitelli Organized Industrial Zone where there is currently traffic problems. There are new roads currently being built around the region which will potentially be completed in June 2014 and as a result, the traffic problems are expected to decline. Access roads of the North Marmara Motorway will be built to the north of the Project area. After these roads are completed together with the 3<sup>rd</sup> bridge, no traffic problems are expected.</li> <li>• Basaksehir attracts an important amount of population and increase in the</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>district population is expected in the future.</p> <ul style="list-style-type: none"> <li>• There is a current metro line serving the Basaksehir district, however it is not efficiently used by passengers. The metro line will be extended to include additional three stations and one of these stations will be inside and/or near the Project area. The construction of the metro is aimed to start in 2016.</li> <li>• Basaksehir Municipality was not involved during the site selection of the Project area as the municipality was not established at the time. It is stated that the selection is conducted by IMM and Çekmece Municipality.</li> <li>• The planning for the Project area is made by the Housing Development Administration of Turkey (TOKİ).</li> <li>• It is stated that the Project area was first planned to move some existing hospitals that are located in the city center, however, it was not accomplished as the doctors of these hospitals did not want to move to this area because it is found far from the city center.</li> </ul>
G2	Ministry of Health, İstanbul Provincial Directorate of Health (Provincial Government)	Face-to-face meeting	Deputy Manager Dr. Metin Tunç	<p>Meeting date: 15.01.2014</p> <p>The following information was provided by the Deputy Manager:</p> <ul style="list-style-type: none"> <li>• According to the planning of the MoH, it is planned to close some hospitals in İstanbul however, there will be no hospital closures directly related with the İkitelli Integrated Health Campus Project (Project). There are some hospitals located near the Project area, one of which is Basaksehir State Hospital serving people living around and is not expected to be closed. Another one is Kanuni Sultan Suleyman Education and Research Hospital which might be affected from the Project in a positive way as a result of reduced occupancy rates. This hospital is not expected to be closed due to its importance for providing children health care services.</li> <li>• Currently, there are an inadequate number of doctors in İstanbul to meet the demands of the public hospitals and this gap will likely increase with the addition of new medical facility investments.</li> <li>• There was no alternative considered for the Project area. The major factor for the selection of the area was that the area belongs to the Treasury, the land area is large enough to locate the IHC. It was also stated that the area is located</li> </ul>

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				<p>in one of the best possible locations of Istanbul as the residential areas of the city are developed at the north part of the city.</p> <ul style="list-style-type: none"> <li>It was stated that 60% of the health personnel are employed by private and university hospitals however, 70% of total patients are treated by hospitals affiliated with the Ministry of Health. The situation is that private and university hospitals are treating less patients with more personnel.</li> </ul>
G3	The Metropolitan Municipality of Istanbul, Department of Rail Systems (Provincial Government)	Face-to-face meeting	Department Manager	<p>Meeting date: 17.01.2014</p> <p>The following issues were discussed in the meeting:</p> <ul style="list-style-type: none"> <li>The current metro line will be extended to include additional three stations. The new routes and the location of the stations are still in the planning phase. It is estimated that the metro capacity will be 70,000 passengers/hour/direction. Metro construction will commence in 2015 and will be completed in 2018. IHC has been considered for the selection of the locations of the new metro stations. It is stated that the project is still in design phase and it is not clear when the final projects will be ready. Exact locations of the metro stations are not yet defined.</li> <li>There is a cloverleaf junction that is planned to be located at the north of the Project site, which is planned within the scope of the North Marmara Motorway (under the responsibility of the Ministry of Transport, Maritime Affairs and Communications) and not directly planned for the Project.</li> <li>The other roads around the Project area are planned by considering the development of the area related to olympic games and new residential areas.</li> <li>The excavated material disposal area at the north of the Project site will be recreated after it is completely filled.</li> <li>The Housing Development Administration of Turkey (TOKİ) will make residential buildings at the north-west direction of the Project area.</li> </ul>
G4	The Metropolitan Municipality of Istanbul, Department of Transport Planning (Provincial Government)	Face-to-face meeting	Department Manager Ahmet Hamdi Guner	<p>Meeting date: 17.01.2014</p> <p>The following issues were discussed in the meeting:</p> <ul style="list-style-type: none"> <li>The design of the metro line extension route and stations are not finalized yet. However it is certain that there will be a metro station to serve IHC. The number</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>of people who will visit the IHC were considered for the design of the metro.</p> <ul style="list-style-type: none"> <li>• It is predicted that 20,000 people will use the metro station that will be located around the IHC.</li> <li>• There will be no expropriation for locating the metro station.</li> <li>• IHC has been considered for the selection of the locations of the new metro stations.</li> <li>• There needs to be a protocol between IHC and Municipality to ensure that the right of use of the metro station within the project site boundaries will be handed over to the municipality.</li> <li>• The roads within the responsibility of IMM are not planned particularly for the Project which are expected to be constructed in 2015 or 2016.</li> </ul>
G5	The Metropolitan Municipality of Istanbul, Department of Transport Planning (Provincial Government)	Face-to-face meeting	Deputy Department Manager Faruk Vahapoglu	<p>Meeting date: 17.01.2014</p> <p>The following issues were discussed at the meeting:</p> <ul style="list-style-type: none"> <li>• There is a cloverleaf junction planned to be built to the north of the Project area which is connecting to the North Marmara Motorway. There is no identified timeline for the construction of the clover leaf which is under the responsibility of the General Directorate of Highways.</li> <li>• The responsibility of the other roads around the Project area, belongs to IMM. The people who will come to the Project are not considered in the design of these roads.</li> <li>• It is estimated that 65,000 residents will be living in Kayasehir (residential area at the north-west of the Project area) and these roads are planned to serve these people. The bidding for the roads are not conducted yet.</li> <li>• The road located inside of the Project area is not included in the zoning plans.</li> <li>• The location of the metro station to serve IHC is not planned yet. It is planned to locate it in the middle of the Project area in order to provide easier accessibility to all buildings of the Project, however this is not yet certain.</li> <li>• It is expected that the location of the metro station will be determined in 2014. It is stated that metro project will be completed in 2019 as it is announced to the public by the government.</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
G6	Ministry of Health, Department of Health Services (National Government)	Face-to-face meeting		Meeting date: 21.01.2014 The following information was provided at the meeting: <ul style="list-style-type: none"> <li>The responsibility of the department is to plan, organize and determine the capacity of health services.</li> <li>The employment capacities of current hospitals will be transferred to newly built hospitals.</li> <li>IHC's are particularly planned to include branch hospitals.</li> <li>IHC's can be seen as an opportunity to provide health tourism to the country.</li> </ul>
G7	Ministry of Health, Department of Management Services (National Government)	Face-to-face meeting		Meeting date: 21.01.2014 The following information was provided at the meeting: <ul style="list-style-type: none"> <li>The responsibility of the department is employment and determination of the roles of doctors and health workers.</li> <li>The total bed capacities of hospitals in Turkey will be fixed (and will not change) based on the planning of the MoH. Currently, the hospitals are organized as ward type patient rooms. Physical conditions of current hospitals will be improved by reducing the number of ward type rooms and increasing the number of single and double bed rooms.</li> <li>There is no doctor shortage, the MoH will make a source allocation plan and supply hospitals with necessary doctors in due course.</li> <li>Currently, 7,500 doctors graduate annually from the medical faculties. The medical students started to increase in recent years. 12,500 students registered to medical schools in 2013 and it is expected that they will graduate after six years.</li> <li>It is planned to employ well educated healthcare staff in the IHC's and working conditions will get better for health workers and doctors.</li> </ul>
G8	Ministry of Health, Public Hospitals Institution (National Government)	Face-to-face meeting	Department Manager Dr. İsmail Kaya	Meeting date: 21.01.2014 The following issues were discussed at the meeting: <ul style="list-style-type: none"> <li>Medical management will be provided by the Public Hospitals Institution. It is planned to assign one chief physician for each branch hospital within the IHC, who are planned to be connected to one secretary general responsible for the</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>entire IHC.</p> <ul style="list-style-type: none"> <li>The exact sources of doctors who will be employed in IHC are not identified yet but it is planned to transfer doctors from other hospitals belonging to MoH. Some hospitals need to be closed as they are old and not resistant to earthquake. As a result of changing patient rooms from ward type to rooms having 1-2 beds, bed capacity of some of the hospitals will be reduced. There is an ongoing planning but it is not finalized yet. It is important to increase and localize doctors in one main health center as IHC in order to provide continuous health services (to shift working hours of doctors during daytime and nighttime).</li> <li>Currently, health personnel in state hospitals are insufficient. The number of medical students have increased in recent years and will continue to increase until the year 2023.</li> <li>Currently, patient accommodation conditions in hospitals of MoH are worse than private hospitals. After completion of IHCs, these will be competing with the private hospitals.</li> <li>It is not clear if IHCs will bring extra cost for patients. It will be determined after negotiations with the Social Security Institution.</li> <li>It is possible to have traffic problems caused by IHCs and traffic should be well managed.</li> <li>Establishing investments is easier with the involvement of the private sector rather than undertaking the investments only by the government due to the limited resources. It is thought that it will be faster to establish the IHCs with a PPP model. According to the agreement between IHIC and the MoH, the medical equipment of the Project will be provided by the IHIC however, in case of need for new medical equipments during operation, the MoH will provide these equipments.</li> </ul>
G9	Ministry of Health, Department of Public Private Partnership (National Government)	Face-to-face meeting	Department Manager Salih Altınay	<p>Meeting date: 21.01.2014</p> <p>The following issues were discussed at the meeting:</p> <ul style="list-style-type: none"> <li>The enforcement of the new EIA Regulation and implications to the project was discussed. It is stated that the Department of Public Private Partnership communicated with the Ministry of Environment and Urban Planning and the</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>opinion letter is obtained stating all investments whose “bidding process are completed before the enactment of the new regulation” are exempt from the EIA regulation.</p> <ul style="list-style-type: none"> <li>• It is mentioned that it is not presently possible to define hospital closures. This issue will be clearer in the following years.</li> <li>• It is mentioned that the lawsuits filed by some of the NGOs related to the PPP model have been finalized.</li> <li>• There are no negative feedbacks received according to the location of Project.</li> </ul>
G10	Beyoglu District Governorship, District Directorate of Health (District Government)	Project Information Document (PID) and a cover letter have been sent to ask for comment.	District Directorate of Health, Special Inpatient Health Service Department	<p>Date of email: 08.01.2004.</p> <p>The email express thanks for asking their opinion and states best wishes.</p>
G11	The Silivri Municipality, Directorate of Plan and Project (District Government)	PID and a cover letter have been sent to ask for comment.	Deputy Vice Mayor Mehmet Has	<p>Date of the opinion letter: 06.01.2014</p> <p>Letter received on 10.01.2014. The letter states that there is no issue to be raised by the Municipality on the project.</p>
G12	Bahcelievler District Directorate of Health (District Government)	PID and a cover letter have been sent to ask for comment.	District Director Dr.Serap Sarihan Akkum	<p>Letter received on 14.01.2014 via e-mail and 17.01.2014 via mail.</p> <p>The letter suggests the following to be included in the campus:</p> <ul style="list-style-type: none"> <li>• Kindergarten and day nursery (for children of the employees)</li> <li>• Housing and resting facilities for the employees</li> <li>• Sports facilities for the employees</li> </ul>
G13	Cekmekoy Municipality, Cleaning Services Directorate (District Government)	PID and a cover letter have been sent to ask for comment.	Deputy Mayor Senol Cetin	<p>Date of the opinion letter: 06.01.2014</p> <p>Letter received via email on 13.01.2014 and via mail on 14.01.2014. The following remarks are stated in the letter:</p> <ul style="list-style-type: none"> <li>• Environmental Impacts: Hospitals may have a load on the environment due to high energy consumption and may cause health problems due to wastes generated during and after the hospital services. Various certification systems have been developed related to sustainable (green) hospitals to minimize</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>adverse impacts of the hospitals on the environment and human health. “LEED for Healthcare”, “Practice Green Health”, “Health Care without Harm” and “American Society for Healthcare Engineering” are the main examples of these certifications. It is important that IHC obtains such a certification or either follow the guidelines of the mentioned certifications during the implementation of the construction and operation phases. The guidelines of these certification systems include the following topics: to use plants in the landscaping that require low watering and that do not trigger allergies; to install required filtration and treatment systems for the wastewater generated from laboratories; to select construction materials that do not lead to growth of pests and insects; and to take measures for the minimization of medical and hazardous wastes.</p> <ul style="list-style-type: none"> <li>• Social Impacts: It has been observed that naming the hospitals as “Mental and Neurological Disorders Hospital” or “Psychiatric Hospital” causes pressure on the patients and it becomes difficult for the patients to apply such hospitals due to their concerns about being misunderstood by other people. For this reason, if it is possible, it would be beneficial to determine an alternative name for this hospital in the campus or present it as if it is a part of the General Hospital. Another issue is about making the campus easily accessible for other parts of the province by means of mass transportation, shuttle bus and similar. It is important to provide necessary requirements for the disabled people both inside and around the Campus.</li> </ul>
G14	Cekmekoy Municipality, Health Services Directorate (District Government)	PID and a cover letter have been sent to ask for comment.	Deputy Mayor Latif Coşar	Date of the opinion letter: 09.01.2014 Letter received on 17.01.2014. The letter content is same as G13.
G15	Ministry of Forest and Water Affairs, General Directorate of State Hydraulic Works (DSI), General Directorate of Research, Planning and Allocations	PID and a cover letter have been sent to ask for comment.	Deputy General Manager Yakup Basoglu	Date of the opinion letter: 08.01.2014 Letter received on 14.01.2014. The letter states that there is no issue to be raised by the General Directorate based on the PID sent.

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
	(National Government)			
G16	Ministry of Labor and Social Security, General Directorate of Occupational Health and Safety (National Government)	PID and a cover letter have been sent to ask for comment.	General Manager Kasim Ozer	Date of the opinion letter: 03.01.2014 Letter received on 14.01.2014. The letter states that occupational health and safety services are undertaken in accordance with the provisions of the Occupational Health and Safety Law (Law No: 6331) and relevant regulations issued within the scope of the mentioned law. It is mentioned that the relevant occupational health and safety legislation based on the potential hazards and risks during project phases can be found in the following link : “ <a href="http://www.csgb.gov.tr/csgbPortal/isggm.portalpage=mevzuat&amp;id=3">http://www.csgb.gov.tr/csgbPortal/isggm.portalpage=mevzuat&amp;id=3</a> ”. In this regard, it is suggested in the letter that necessary actions to be taken is to be decided after the legislation is reviewed in terms of scope and implementation.
G17	Ministry of Labor and Social Security, General Directorate Labor (National Government)	PID and a cover letter have been sent to ask for comment.	Deputy General Manager Nurcan Onder	Date of the opinion letter: 08.01.2014 Letter received on 14.01.2014. The letter is sent for informative purposes and it requests an opinion from the General Directorate of Occupational Health and Safety (already given in G16) by forwarding the PID as an attachment.
G18	Istanbul Metropolitan Municipality, Department of Environmental Protection and Control, Waste Management Directorate (Provincial Government)	PID and a cover letter have been sent to ask for comment.	Director Turker Eroglu	Date of the opinion letter: 10.01.2014 Letter received on 17.01.2014. The letter states that the medical waste generated in healthcare facilities having less than 20 bed capacity is collected by district municipalities and transported to medical waste disposal facilities of Istanbul Metropolitan Municipality (IMM) in order to be disposed by the IMM; medical waste generated by healthcare facilities having more than 20 bed capacity is collected-transported and disposed by the IMM. The letter further mentions about a decision which is related with the latest circular of the Ministry of Health that requires medical wastes from all private and public health facilities to be weighed before delivering which will be valid as of June 2014; and further informs that the disposal fee per kg of waste will be determined in November 2014 for the year 2015 and all medical wastes will be subject to fees per kg as of 2015. In this regard, the letter suggests that all public and private hospitals (having 20 beds and above) within the IMM area, are

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>required to have the necessary infrastructure (such as setting up computerized weighbridge system) until June 2014 in order to weigh and deliver their medical waste.</p> <p>The letter states the following to be undertaken for the IHC: to make appropriate planning during construction for the management of medical wastes; preparation and implementation of a waste management plan in compliance with the Medical Waste Control Regulation (Official Gazette date/number: 22.07.2005/25883) during operation; construction of a medical waste temporary storage area in line with the Article 19 of the mentioned regulation; and completely fulfilling the “Responsibilities of Medical Waste Generators” that are specified in Article 8 of the same regulation.</p>
G19	Istanbul Governorship, Public Health Directorate (Provincial Government)	PID and a cover letter have been sent to ask for comment.	Audit Commission Members of Environmental Health Department	<p>Date of the minute: 16.01.2014</p> <p>Minute received on 17.01.2014. The directorate sends the copy of the minute of the on-site assessment made by the directorate which presents the following:</p> <ul style="list-style-type: none"> <li>• It was found out that the Project area is 789,031 m<sup>2</sup>, construction works has not been started yet and ground surveys are being conducted according to the information obtained from the site engineer Mustafa Yetgin.</li> <li>• No non-sanitary enterprise is observed around the Project area during the site visit; no activity was determined that will cause adverse impacts (noise, emissions etc.) on the local residents.</li> </ul>
G20	Beylikduzu Municipality, Planning and Project Department (District Government)	PID and a cover letter have been sent to ask for comment.	Deputy Technical Manager Ali Gencbay	<p>Date of the opinion letter: 10.01.2014</p> <p>Letter received on 17.01.2014. The letter states that the Project may lead to increase in local roads during operation which may require measures to be taken. The letter further states that it is important for the metro to become operational before the Project starts operation; and high-capacity parking areas are planned for those people that will come to the Project by private cars.</p> <p>It is also mentioned in the letter that the need for rehabilitation of the main roads is considered, and it is necessary to have roads as divided roads with 2 lanes at each direction.</p>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
G21	Istanbul Metropolitan Municipality, Directorate of Health and Hygiene (Provincial Government)	PID and a cover letter have been sent to ask for comment.	-	Letter received on 20.01.2014 via e-mail. The letter suggests that the following services are included in the project: <ul style="list-style-type: none"> <li>• Providing transportation between the units of the Project (especially for patients)</li> <li>• Hotel/accommodation services for patients and their relatives who come from out of town</li> <li>• Health services at home and availability of dental polyclinic</li> </ul>
G22	Ministry of Forest and Water Affairs, 1 <sup>st</sup> Regional Directorate (Regional Government)	PID and a cover letter have been sent to ask for comment.	Deputy Regional Director Haluk Ozder	Date of the opinion letter: 13.01.2014 Letter received on 21.01.2014. The letter states that the Project area is reviewed by the Istanbul Branch Office and it is identified that the Regional Directorate is not responsible for the Project area and there is no inconvenience.
G23	Ministry of Environment And Urbanization, General Directorate of Natural Assets Protection (National Government)	PID and a cover letter have been sent to ask for comment.	Deputy Director General Osman Ozturk	Date of the opinion letter: 13.01.2014 Letter received on 20.01.2014. The letter states the following issues: <ul style="list-style-type: none"> <li>• It is identified that the Project area is not located within a Special Environmental Protection Area</li> <li>• It is suggested to include in the ESIA an official letter to be obtained from the Istanbul Governorship, Provincial Directorate of Environment and Urbanization related to whether a natural asset and natural protected area is located within the Project area.</li> <li>• In case there is a natural asset and natural protected area, Istanbul Natural Assets Protection Regional Commission will be notified in order to have the issue assessed in accordance with the effective legislation, and necessary action will then need to be taken according to the commission decision.</li> </ul>
G24	Social Security Institution, General Directorate of General Health Insurance (National Government)	PID and a cover letter have been sent to ask for comment.	Deputy General Manager Ismail Koksali	Date of the opinion letter: 15.01.2014 Letter received on 23.01.2014. The letter states that the general directorate has no opinion as the Project has no direct relevance with the general directorate.
G25	Eyup Local Governorship	PID and a cover letter have been	District Governor Ali Taskin Balaban	Date of the opinion letter: 23.01.2014 Letter received on 23.01.2014. The letter states that the Project is found

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
	District Health Directorate (National Government)	sent to ask for comment.		appropriate and the traffic and transportation issues need to be taken into account for citizens of Eyup District to access the health campus.
G26	Ministry of Culture and Tourism, Istanbul 1 <sup>st</sup> Cultural Assets Protection Regional Board Directorate (Provincial Government)	PID and a cover letter have been sent to ask for comment.	Deputy Manager Kemal Durmaz	Date of the opinion letter: 16.01.2014 Letter received on 24.01.2014. The letter forwards the decision (date/no: 09.01.2014/876) taken by the Istanbul 1 <sup>st</sup> Cultural Assets Protection Regional Board Directorate. The decision states that the Regional Board Directorate is informed by IHIC about the archaeological artifacts that are mentioned in the "Cultural Heritage Assessment Report" prepared as part of the ESIA study for the IHC, and that the archaeological report has been submitted to the Regional Board Directorate and has been reviewed. The letter further states that the ownership of the site is understood to be the General Directorate of Health Investments of the MoH. It is mentioned that comprehensive surface investigation needs to be undertaken by the Istanbul Archaeological Museums Directorate with the technical support by the ownership of the site, and the issue can only then be evaluated after the report and photographs of the surface investigation is submitted to the Regional Board Directorate.
G27	The Ministry of Health, General Directorate of Emergency Health Service (National Government)	PID and a cover letter have been sent to ask for comment.	Prof. Ali Coşkun	Date of the opinion letter: 22.01.2014 Letter received on 31.01.2014. According to the letter, The Ministry of Health, General Directorate of Emergency Health Service requests more detailed information regarding the emergency services to be provided, architecture and sketches of the buildings etc. to be able to give an opinion for this topic. The General Directorate states that: <ul style="list-style-type: none"> <li>• Decontamination units (to the north and the south) are required to be established against chemical, biological, radiological, nuclear (CBRN) threats.</li> <li>• Emergency exits are required to be constructed in line with international standards within the scope of the Turkey Hospital Disaster Plans (THDP).</li> <li>• Establishment of isolation rooms for the treatment of the people who affected from CBRN threats is advisable.</li> <li>• Health Campus is required to be constructed in line with THDP system; emergency entrances-exits, patient assembly areas, patient treatment areas,</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>field hospitals, management centers and triage areas and accommodations for hospital personnel and their relatives are required to be planned. It is essential not to plan these accommodations in car park areas.</p> <ul style="list-style-type: none"> <li>• Construction of the buildings in smart building style and in line with hospital architecture and provision of more than one exit will be important for employees, patients, patients' relatives, and visitors.</li> <li>• Energy lines (and information whether it is double supply or not), backup generator systems, disaster storages and their locations should be shown in the sketches. Any organization such as field hospitals and storages should not be planned in the car park areas.</li> <li>• Location of the water tanks and information regarding the auxiliary storage systems are not definite.</li> <li>• It is advisable to show collection areas of the medical wastes and CBRN wastes for management and control of these wastes.</li> <li>• Education halls should be planned for First Aid trainings and other potential trainings for patients and their relatives.</li> <li>• Emergency patients transportation between clinics and medical workup; and between emergency service and intensive care unit should be planned and architecture of the hospitals should be proper for transportation.</li> <li>• Planned emergency patient number is determined as considerably lower than Turkey average. Emergency healthcare areas and bed numbers for general intensive care should be enhanced as the actual numbers will be higher.</li> <li>• A Trauma Center within the scope of the basic branches should be determined and defined as the hospitals were designed as horizontal blocks.</li> <li>• Ambulance entrance and passage points should be planned between the hospital blocks to be used when necessary.</li> <li>• Proper areas should be planned for ambulances and ambulance staff to park, wait and provide service.</li> <li>• Sufficient size 112 Central Station building should be determined in which more than one team deploy to serve region.</li> <li>• All hospital blocks should have proper decontamination units in line with</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>Hospital Disaster Plan.</p> <ul style="list-style-type: none"> <li>It is thought that coordination with our General Directorate would be beneficial in terms of Hospital Disaster Planning when hospitals and hospital garden are arranged/designed.</li> </ul>
G28	The Ministry of Environment and Urban Planning General Directorate of Environmental Impact Assessment, Permitting and Auditing (National Government)	PID and a cover letter have been sent to ask for comment.	M. Mustafa Satılmış	<p>Date of the opinion letter: 03.02.2014</p> <p>Letter received on 05.02.2014. It is mentioned in the letter that hospital projects were included in the scope of EIA Regulation with the EIA Regulation entered into force through publication in the Official Gazette dated 03.10.2013 and numbered 28784 as included in article 46 of Annex-I list as “Hospitals with a capacity of 500 beds and above” and in article 37 of Annex-II as “Hospitals with 50-500 bed capacity and dialysis centers (15 devices and above) located outside hospitals and medical centers”. It is further mentioned that “when hospital projects that were included in the public investment program are evaluated, it is found appropriate to scope out these projects from the EIA Regulation if it is documented that the project bidding process is completed before the issue date of the EIA Regulation. In order to record and evaluate the scoped-out activities by "Online EIA Process Management System", detailed information related to the Project (Name, Province, Location of the Project, Name and address of the Project owner, tax office and tax ID Number of the Project owner, capacity of the Project, summary of the Project, Partnership Agreement with the Ministry of Health (if available), detailed information about the bidding process) needs to be submitted to the Ministry”. Moreover, Article 24 paragraph (b) of the EIA Regulation is mentioned which includes a provision as “If it is requested by the project owner for preparation of an EIA Report for projects that are not subject to the EIA Regulation or subject to selection elimination criteria, the method is determined by the Ministry for the projects found appropriate by the Ministry”, and is stated that EIA procedure can be implemented for the assessment of the environmental impacts of the project if it is requested by the project owner.</p>
G29	The Ministry of Health, Directorate of Public Health	PID and a cover letter have been	Dr. Hasan Irmak	<p>Date of the opinion letter: 30.01.2014</p> <p>Letter received on 16.02.2014.</p>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
	Institution of Turkey (National Government)	sent to ask for comment.		It is stated in the letter that it is necessary to apply relevant authorities in order for the Project to be evaluated according to the Environmental Impact Assessment Regulation entered into force through publication in the Official Gazette dated 03.10.2013 and numbered 28784, and Regulation on Private Hospitals entered into force through publication in the Official Gazette dated 27.03.2002 and numbered 24708.
G30	Istanbul Metropolitan Municipality, Directorate of Environmental Protection and Control (Provincial Government)	PID and a cover letter have been sent to ask for comment.	Doğan Çetin	<p>Date of the opinion letter: 03.02.2014</p> <p>Letter received on 16.02.2014. According to the letter, Istanbul Metropolitan Municipality, Directorate of Environmental Protection and Control is responsible for inspection and taking decisions on administrative sanctions within the scope of the Environmental Law entered into force through publication in the Official Gazette dated 11.08.1983 and numbered 18132, related to the excavated soil control, noise control within the boundaries of Istanbul Province.</p> <p>The following issues are further stated in the letter:</p> <ul style="list-style-type: none"> <li>• According to the provisions of the Regulation on the Assessment and Management of Environmental Noise (Official Gazette Date/ Number: 04.06.2010/27601), it is necessary to apply mitigation measures to meet the noise limits defined in the mentioned regulation during pre-construction, construction and operation phases of the Project. It is also necessary to locate noise sources away from sensitive and highly sensitive areas and to comply with working hours determined by the regulation.</li> <li>• The construction/excavation wastes generated during demolishing, excavation and construction phases need to be managed according to the provisions of the Regulation on Control of Excavated Soil, Construction and Demolition Wastes entered into force through publication in the Official Gazette dated 18.03.2004 and numbered 25406. This needs to consider reduction at the source, temporary storage, transportation, reuse and where these are not applicable, disposal in approved disposal areas.</li> <li>• Necessary mitigation measures need to be applied for dust and noise emissions to be generated during construction/maintenance and demolishing activities according to the provisions of articles 19, 20 and 21 of Regulation on</li> </ul>

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication	Name and contact details	Date and summary of the meeting / Date of the opinion letter and summary of the opinion
				<p>Control of Excavated Soil, Construction and Demolition Waste.</p> <ul style="list-style-type: none"> <li>• Before the initiation of the construction activities, necessary measures need to be taken to avoid environmental pollution on main roads and roads where the construction site is connected, in accordance with the Regulation on Control of Excavated Soil, Construction and Demolition Waste. In addition, in accordance with the article 14.01.2 of the Istanbul Zoning Regulation, construction sites that generate excavated soils are obliged to install washing facilities for tires and dumpers of the vehicles, before the foundation excavation and excavated soil transport starts. The contractors should commit to install the mentioned facilities during the licensing process.</li> <li>• Necessary measures and permits should be obtained in accordance with the provisions of the Metropolitan Municipality Law and regulations published pursuant to this law.</li> </ul>

#### Public

No	Name of the Organization (Type of the organization in parenthesis)	Type of communication made	Location	Issues raised
P1	Private Individual	Public meeting	Ikitelli	The participant explained that he has pharmacies and wanted to know whether there will be a commercial area within the IHC to open pharmacies, medical shops, optician shops and similar.

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## **ANNEX E**

### **Project Description Supporting Information**

Annex E-1: Official letter from IGDAS related to natural gas pipeline

Annex E-2: Illustrations of the hospitals

Annex E-3: Environmental, Health and Safety (EHS) based design criteria and infrastructure requirements

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## **ANNEX E-1**

### **Official Letter from IGDAS related to Natural Gas Pipeline**



İSTANBUL GAZ DAĞITIM SANAYİ ve TİCARET A.Ş.  
Kazım Karabekir Cad. No: 4, 34060 Alibekköy / İSTANBUL  
Tel: +90 212 499 11 11 Faks: +90 212 499 11 66  
Ticaret Sicil Numarası: 229806 • www.igdaskom.tr

Tarih : 10.02.2014  
Sayı : 50.40/ 10396  
Konu Kodu : AYP 041.01  
DIŞ YAZIŞMA

İHİC

İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.  
Turgut Özal Bulvarı, No:141, Sahilyolu İdealtepe, Maltepe / İSTANBUL

KONU : Başakşehir İlçesi, İkitelli 1305 Ada 1 ve 2 Nolu Parseller  
İLGİ : 31.01.2014 tarih ve 07742 sayıda kayıtlı yazınız.

İlgi yazı ile "İstanbul İkitelli Entegre Sağlık Kampüsü Yapım İşleri ile Ürün ve Hizmetlerinin Temin Edilmesi işi" kapsamında, Başakşehir İlçesi, 1356 (eski 1305) ada 1 ve 2 parsel alan içinde doğalgaz hatlarının bulunduğu belirtilerek, iç ulaşım yollarının inşaatı için mevcut altyapı tesislerinin durumu hakkında bilgi talep edilmektedir.

Söz konusu proje bölgesinde yer alan mevcut altyapı tesislerimiz ekli pafta ve CD' de (sayısal olarak .dgn ve .dwg ve .dxf formatında) ED50 koordinat sisteminde gösterilmiştir.

Mevcut altyapılarımıza güzergah olarak İGDAŞ yapım işleri teknik şartnamesine göre açılan deneme çukurlarıyla tespit edilen altyapı yoğunluğu dikkate alındığı gibi yeni açılan veya düzenleme yapılan yolların yine bu şartname kriterlerine uygunluğu esas alınır. Mevcut altyapı tesislerimize yapı yaklaşma sınırı; çelik doğalgaz hatlarına min. 2.50 m boru orta aksından (boru sağ ve sol ayrı olmak üzere), polietilen doğalgaz hatlarına 1.25 m boru orta aksından (boru sağ ve sol ayrı olmak üzere) olarak belirlenmiştir. Bu koşulların sağlanması durumunda konulacak metro istasyonunun yeri uygun olacaktır. Altyapı tesislerimiz ile ilgili olarak yatırım ve koruma bandı kesitlerimiz ekte sunulmuştur.

Bölgede hatlarımız civarında tarafınızca yapılacak olan altyapı, üstyapı, yol, vb işlerin kazı çalışmalarına başlamadan önce Başakşehir Şebeke Şefliği (0212 499 22 17) Altyapı kazı çalışması protokolü yapılması, doğalgaz hatlarının elle açılacak gözlem çukurları yardımı ile hatlarımızın kesin yerlerinin tespit edilmesi ve bu işlemler yapılırken Doğalgaz Acil (187) nezaretçi personel alınması can ve mal güvenliği açısından gerekmektedir.

Bilgilerinize rica ederiz.

Saygılarımızla,

Mehmet Fatih KARAMAN  
Etüd Proje Müdürü

Dr. Erdoğan TOZAN  
Genel Müdür Yardımcısı

A. Karafoc / F. Ünlüyuysal

Ek : 1 Adet Pafta  
1 Adet CD  
3 Adet Farklı Doğalgaz Altyapı Kesitleri

Dağıtım: İstanbul Bölge Müdürlüğü (1 Adet Pafta Ekli)  
Pazarlama Müdürlüğü (1 Adet Pafta Ekli)

İSTANBUL BÜYÜKŞEHİR BELEDİYESİ

Date : 10/02/2014

Number : 50.40/10396

Subject Code : AYP 041.01

EXTERNAL CORRESPONDANCE

IHIC

İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş.

Turgut Özal Bulvarı, No :141, Sahilyolu İdealtepe, Maltepe/İSTANBUL

Subject : Başakşehir District, İkitelli parcel numbered 1 and 2 of plot number 1305

Ref: Your letter dated 31/01/2014 and numbered as 07742.

With the referenced letter, it was indicated that there is a natural gas pipeline within the area of Başakşehir District Plot number: 1356 (Former 1305), parcel no: 1 and 2 within the scope of the work of "Construction works and supply of products and services of İstanbul İkitelli Integrated Health Campus" and information on current infrastructure is requested for the construction of internal transportation roads.

Current infrastructure located in the mentioned Project area is shown on the attached map and on the CD in ED50 coordinate system (.dgn, .dwg and .dxf as digital format).

The current pipeline routes are determined by trial wells opened in accordance with IGDAS construction works technical specifications and is determined based on the infrastructure density. The mentioned specifications are also taken as a basis for roads that are newly opened or arranged. The minimum clear distance required between any structure and our current infrastructure is 2.50 m from the pipe centerline of (both for right and left of the pipe) steel natural gas lines; 1.25 m from pipe centerline of (both for right and left of the pipe) polyethylene natural gas lines. The location of the metro station is appropriate on the condition that the aforementioned requirements are met. Sections of investment and protection band for our infrastructure are attached to the letter.

Prior to the start of the excavation works for the infrastructure, superstructure, roads, etc. near the natural gas pipelines; it is necessary for the security and health and safety of people and property to develop an infrastructure excavation work protocol with Başakşehir Network Directorate (0212 499 22 17), to determine the exact locations of natural gas pipelines by manually opening observation wells and to employ a Natural Gas Emergency supervisor to be present while performing these works.

Kindly submitted for your information.

Regards,

Mehmet Fatih Karaman  
Director of Etude Project

Dr. Erdoğan Tozan  
Depudy General Manager

A. Karakoç / F.Ünlüysal

Attachment: 1 Map Section

1 CD

3 Different Natural Gas infrastructure sections

Distribution: Istanbul Regional Directorate (1 Map Section attached)

Marketing Directorate (1 Map Section attached)

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## **ANNEX E-2**

### **Illustrations of the hospitals**



Exterior Planning of the Hospitals



The View of Main Entrance Hall



The View from the Waiting Area of Polyclinics



The View from the Patient Rooms



The View from the Exam Rooms of Polyclinics



The View from the Operation Rooms

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## **ANNEX E-3**

### **EHS based design criteria and infrastructure requirements (extracted from Technical Specifications provided by the MoH)**

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## **PART 1: ARCHITECTURAL and CONSTRUCTION WORKS TECHNICAL SPECS**

### **A. CONCEPT SCHEME DESIGN**

#### ***Campus Overall Planning Assumptions***

Today and in the future it is very important that environmental issues be addressed in any new building project. The very large scale of these hospitals provides the opportunity to have a major impact on reducing harm to the environment through using “green” building practices and creating sustainable buildings.

## **PART 2: MECHANICAL and PLUMBING SPECS**

### **A. PLUMBING SYSTEM**

- ***Domestic Cold Water System***

Each hospital will be provided with two independent domestic water sources. Each domestic water service will be provided with a meter and reduced pressure backflow preventers. A domestic water system booster pump system will be provided when the water source does not have sufficient water pressure. Each hospital building will have its own booster system when a given site has multiple hospital buildings. Additional reduced pressure backflow preventer assemblies will be provided for the HVAC and irrigation systems. The cooling tower make-up water supply will be provided with a water meter so the cooling tower make-up water consumption can be measured.

The steam boiler feed-water will have a water softener. The softener will be a multiple tank type with hard water bypass; each tank will furnish equal percentage of the maximum flow rate at an exchange capacity required for peak boiler feed-water make-up with 100% reserve tank redundancy. A water quality report is required for the sizing of the water softener.

- ***Domestic Hot Water System***

The domestic hot water supply piping distribution mains and domestic hot water heaters will be sized for the loads of the proposed facility plus a 20% safety factor for capacity.

- ***Drainage - Sanitary Waste and Vent System***

The building underground sanitary drainage system will be sized to serve the loads of the proposed facility. A system of sanitary waste and vent piping will be routed throughout the building to vent and collect the discharge from all of the plumbing fixtures and drains.

The kitchen waste will be collected separately and will be routed to a grease interceptor located exterior to the building. The grease interceptor will be rated to the design flow rate plus 20% extra capacity safety factor. At this point, it is assumed that an acid waste system is not required for the hospital.

Floor drains will be provided in all toilet rooms, in areas as required for the discharge from equipment (kitchen, central sterile, and the like), and in all mechanical rooms.

If required (as determined by the Emergency Department staff), the decontamination room will be provided with drains that are routed through double wall piping to a double wall exterior tank. The piping and tank will be provided with leak detection and level monitoring systems.

- ***Drainage - Stormwater Systems***

The stormwater piping from the roofs will be collected within the building and routed outside the building for connection to the site storm sewer system. Stormwater from the upper levels will be discharged to the site storm sewer system by gravity flow.

The stormwater from the loading dock and from the parking structures (parking garages) will be routed through an oil interceptor. If the outlets are below the site storm main, interior storm sump pump systems with duplex pumps will be provided. The duplex stormwater pumps will be provided with emergency power from the building. The building automation system will monitor the stormwater sump pump system high water alarm.

The stormwater collected by the foundation drainage system will be collected in multiple separate sumps within the building and pumped to the exterior of the building for extension by the site utility contractor to the site storm sewer system. A duplex sump pump with a control panel will be provided at each location. Elevator pits will be provided with a simplex sump pump to discharge collected water to the storm sewer system.

- ***Fuels***

*Natural Gas System*

Natural gas will be supplied from the gas utility main. A gas meter/regulator setting, with bypass (or multiple meters), will be provided outside the central energy plant and extended into the building and distributed to equipment as required. Multiple gas regulators will be provided in order to deliver the gas at the pressure required by the boilers, laboratory equipment, and the kitchen equipment.

A solenoid valve will be provided in the natural gas supply line to the kitchen area and to each laboratory area with an emergency shut-off control switch/button located in each area.

*Propane System*

A liquid propane fuel tank will be located outside Central Energy Plant to supply fuel to spark the #2 fuel oil for the boilers in the event of a loss of natural gas. The propane piping will be extended into the central energy plant and tied into the gas train for the boilers. Manual valves will be provided for a manual operation to switch from operating the boiler pilot with propane rather than natural gas.

*Fuel Oil System*

Multiple double wall underground fuel oil tanks or above ground tanks with dikes will be provided near the central energy plant to serve the emergency generators and the boilers. Individual remote fill points will be provided. Each fuel oil tank will be provided with at least two fuel oil pumps. One pump shall be a standby pump that has a capacity equal to the other fuel oil pumps. The tanks will

be interconnected to allow fuel to be transferred from one tank to the other. A double wall piping system will be provided to deliver the fuel from the tanks to the interior of the building. The piping will transition from double wall to steel piping outside the building. Fire and isolation valves will be provided on the piping at the entrance into the building. The fuel oil piping will be extended to the emergency generator day tanks. The day tanks will be provided with solenoid valves that are operated by an internal float. The fuel oil overflow from the daytanks will be a gravity line to the exterior fuel oil tank without any valves. The fuel oil pump discharge for the boiler fuel oil system will be routed to the daytanks in the boiler room. Duplex daytank mounted pumps, each sized for the full flow, will move the fuel oil to the boilers from the day tank. The specific method of delivering fuel to the boilers and atomization will be determined during boiler selection and shall be based on the specific requirements of the boiler being provided.

A leak detection and level monitoring control system will be provided in the central energy plant to monitor the piping system and fuel oil tanks. The automated Building Management System (BMS) will be utilized to control the fuel oil pumps. The fuel oil pumps will be provided with hand-off-auto switches. When one of the fuel oil daytank's solenoid valves open, the fuel oil pumps will be activated. When the fuel oil daytank's solenoid valves are closed, the fuel oil pumps will be deactivated. All fuel oil alarms will be connected to the building automation system.

The fuel oil tanks will be sized to have at least 72 hours of on site fuel supply for both the boilers and the generators both operating at peak fuel consumption.

- ***Medical Gas and Vacuum Systems***

Dedicated medical gas supply and vacuum system distribution mains will be sized to serve the loads of the proposed facility construction. Medical gas and vacuum equipment will be sized for the loads of the proposed facility and planned future expansion.

Each hospital building will have its own independent medical gas and vacuum systems. Centralized oxygen systems may serve more than one hospital building.

- ***Plumbing Fixtures***

All fixtures shall be low flow water saving type.

- ***Seismic Restraints***

All Plumbing equipment, piping, and devices that are required for the hospital to function properly as a hospital shall be seismically restrained. The restraint shall be sized and selected based on the Seismic criteria for the location of the hospital.

- ***Fire Suppression System***

Fire Suppression systems shall be provided throughout the hospitals as required by Turkish and local codes.

## B. HVAC SYSTEM

- **Central Energy Plant**

### *Plant Steam System*

The main boiler plant will consist of multiple boilers located in the remote central energy plant. The steam boilers will be sized to provide the design capacity of the hospital with one boiler, the largest boiler, out of service. The boilers will generate steam at the plant steam supply pressure listed above.

In addition to the boilers in the central plant, condensate return from the building will be collected in two surge tanks, one in service and one as standby, each with transfer pumps, two transfer pumps for each deaerator included in the system. Make-up water will be added to the system through these surge tanks. Surge tank transfer pumps will supply condensate return and make-up water to each deaerator with one additional standby pump located at each surge tank. The deaerators will be sized to provide all of the make-up water demand of the boilers with one deaerator, the largest deaerator, out of service. The deaerators shall be cross-connected such that any deaerator can supply any boiler. The boiler make-up water will be delivered to the boilers from deaerators with feed water pumps, each deaerator will serve two to three boilers. Feedwater pumps will supply the condensate return and make-up water for the boilers associated with that deaerator, with an additional pump as a standby pump. The changeover operation for the standby pump will require manual operation of the valves.

The boiler feed water will be routed through a boiler stack economizer and through boiler blow down heat recovery heat exchangers to improve the system energy efficiency.

### *Plant Chilled Water System*

The main chilled water generation system, located in the central energy plant, will consist of chillers with one of the chiller sized for part load fall, winter, and spring operation. The liquid chillers will be water cooled, centrifugal, variable speed (with variable frequency drives), that are piped in a primary/secondary arrangement. The chillers will utilize R134a or R123 refrigerant. Each chiller will have a dedicated constant speed, primary chilled water pump, and condenser water pump. Chillers of equal capacities will have the pumps cross-connected for added redundancy. The capacity of the chilled water system will be such that the design cooling capacity can be provided with the single largest chiller out of service.

The induced draft cooling towers will be located at the central energy plant building and will be piped together as a common cooling tower system rather than dedicated to a chiller. This piping arrangement provides for more economical operation as well as maintaining inherent flexibility. The fans for the cooling towers will be sized for low noise and will be provided with variable frequency drive for more energy efficient operation. The cooling tower sumps will be provided with sump heaters. The cooling tower system will be sized to equal the installed chiller capacity allowing all of the chillers to operate simultaneously should this ever become necessary.

The availability of well water in sufficient capacity to replace the heat rejection capacity of the cooling towers shall be studied at each site. If well water can be used and returned to its ground

source without environment impact, then the use of well water is preferred over the use of cooling towers. A site specific report indicating the availability of well water and the environment impact shall be provided during the first part of the final design.

If water sufficient water resources are not available to support water cooled chillers, then air cooled chillers and air cooled condensers can be used.

The smallest chiller will operate in the winter to provide cooling for the equipment loads throughout the building. Free cooling, water side economizer, utilizing the cooling towers or dry coolers (with glycol heat exchangers) will be provided for the equipment cooling loads. This free cooling will consist of a heat exchanger in parallel to the chillers that would use one or more of the cooling towers or dry coolers (with glycol heat exchangers) to generate chilled water using the tower condenser water to reject heat through a tower or dry cooler.

### *Central Plant Conditioning*

The central energy plant will be cooled and heated with the steam and chilled water systems. The boiler room will be provided with blower coils hung from the steel above. The chiller room will be provided with blower coils and the office space will be provided with packaged heating and cooling unit including economizer operation. The boiler room will be provided with a combustion air system and exhaust fans. The chiller room will be provided with a refrigerant detection and exhaust systems.

- ***Hospital Steam Systems***

Pressure reducing stations will be provided at each of the buildings to reduce the plant steam pressure to the high pressure building steam pressure and to low pressure building steam pressure indicated above. The pressure reducing stations will be parallel single stage pressure reducing stations with two pressure reducing valves. The valves will be sized for a 1/3 – 2/3 configuration with a manual bypass. The high-pressure building steam will then be piped to the sterilizers and hot water heat exchangers. The low-pressure steam will then be piped to the steam-to-steam humidifiers.

- ***Seismic Restraints***

All HVAC equipment, piping, ductwork and devices that are required for the hospital to function properly as a hospital shall be seismically restrained. The restraint shall be sized and selected based on the Seismic criteria for the location of the hospital.

- ***Natural Ventilation***

When the outside temperature and humidity and the solar load by exterior exposure is such the patient rooms can maintain the required indoor temperature and humidity, the BAS system shall be capable of shutting down the cooling chilled, water or air, to groups of patient rooms and the patient rooms will be ventilated by opening the windows in the rooms. This will require the chilled water piping and supply air ductwork with dampers be arranged to only shut down cooling in the patient rooms while maintaining cooling in all other areas of the hospital. If any of the patient rooms in the group cannot maintain temperature and/or humidity the cool capability shall be energized.

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### **PART 3: ELECTRICAL TECHNICAL SPECIFICATIONS**

- ***Utility Services***

There will be a central energy plant located within the hospital site. The central energy plant will accommodate the High Voltage (HV) and Medium Voltage (MV) electrical switchgear including HV/MV power transformers, in addition to the emergency backup generators that will supply the whole site. Coordination shall be made with the local electricity utility company to establish design requirements including required spaces to house the HV/MV switchgear, and identify tie-in points and exact scope for the HV/MV power network.

- ***Emergency Power Distribution***

Prime type diesel fueled emergency generators located within central energy plant will be used to provide 100% backup power supply for the hospital buildings. Hospital grade silencers will be provided to reduce engine exhaust noise. Each generator will be furnished with a day fuel tank that will be sized to operate the engine generator for a minimum of 2 hours continuous operation at full load. The day tank will be located within the same room as the generator.

In addition to the day fuel tank, a bulk fuel storage tank sized for 72 hours will also be provided with associated piping and pumps.

The generator plant shall be designed to be expandable to allow for future buildings expansions and with a minimum of 10% spare capacity.

Automatic transfer switches will control the distribution of emergency power to essential loads. Automatic transfer switches will be electrically operated, mechanically held, continuously rated, four pole double throw. Automatic transfer switches will monitor the presence of normal power, and upon loss of power failure, will signal the emergency generators to start and pickup the essential loads.

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## **ANNEX F**

### **Geology, Soils and Contaminated Land Supporting Information**

F-1: Borehole Logs

F-2: Laboratory Analysis Results of Soil Samples

F-2.1 Laboratory Analysis Results

F-2.2 Evaluation and Summary of Laboratory Analysis Results

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## **ANNEX F-1**

### **Borehole Logs**

İMAKSU MÜHENDİSLİK İNŞ. SAN. ve TİC. LTD. ŞTİ.												TEMEL SONDAJ LOGU												Sayfa No: 1/2	
Proje Adı												İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU													
İli			Yeri			Kuyu Derinliği			25.00 m			Sondaj No			SK-23 (ELC-1)										
Baş.Tarihi			Bitiş Tarihi			Yeraltı Suyu Durumu			Tarih			Metraj			Zemin Kotu : 113.20			Logu Hazırlayan							
Sondaj Metodu			Rotary												Koor. N-S (y) : 397210.176			ISMAIL AKSU							
															Koor. E-W (x) : 4553296.141										
Derinlik (m)	Numune		SPT				SPT Grafiği					Zemin Sınıfı	KAROT		Zemin Profili	BİRİM									
	Örselememiş	Örselemiş	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40	50		KAROT %	RQD %											
1																	Bitkisel Toprak	0.30 m							
2																									
3	0.30-3.00	CR-											5	0											
4																									
5																									
6																									
7																									
8	3.00-7.50	CR-											60	20			Açık kahve-yeşil-kahve renkli, ince çakıllı kumlu siltli KİL.	(Trakya Formasyonu Rezidüeli)							
9																									
10	7.50-10.50	CR-											30	20											
11																									
12	10.50-12.00	CR-											66	10											
13																									
14																									
15	12.00-15.00	CR-											15	0											
ZEMİN DEĞERLENDİRMESİ SPT												KAYA NİTELİĞİ		AYRIŞMA DERESESİ		ÇATLAK SIKLIĞI									
İnce taneli (Kohezyonlu)				İri Taneli (Kohezyonsuz)				RQD (%)		W		(m-1)													
N : 0-2	Çok yumuşak			N : 0-4	Çok Gevşek			0-25	Çok Zayıf	W1	Taze (Ayrışmamış)		<1	Masif											
N : 3-4	Yumuşak			N : 5-10	Gevşek			25-50	Zayıf	W2	Az Ayrışmış		1-3	Az çatlaklı - Kırıklı											
N : 5-8	Orta katı			N : 11-30	Orta Sıkı			50-75	Orta	W3	Orta derecede Ayr.		3-10	Kırıklı											
N : 9-13	Kati			N : 31-50	Sıkı			75-90	İyi	W4	Ayrışmış		10-50	Çok Çatlaklı - Kırıklı											
N : 14-30	Çok katı			N : > 50	Çok Sıkı			90-100	Çok İyi	W5	Tamamen Ayrışmış		<50	Parçalanmış											
N : > 30	Sert																								

Proje Adı		İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU															
İli		İSTANBUL İLİ İKİTELLİ		Kuyu Derinliği				25.00 m				Sondaj No		SK-23 (ELC-1)			
Derinlik (m)	Numune		SPT				SPT Grafiği N/30 cm					Zemin Sınıfı	KAROT		Zemin Profili	BİRİM	
	Örselemedi	Örselemiş	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40	50		KAROT %	RQD %			
16																	
17																	
18	15.00-18.00		CR-										35	0			
19																	
20	18.00-20.00		CR-										40	0			Açık kahve-yeşil-kahve renkli, ince çakıllı kumlu siltli KİL. <b>(Trakya Formasyonu Rezidüeli)</b>
21																	
22																	
23																	
24																	
25																	
26																	Kuyu Sonu: 25.00 m
27																	
28																	
29																	
30																	
31																	
ZEMİN DEĞERLENDİRMESİ SPT										KAYA NİTELİĞİ		AYRIŞMA DERECESİ		ÇATLAK SIKLIĞI			
İnce taneli (Kohezyonlu)			İri Taneli (Kohezyonsuz)				RQD (%)		W		(m <sup>-1</sup> )						
N : 0-2	Çok yumuşak		N : 0-4	Çok Gevşek			0-25	Çok Zayıf		W1	Taze (Ayrışmamış)		<1	Masif			
N : 3-4	Yumuşak		N : 5-10	Gevşek			25-50	Zayıf		W2	Az Ayrışmış		1-3	Az çatlaklı - Kırıklı			
N : 5-8	Orta katı		N : 11-30	Orta Sıkı			50-75	Orta		W3	Orta derecede Ayr.		3-10	Kırıklı			
N : 9-13	Katı		N : 31-50	Sıkı			75-90	İyi		W4	Ayrışmış		10-50	Çok Çatlaklı - Kırıklı			
N : 14-30	Çok katı		N : > 50	Çok Sıkı			90-100	Çok İyi		W5	Tamamen Ayrışmış		<50	Parçalanmış			
N : > 30	Sert																



İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETÜT RAPORU																
Proje Adı		İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETÜT RAPORU														
İli		Kuyu Derinliği		15.00 m		Sondaj No		SK-67 (ELC-3)								
Yeri		IKITELLI		Tarih		Metraj		Zemin Kotu : 93.40		Loğu Hazırlayan						
Baş Tarihi		11.01.2014		Yeraltı Suyu Durumu		8.00		Koor. N-S (y) : 397402.599		ISMAIL AKSU						
Bitiş Tarihi		11.01.2014						Koor. E-W (x) : 4552971.113								
Sondaj Metodu		Rotary														
Derinlik (m)	Numune		SPT				SPT Grafiği					KAROT		Zemin Profili	BİRİM	
	Örselemediği	Örselemediği	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40	50	Zemin Sınıfı	KAROT %			RQD %
1																<b>Bitkisel Toprak</b>
2																0.30 m
3	3.00	SPT	3	7	8	15										Açık kahve-yeşil-kahve renkli, ince çakıllı kumlu siltli KİL. <b>(Trakya Formasyonu Rezidüeli)</b>
4	4.50	SPT	11	13	17	30										
5																
6	5.00-6.00		CR-									30	30			
7																
8	6.00-7.50		CR-									30	25			
9																
10	7.50-10.50		CR-									15	10			<b>Kiltaş-Kumtaş Ardalanması;</b> Kahve-yeşil-gri renkli, kırıklı-çatlaklı yer yer killeşmiş. çok zayıf-zayıf-orta kaya niteliğinde <b>(Trakya Formasyonu)</b>
11																
12																
13	10.50-13.50		CR-									50	40			
14																
15	13.50-15.00		CR-									60	60			
														<b>Kuyu Sonu: 15.00 m</b>		
ZEMİN DEĞERLENDİRMESİ SPT						KAYA NİTELİĞİ		AYRIŞMA DERECESİ		ÇATLAK SIKLIĞI						
İnce taneli (Kohezyonlu)		İri Taneli (Kohezyonsuz)		RQD (%)		W		(m-1)								
N : 0-2	Çok yumuşak	N : 0-4	Çok Gevşek	0-25	Çok Zayıf	W1	Taze (Ayrışmamış)	<1	Masif							
N : 3-4	Yumuşak	N : 5-10	Gevşek	25-50	Zayıf	W2	Az Ayrışmış	1-3	Az çatlaklı - Kırıklı							
N : 5-8	Orta katı	N : 11-30	Orta Sıkı	50-75	Orta	W3	Orta derecede Ayr.	3-10	Kırıklı							
N : 9-13	Katı	N : 31-50	Sıkı	75-90	İyi	W4	Ayrışmış	10-50	Çok Çatlaklı - Kırıklı							
N : 14-30	Çok katı	N : > 50	Çok Sıkı	90-100	Çok İyi	W5	Tamamen Ayrışmış	<50	Parçalanmış							
N : > 30	Sert															

İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU																	
Proje Adı		İSTANBUL		Kuyu Derinliği		30.00 m		Sondaj No		SK-48 (ELC-4)							
İli		İKİTELLİ		Yeraltı Suyu Durumu		Tarih		Metraj		Zemin Kotu : 122.30							
Yeri		İKİTELLİ		Yeraltı Suyu Durumu		Tarih		Metraj		Logu Hazırlayan							
Baş Tarihi		12.01.2014		Yeraltı Suyu Durumu		Tarih		Metraj		Koor. N-S (y) : 397233.805							
Bitiş Tarihi		12.01.2014		Yeraltı Suyu Durumu		Tarih		Metraj		Koor. E-W (x) : 4552902.967							
Sondaj Metodu		Rotary		Yeraltı Suyu Durumu		Tarih		Metraj		Koor. E-W (x) : 4552902.967							
Derinlik (m)	Numune		SPT				SPT Grafiği					Zemin Sınıfı	KAROT		Zemin Profili	BİRİM	
	Örselememiş	Örselemiş	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40	50		KAROT %	RQD %			
0.30-1.50		CR-										25	0			<b>Bitkisel Toprak</b> 0.30 m	
1.50-4.50		CR-										33	10			<b>Killi Kireçtaşı;</b> Beyaz-krem renkli, kırıklı, çok zayıf-zayıf kaya niteliğinde <b>(Soğucak Formasyonu)</b>	
4.50-6.00		CR-										30	20				
6.00-7.50		CR-										20	0				
7.50-9.00		CR-										40	30				
9.00-12.00		CR-										30	10			<b>Kiltaşı;</b> Gri-koyu gri renkli, karbonat ve fosil içerikli zayıf dayanımlı. çok zayıf kaya niteliğinde <b>(Koyunbaba Formasyonu)</b>	
12.00-13.50		CR-										50	20				
																13.50 m	
ZEMİN DEĞERLENDİRMESİ SPT												KAYA NİTELİĞİ		AYRIŞMA DERECESİ		ÇATLAK SIKLIĞI	
İnce taneli (Kohezyonlu)				İri Taneli (Kohezyonsuz)				RQD (%)		W		(m <sup>-1</sup> )					
N : 0-2	Çok yumuşak			N : 0-4	Çok Gevşek			0-25	Çok Zayıf		W1	Taze (Ayrışmamış)		<1	Masif		
N : 3-4	Yumuşak			N : 5-10	Gevşek			25-50	Zayıf		W2	Az Ayrışmış		1-3	Az çatlaklı - Kırıklı		
N : 5-8	Orta katı			N : 11-30	Orta Sıkı			50-75	Orta		W3	Orta derecede Ayr.		3-10	Kırıklı		
N : 9-13	Katı			N : 31-50	Sıkı			75-90	İyi		W4	Ayrışmış		10-50	Çok Çatlaklı - Kırıklı		
N : 14-30	Çok katı			N : > 50	Çok Sıkı			90-100	Çok İyi		W5	Tamamen Ayrışmış		<50	Parçalanmış		
N : > 30	Sert																

Proje Adı		İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU															
İli		Yeri		Kuyu Derinliği		30.00 m		Sondaj No		SK-48 (ELC-4)							
Derinlik (m)	Numune		SPT				SPT Grafiği N/30 cm				Zemin Sınıfı	KAROT		Zemin Profili	BİRİM		
	Örselemiş	Örselemiş	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40		50	KAROT %			RQD %	
16																	
13.50-16.50		CR-											25	10			Kiltaşı; Gri-koyu gri renkli, karbonat ve fosil içerikli zayıf dayanımlı. çok zayıf kaya niteliğinde <b>(Koyunbaba Formasyonu)</b>
17																	
18																	
19																	
16.50-19.50		CR-											25	20			
20																	19.50 m
21																	
22																	
19.50-22.50		CR-											50	30			
23																	
24																	
22.50-24.00		CR-											60	50			Açık kahve-yeşil-kahve renkli, ince çakıllı kumlu siltli KİL. <b>(Trakya Formasyonu Rezidüeli)</b>
25																	
26																	
27																	
24.00-27.00		CR-											33	30			
28																	
29																	
30																	
27.00-30.00		CR-											50	25			
31																	Kuyu Sonu: 30.00 m
ZEMİN DEĞERLENDİRMESİ SPT		İnce taneli (Kohezyonlu)				İri Taneli (Kohezyonsuz)				KAYA NİTELİĞİ RQD (%)		AYRIŞMA DERECESİ W		ÇATLAK SIKLIĞI (m <sup>-1</sup> )			
N : 0-2	Çok yumuşak	N : 0-4	Çok Gevşek	0-25	Çok Zayıf	W1	Taze (Ayrışmamış)	<1	Masif								
N : 3-4	Yumuşak	N : 5-10	Gevşek	25-50	Zayıf	W2	Az Ayrışmış	1-3	Az çatlaklı - Kırıklı								
N : 5-8	Orta katı	N : 11-30	Orta Sıkı	50-75	Orta	W3	Orta derecede Ayr.	3-10	Kırıklı								
N : 9-13	Katı	N : 31-50	Sıkı	75-90	İyi	W4	Ayrışmış	10-50	Çok Çatlaklı - Kırıklı								
N : 14-30	Çok katı	N : > 50	Çok Sıkı	90-100	Çok İyi	W5	Tamamen Ayrışmış	<50	Parçalanmış								
N : > 30	Sert																

İMAKSU MÜHENDİSLİK İNŞ. SAN. ve TİC. LTD. ŞTİ.												TEMEL SONDAJ LOGU												Sayfa No: 1/2	
Proje Adı												İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU													
İli			İSTANBUL			Kuyu Derinliği			25.00 m			Sondaj No			SK-94 (ELC-5)										
Yeri			İKİTELLİ			Tarih			Metraj			Zemin Kotu : 137.50			Logu Hazırlayan										
Baş.Tarihi			08.01.2014			Yeraltı Suyu Durumu			--			Koor. N-S (y) : 397057.141			ISMAIL AKSU										
Bitiş Tarihi			08.01.2014									Koor. E-W (x) : 4552319.618													
Sondaj Metodu			Rotary																						
Derinlik (m)	Numune		SPT				SPT Grafiği					Zemin Sınıfı	KAROT		Zemin Profili	BİRİM									
	Örselemediği	Örselemediği	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40	50		KAROT %	RQD %											
1																Bitkisel Toprak	0.30 m								
0.30-1.50		CR-											10	0											
2																									
3		CR-											15	0											
1.50-3.00																									
4																									
5																									
6		CR-											15	0											
3.00-6.00																									
7																									
8																									
9		CR-											10	0											
6.00-9.00																									
10																									
11																									
12		CR-											10	0											
9.00-12.00																									
13																									
14																									
15		CR-											20	0											
12.00-15.00																									
ZEMİN DEĞERLENDİRMESİ SPT						KAYA NİTELİĞİ					AYRIŞMA DERECESİ			ÇATLAK SIKLIĞI											
İnce taneli (Kohezyonlu)			İri Taneli (Kohezyonsuz)			RQD (%)					W			(m-1)											
N : 0-2	Çok yumuşak		N : 0-4	Çok Gevşek		0-25	Çok Zayıf				W1	Taze (Ayrılmamış)		<1	Masif										
N : 3-4	Yumuşak		N : 5-10	Gevşek		25-50	Zayıf				W2	Az Ayrılmış		1-3	Az çatlaklı - Kırıklı										
N : 5-8	Orta katı		N : 11-30	Orta Sıkı		50-75	Orta				W3	Orta derecede Ayr.		3-10	Kırıklı										
N : 9-13	Kati		N : 31-50	Sıkı		75-90	İyi				W4	Ayrılmış		10-50	Çok Çatlaklı - Kırıklı										
N : 14-30	Çok katı		N : > 50	Çok Sıkı		90-100	Çok İyi				W5	Tamamen Ayrılmış		<50	Parçalanmış										
N : > 30	Sert																								

Proje Adı										İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU									
İli		Yeri		Kuyu Derinliği				25.00 m				Sondaj No		SK-94 (ELC-5)					
Derinlik (m)	Numune		SPT				SPT Grafiği					Zemin Sınıfı	KAROT		Zemin Profili	BİRİM			
	Örselememiş	Örselemiş	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40	50		KAROT %	RQD %					
16																			
17																			
18	15.00-18.00		CR-										20	0			<b>Killi Kireçtaşı;</b> Beyaz-krem renkli, kırıklı, çok zayıf kaya niteliğinde <b>(Soğucak Formasyonu)</b>		
19																			
20																			
21	18.00-21.00		CR-										15	0					
22																			
23	21.00-23.00		CR-										20	10			<b>Kilitaşı;</b> Gri-koyu gri renkli, karbonat ve fosil içerikli zayıf dayanımlı. çok zayıf kaya niteliğinde <b>(Koyunbaba Formasyonu)</b>		
24																			
25	23.00-25.00		CR-										10	0					
26																	<b>Kuyu Sonu: 25.00 m</b>		
27																			
28																			
29																			
30																			
31																			
ZEMİN DEĞERLENDİRMESİ SPT										KAYA NİTELİĞİ					AYRIŞMA DERECESİ			ÇATLAK SIKLIĞI	
İnce taneli (Kohezyonlu)		İri Taneli (Kohezyonsuz)		RQD (%)		W		(m <sup>-1</sup> )											
N : 0-2	Çok yumuşak	N : 0-4	Çok Gevşek	0-25	Çok Zayıf	W1	Taze (Ayrışmamış)	<1	Masif										
N : 3-4	Yumuşak	N : 5-10	Gevşek	25-50	Zayıf	W2	Az Ayrışmış	1-3	Az çatlaklı - Kırıklı										
N : 5-8	Orta katı	N : 11-30	Orta Sıkı	50-75	Orta	W3	Orta derecede Ayr.	3-10	Kırıklı										
N : 9-13	Katı	N : 31-50	Sıkı	75-90	İyi	W4	Ayrışmış	10-50	Çok Çatlaklı - Kırıklı										
N : 14-30	Çok katı	N : > 50	Çok Sıkı	90-100	Çok İyi	W5	Tamamen Ayrışmış	<50	Parçalanmış										
N : > 30	Sert																		



ELC GROUP MÜŞ. ve MÜH. A.Ş.

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## SONDAJ LOGU / BOREHOLE LOG

PROJE / PROJECT :  
IKITELLI PPP ÇSED / IKITELLI  
PPP ESIA

Sondaj No / Boring No : ELC-6

Sayfa No / Page No : 1 / 1

İŞVEREN / CLIENT :  
IHIC

PROJE NO/ PROJECT NO:  
E13C123

Başlangıç Tarihi / Begin Date : 17.01.2014

Bitiş Tarihi / Completion Date : 18.01.2014

Ağız kotu / Ground elevation :

Sondaj Tipi / Boring Type : Rotary

Y: 4552490 m

X: 649167 m

Sondaj derinliği / Boring depth : 4 m

Sondör / Driller : Murat UZUN

Mevkii / Location : İSTANBUL

Su seviyesi / Water table :

Mühendis / Engineer : Bora GENÇ

Sondaj Derinliği Boring Depth (m)	Lejant Legend	YASS / GW	Tanımlama Description	Numune No Sample ID	Numune Derinliği Sample Depth	PID (ppm)	Notlar Remarks
1			(2) <b>KİL / CLAY</b> Sarı / Yellowish				
2			2.0				
3			(2) <b>KUMTAŞI / SANDSTONE</b> Kumtaşı / Sandstone				
4			4.0				
5			Kuyu Sonu End of borehole : 4.00 m.				
6							
7							
8							
9							
10							

EBH1 ELC GROUP.GDT 31.1.14C:\USERS\GOKMEN\DESKTOP\IKITELLI\_HASTANE.GPJ

İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU																	
Proje Adı		İSTANBUL															
İli		Kuyu Derinliği		20.00 m		Sondaj No		SK-103 (ELC-7)									
Yeri		Baş. Tarihi		07.01.2014		Tarih		Metraj		Zemin Kotu : 124.30		Logu Hazırlayan					
Bitiş Tarihi		07.01.2014		Yeraltı Suyu Durumu		-		Koor. N-S (y) : 397149.353		ISMAIL AKSU							
Sondaj Metodu		Rotary		Koor. E-W (x) : 4552678.095													
Derinlik (m)	Numune		SPT				SPT Grafiği N/30 cm					Zemin Sınıfı		KAROT		Zemin Profili	BİRİM
	Örselelenmemiş	Örselelenmiş	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	10	20	30	40	50	KAROT %	RQD %				
1																	<b>Bitkisel Toprak</b> 0.50 m
0.50-1.50		CR-										66	40				
2																	
3	1.50-3.00		CR-									33	0				
4																	
5	3.00-4.50		CR-									33	10				
6																	
7	4.50-6.00		CR-									15	0				
8																	
9	6.00-7.50		CR									25	0				<b>Killi Kireçtaşı;</b> Beyaz-krem renkli, kırıklı, çok zayıf-zayıf kaya niteliğinde <b>(Soğucak Formasyonu)</b>
10																	
11	7.50-9.00		CR									33	0				
12																	
13	9.00-10.50		CR									20	0				
14																	
15	10.50-13.50		CR-									30	15				
ZEMİN DEĞERLENDİRMESİ SPT						KAYA NİTELİĞİ		AYRIŞMA DERECESELİ		ÇATLAK SIKLIĞI							
İnce taneli (Kohezyonlu)			İri Taneli (Kohezyonsuz)			RQD (%)		W		(m-1)							
N : 0-2	Çok yumuşak		N : 0-4	Çok Gevşek		0-25	Çok Zayıf		W1	Taze (Ayrışmamış)			<1	Masif			
N : 3-4	Yumuşak		N : 5-10	Gevşek		25-50	Zayıf		W2	Az Ayrışmış			1-3	Az çatlaklı - Kırıklı			
N : 5-8	Orta katı		N : 11-30	Orta Sıkı		50-75	Orta		W3	Orta derecede Ayr.			3-10	Kırıklı			
N : 9-13	Katı		N : 31-50	Sıkı		75-90	İyi		W4	Ayrışmış			10-50	Çok Çatlaklı - Kırıklı			
N : 14-30	Çok katı		N : > 50	Çok Sıkı		90-100	Çok İyi		W5	Tamamen Ayrışmış			<50	Parçalanmış			
N : > 30	Sert																

Proje Adı		İSTANBUL İLİ İKİTELLİ İLÇESİ ENTEGRE SAĞLIK KOMPLEKSİ ZEMİN ETUT RAPORU															
İli		İSTANBUL		Kuyu Derinliği		20.00 m				Sondaj No		SK-103 (ELC-7)					
Yeri		İKİTELLİ		Numune		SPT		SPT Grafiği N/30 cm				Zemin Sınıfı		Zemin Profili		BİRİM	
Derinlik (m)	Örselememiş	Örselemiş	0-15 cm	15-30 cm	30-45 cm	N <sub>30</sub>	SPT Grafiği N/30 cm				Zemin Sınıfı	KAROT		Zemin Profili	BİRİM		
							10	20	30	40		50	KAROT %			ROD %	
16																	
13.50-16.50		CR										30	0				
17																	
18		CR-										25	0				
16.50-18.00																	
19																	
20		CR-										30	10				
18.00-20.00																	
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
<b>Kuyu sonu : 20.00 m</b>																	
ZEMİN DEĞERLENDİRMESİ SPT						KAYA NİTELİĞİ				AYRIŞMA DERECESİ				ÇATLAK SIKLIĞI			
İnce taneli (Kohezyonlu)		İri Taneli (Kohezyonsuz)				RQD (%)				W				( m-1 )			
N : 0-2	Çok yumuşak	N : 0-4	Çok Gevşek			0-25	Çok Zayıf			W1	Taze (Ayrışmamış)			<1	Masif		
N : 3-4	Yumuşak	N : 5-10	Gevşek			25-50	Zayıf			W2	Az Ayrışmış			1-3	Az çatlaklı - Kırıklı		
N : 5-8	Orta katı	N : 11-30	Orta Sıkı			50-75	Orta			W3	Orta derecede Ayr.			3-10	Kırıklı		
N : 9-13	Katı	N : 31-50	Sıkı			75-90	İyi			W4	Ayrışmış			10-50	Çok Çatlaklı - Kırıklı		
N : 14-30	Çok katı	N : > 50	Çok Sıkı			90-100	Çok İyi			W5	Tamamen Ayrışmış			<50	Parçalanmış		
N : > 30	Sert																



ELC GROUP MÜŞ. ve MÜH. A.Ş.

Şehit Mustafa Yazıcı Sok. No:20

34810 Kavacak/Istanbul

(+90) Tel 216 465 91 30 Fax +90 216 465 91 39

## SONDAJ LOGU / BOREHOLE LOG

PROJE / PROJECT :  
IKITELLI PPP ÇSED / IKITELLI  
PPP ESIA

Sondaj No / Boring No : ELC-8

Sayfa No / Page No : 1 / 1

İŞVEREN / CLIENT :  
IHIC

PROJE NO/ PROJECT NO:  
E13C123

Başlangıç Tarihi / Begin Date : 17.01.2014

Bitiş Tarihi / Completion Date : 18.01.2014

Ağız kotu / Ground elevation :

Sondaj Tipi / Boring Type : Rotary

Y: 4555943 m

X: 648947 m

Sondaj derinliği / Boring depth : 4 m

Sondör / Driller : Murat UZUN

Mevkii / Location : ISTANBUL

Su seviyesi / Water table :

Mühendis / Engineer : Bora GENÇ

Sondaj Derinliği Boring Depth (m)	Lejant Legend	YASS / GW	Tanımlama Description	Numune No Sample ID	Numune Derinliği Sample Depth	PID (ppm)	Notlar Remarks
1			(2) YAPAY DOLGU / ARTIFICIAL FILL				
2			2.0				
3			(2) KUMTAŞI / SANDSTONE Kumtaşı / Sandstone				
4			4.0				
5			Kuyu Sonu End of borehole : 4.00 m.				
6							
7							
8							
9							
10							

EBH1 ELC GROUP.GDT 31.1.14C:\USERS\GOKMEN\DESKTOP\IKITELLI\_HASTANE.GPJ



ELC GROUP MÜŞ. ve MÜH. A.Ş.

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## SONDAJ LOGU / BOREHOLE LOG

PROJE / PROJECT :  
IKITELLI PPP ÇSED / IKITELLI  
PPP ESIA

Sondaj No / Boring No : ELC-9

Sayfa No / Page No : 1 / 1

İŞVEREN / CLIENT :  
IHIC

PROJE NO/ PROJECT NO:  
E13C123

Başlangıç Tarihi / Begin Date : 17.01.2014

Bitiş Tarihi / Completion Date : 18.01.2014

Ağız kotu / Ground elevation :

Sondaj Tipi / Boring Type : Rotary

Y: 4551867 m

X: 648998 m

Sondaj derinliği / Boring depth : 4 m

Sondör / Driller : Murat UZUN

Mevkii / Location : İSTANBUL

Su seviyesi / Water table :

Mühendis / Engineer : Bora GENÇ

Sondaj Derinliği Boring Depth (m)	Lejant Legend	YASS / GW	Tanımlama Description	Numune No Sample ID	Numune Derinliği Sample Depth	PID (ppm)	Notlar Remarks
1			(3) YAPAY DOLGU / ARTIFICIAL FILL				
2							
3			3.0				
4			(1) KUMTAŞI / SANDSTONE Kumtaşı / Sandstone				
5			Kuyu Sonu End of borehole : 4.00 m.				
6							
7							
8							
9							
10							

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ELC GROUP MÜŞ. ve MÜH. A.Ş.

Şehit Mustafa Yazıcı Sok. No:20

34810 Kavacak/İstanbul

(+90) Tel 216 465 91 30 Fax +90 216 465 91 39

## SONDAJ LOGU / BOREHOLE LOG

PROJE / PROJECT :  
IKITELLI PPP ÇSED / IKITELLI  
PPP ESIA

Sondaj No / Boring No : ELC-10

Sayfa No / Page No : 1 / 1

İŞVEREN / CLIENT :  
IHIC

PROJE NO/ PROJECT NO:  
E13C123

Başlangıç Tarihi / Begin Date : 17.01.2014

Bitiş Tarihi / Completion Date : 18.01.2014

Ağız kotu / Ground elevation :

Sondaj Tipi / Boring Type : Rotary

Y: 4551551 m

X: 649369 m

Sondaj derinliği / Boring depth : 4 m

Sondör / Driller : Murat UZUN

Mevkii / Location : İSTANBUL

Su seviyesi / Water table :

Mühendis / Engineer : Bora GENÇ

Sondaj Derinliği Boring Depth (m)	Lejant Legend	YASS / GW	Tanımlama Description	Numune No Sample ID	Numune Derinliği Sample Depth	PID (ppm)	Notlar Remarks
1			<b>KİL / CLAY</b> (2.5) Gri renkli yumuşak kil / Grayish soft clay				
2							
3			<b>KUMTAŞI / SANDSTONE</b> (1.5) Kumtaşı / Sandstone				
4							
5			Kuyu Sonu End of borehole : 4.00 m.				
6							
7							
8							
9							
10							

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## **ANNEX F-2**

### **Laboratory Analysis Results of Soil Samples**

#### F-2.1 Laboratory Analysis Results

#### F-2.2 Evaluation and Summary of Laboratory Analysis Results

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## **ANNEX F-2.1**

### **Laboratory Analysis Results**

# AGROLAB Labor GmbH

Dr.-Pauling-Str. 3, 84079 Bruckberg, Germany  
Fax: +49 (08765) 93996-28  
www.agrolab.de



ELC GROUP LTD.  
SEHIT MUSTAFA YAZICI SOK.  
80630 NO:20 KAVACIK / ISTANBUL  
TÜRKEI

Date 28.01.2014  
Customer no. 1110005950  
Order nr. 1093138  
Page 1 of 11

## REPORT

**Order 1093138**

*Reference* E13C123 Air-Liquide Soil and GW Investigation  
*Client* 1110005950 ELC GROUP LTD.  
*Sample acceptance* 17.01.14

Dear sir, madam,

Please find enclosed the results of the laboratory tests you requested.

Yours sincerely,

A handwritten signature in black ink that reads 'Jan Vizoso'.

**AGROLAB Labor Jan Vizoso, Tel. 08765/93996-61**  
**jan.vizoso@agrolab.de**  
**Customer relation manager**

Document certified  
by www.agrolab.de



1 Durch die DAKS nach DIN  
EN ISO 9001:2008  
akkreditiertes Prüflaboratorium.  
Die Akkreditierung gilt für alle in  
der UfU-VW aufgeführten  
Produktarten.

Order 1093138

Page 2 of 11

Sample no.	Date of sampling	Sample code
801443	not reported	Ikitelli CSED ELC-1_0-3m
801447	not reported	Ikitelli CSED ELC-1_23-25m
801449	not reported	Ikitelli CSED ELC-2_0-1,5m
801457	not reported	Ikitelli CSED ELC-2_13-15m
801459	not reported	Ikitelli CSED ELC-3_0-1,5m

	Unit	801443 Ikitelli CSED ELC-1_0-3m	801447 Ikitelli CSED ELC-1_23-25m	801449 Ikitelli CSED ELC-2_0-1,5m	801457 Ikitelli CSED ELC-2_13-15m	801459 Ikitelli CSED ELC-3_0-1,5m
<b>Solids</b>						
Analysis on the entire fraction		++	++	++	++	++
dry matter	%	82,0 *	81,5 *	80,9 *	87,1 *	70,2 *
aromatic hydrocarbons C6-C7	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C8	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C9	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C10	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
Aromatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C21-C35	mg/kg	<10	<10	<10	<10	<10
aliphatic hydrocarbons C5-C6	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C6-C8	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C8-C10	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C21-C35	mg/kg	<10	<10	<10	<10	28
EOX	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
Digestion with aqua regia		++	++	++	++	++
Antimony (Sb)	mg/kg	<2	<2	<2	<2	<2
Arsenic (As)	mg/kg	45	30	12	11	11
Barium (Ba)	mg/kg	430	220	120	21	82
Lead (Pb)	mg/kg	15	11	<4	11	20
Cadmium (Cd)	mg/kg	0,3	0,5	0,4	<0,2	<0,2
Chromium (Cr)	mg/kg	43	60	14	41	43
Cobalt (Co)	mg/kg	160	14	4,4	48	12
Copper (Cu)	mg/kg	130	24	13	32	24
Molybdenum (Mo)	mg/kg	<2,0	9,4	5,7	<2,0	<2,0
Nickel (Ni)	mg/kg	220	58	21	63	75
Mercury (Hg)	mg/kg	<0,05	0,10	<0,05	<0,05	<0,05
Vanadium (V)	mg/kg	48	87	27	54	27
Zinc (Zn)	mg/kg	410	66	32	130	53
Tin (Sn)	mg/kg	<1	<1	<1	<1	<1



Order 1093138

Page 3 of 11

Sample no.	Date of sampling	Sample code
801461	not reported	Ikitelli CSED ELC-3_13-15m
801463	not reported	Ikitelli CSED ELC-4_0-3m
801464	not reported	Ikitelli CSED ELC-4_12-15m
801465	not reported	Ikitelli CSED ELC-5_0-1,5m
801466	not reported	Ikitelli CSED ELC-5_22-24m

Unit	801461 <small>Ikitelli CSED ELC-3_13-15m</small>	801463 <small>Ikitelli CSED ELC-4_0-3m</small>	801464 <small>Ikitelli CSED ELC-4_12-15m</small>	801465 <small>Ikitelli CSED ELC-5_0-1,5m</small>	801466 <small>Ikitelli CSED ELC-5_22-24m</small>	
<b>Solids</b>						
Analysis on the entire fraction	++	++	++	++	++	
dry matter	%	85,8 *	85,2 *	85,8 *	77,6 *	89,6 *
aromatic hydrocarbons C6-C7	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C8	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C9	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C10	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
Aromatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C21-C35	mg/kg	<10	<10	<10	<10	<10
aliphatic hydrocarbons C5-C6	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C6-C8	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C8-C10	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C21-C35	mg/kg	<10	<10	<10	<10	22
EOX	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
Digestion with aqua regia	++	++	++	++	++	++
Antimony (Sb)	mg/kg	<2	<2	<2	2	<2
Arsenic (As)	mg/kg	5,2	20	2,8	18	9,0
Barium (Ba)	mg/kg	18	91	33	590	14
Lead (Pb)	mg/kg	8	8	6	37	5
Cadmium (Cd)	mg/kg	<0,2	<0,2	<0,2	0,9	<0,2
Chromium (Cr)	mg/kg	35	47	32	120	15
Cobalt (Co)	mg/kg	<3,0	6,3	14	35	3,2
Copper (Cu)	mg/kg	45	16	19	66	9,1
Molybdenum (Mo)	mg/kg	<2,0	2,5	<2,0	<2,0	2,0
Nickel (Ni)	mg/kg	7,0	33	29	130	16
Mercury (Hg)	mg/kg	0,08	0,09	<0,05	<0,05	<0,05
Vanadium (V)	mg/kg	49	68	37	170	18
Zinc (Zn)	mg/kg	26	39	68	130	34
Tin (Sn)	mg/kg	<1	<1	<1	1	<1



**Order 1093138**

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Sample no.	Date of sampling	Sample code
801468	not reported	Ikitelli CSED ELC-6_0-2m
801469	not reported	Ikitelli CSED ELC-6_2-4m

	Unit	801468	801469
		Ikitelli CSED ELC-6_0-2m	Ikitelli CSED ELC-6_2-4m
<b>Solids</b>			
Analysis on the entire fraction		++	++
dry matter	%	84,9 *	84,8 *
aromatic hydrocarbons C6-C7	mg/kg	<1,0	<1,0
aromatic hydrocarbons C8	mg/kg	<1,0	<1,0
aromatic hydrocarbons C9	mg/kg	<1,0	<1,0
aromatic hydrocarbons C10	mg/kg	<1,0	<1,0
Aromatic Hydrocarbons >C10-C12	mg/kg	<10	<10
Aromatic Hydrocarbons >C12-C16	mg/kg	<10	<10
Aromatic Hydrocarbons >C16-C21	mg/kg	<10	<10
Aromatic Hydrocarbons >C21-C35	mg/kg	<10	<10
aliphatic hydrocarbons C5-C6	mg/kg	<10	<10
Aliphatic Hydrocarbons >C6-C8	mg/kg	<10	<10
Aliphatic Hydrocarbons >C8-C10	mg/kg	<10	<10
Aliphatic Hydrocarbons >C10-C12	mg/kg	<10	<10
Aliphatic Hydrocarbons >C12-C16	mg/kg	<10	<10
Aliphatic Hydrocarbons >C16-C21	mg/kg	<10	<10
Aliphatic Hydrocarbons >C21-C35	mg/kg	<10	<10
EOX	mg/kg	<1,0	<1,0
Digestion with aqua regia		++	++
Antimony (Sb)	mg/kg	7	<2
Arsenic (As)	mg/kg	260 <sup>u)</sup>	4,1
Barium (Ba)	mg/kg	97	51
Lead (Pb)	mg/kg	15	8
Cadmium (Cd)	mg/kg	0,3	<0,2
Chromium (Cr)	mg/kg	17	20
Cobalt (Co)	mg/kg	<3,0	6,0
Copper (Cu)	mg/kg	6,2	28
Molybdenum (Mo)	mg/kg	4,8	<2,0
Nickel (Ni)	mg/kg	3,2	18
Mercury (Hg)	mg/kg	0,06	<0,05
Vanadium (V)	mg/kg	44	35
Zinc (Zn)	mg/kg	7	75
Tin (Sn)	mg/kg	<1	<1



	Unit	801443 Ikitelli CSED ELC-1_0-3m	801447 Ikitelli CSED ELC-1_23-25m	801449 Ikitelli CSED ELC-2_0-1.5m	801457 Ikitelli CSED ELC-2_10-15m	801459 Ikitelli CSED ELC-3_0-1.5m
<b>Solids</b>						
Naphthalene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Acenaphthylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Acenaphthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Fluorene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Phenanthrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Anthracene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Fluoranthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Pyrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(a)anthracene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Chrysene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(b)fluoranthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(k)fluoranthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(a)pyrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Dibenz(ah)anthracene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(ghi)perylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Indeno(1,2,3-cd)pyrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
<b>Sum PAHs (EPA)</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Vinyl chloride	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Dichloromethane	mg/kg	<0,2	<0,2	<0,2	<0,2	<0,2
1,2-Dichloroethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
cis-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
trans-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Trichloromethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,1,1-Trichloroethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Trichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Tetrachloromethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Tetrachloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
<b>volatile halogenated hydrocarbons total</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Chlorobenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Benzene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Toluene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Ethylbenzene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
m,p-Xylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
o-Xylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Cumene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
n-Propylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Styrene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Mesitylene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,2,3-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,2,4-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1

	Unit	801461 <small>IKM/1 CSED ELC-3, 13-15m</small>	801463 <small>IKitelli CSED ELC-4, 0-3m</small>	801464 <small>IKM/1 CSED ELC-4, 12-15m</small>	801465 <small>IKM/1 CSED ELC-5, 6-15m</small>	801466 <small>IKM/1 CSED ELC-5, 22-24m</small>
<b>Solids</b>						
Naphthalene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Acenaphthylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Acenaphthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Fluorene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Phenanthrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Anthracene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Fluoranthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Pyrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(a)anthracene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Chrysene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(b)fluoranthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(k)fluoranthene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(a)pyrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Dibenz(ah)anthracene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Benzo(ghi)perylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Indeno(1,2,3-cd)pyrene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
<b>Sum PAHs (EPA)</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Vinyl chloride	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Dichloromethane	mg/kg	<0,2	<0,2	<0,2	<0,2	<0,2
1,2-Dichloroethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
cis-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
trans-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Trichloromethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,1,1-Trichloroethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Trichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Tetrachloromethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Tetrachloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
<b>volatile halogenated hydrocarbons total</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Chlorobenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Benzene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Toluene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Ethylbenzene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
m,p-Xylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
o-Xylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Cumene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
n-Propylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Styrene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Mesitylene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,2,3-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,2,4-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1



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	Unit	801468 Ikitelli CSED ELC-6_0- 2m	801469 Ikitelli CSED ELC-6_2- 4m
<b>Solids</b>			
<i>Naphthalene</i>	mg/kg	<0,05	<0,05
<i>Acenaphthylene</i>	mg/kg	<0,05	<0,05
<i>Acenaphthene</i>	mg/kg	<0,05	<0,05
<i>Fluorene</i>	mg/kg	<0,05	<0,05
<i>Phenanthrene</i>	mg/kg	<0,05	<0,05
<i>Anthracene</i>	mg/kg	<0,05	<0,05
<i>Fluoranthene</i>	mg/kg	<0,05	<0,05
<i>Pyrene</i>	mg/kg	<0,05	<0,05
<i>Benzo(a)anthracene</i>	mg/kg	<0,05	<0,05
<i>Chrysene</i>	mg/kg	<0,05	<0,05
<i>Benzo(b)fluoranthene</i>	mg/kg	<0,05	<0,05
<i>Benzo(k)fluoranthene</i>	mg/kg	<0,05	<0,05
<i>Benzo(a)pyrene</i>	mg/kg	<0,05	<0,05
<i>Dibenz(ah)anthracene</i>	mg/kg	<0,05	<0,05
<i>Benzo(ghi)perylene</i>	mg/kg	<0,05	<0,05
<i>Indeno(1,2,3-cd)pyrene</i>	mg/kg	<0,05	<0,05
<b>Sum PAHs (EPA)</b>	mg/kg	n.q.	n.q.
<i>Vinyl chloride</i>	mg/kg	<0,1	<0,1
<i>Dichloromethane</i>	mg/kg	<0,2	<0,2
<i>1,2-Dichloroethane</i>	mg/kg	<0,1	<0,1
<i>cis-1,2-Dichloroethene</i>	mg/kg	<0,1	<0,1
<i>trans-1,2-Dichloroethene</i>	mg/kg	<0,1	<0,1
<i>Trichloromethane</i>	mg/kg	<0,1	<0,1
<i>1,1,1-Trichloroethane</i>	mg/kg	<0,1	<0,1
<i>Trichloroethene</i>	mg/kg	<0,1	<0,1
<i>Tetrachloromethane</i>	mg/kg	<0,1	<0,1
<i>Tetrachloroethene</i>	mg/kg	<0,1	<0,1
<b>volatile halogenated hydrocarbons total</b>	mg/kg	n.q.	n.q.
<i>Chlorobenzene</i>	mg/kg	<0,1	<0,1
<i>Benzene</i>	mg/kg	<0,05	<0,05
<i>Toluene</i>	mg/kg	<0,05	<0,05
<i>Ethylbenzene</i>	mg/kg	<0,05	<0,05
<i>m,p-Xylene</i>	mg/kg	<0,05	<0,05
<i>o-Xylene</i>	mg/kg	<0,05	<0,05
<i>Cumene</i>	mg/kg	<0,1	<0,1
<i>n-Propylbenzene</i>	mg/kg	<0,1	<0,1
<i>Styrene</i>	mg/kg	<0,1	<0,1
<i>Mesitylene</i>	mg/kg	<0,1	<0,1
<i>1,2,3-Trimethylbenzene</i>	mg/kg	<0,1	<0,1
<i>1,2,4-Trimethylbenzene</i>	mg/kg	<0,1	<0,1

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	Unit	801443 Iktelli CSED ELC-1_0-3m	801447 Iktelli CSED ELC-1_20-25m	801449 Iktelli CSED ELC-2_0-1.5m	801457 Iktelli CSED ELC-2_15-15m	801459 Iktelli CSED ELC-2_0-1.5m
<b>Solids</b>						
<i>o</i> -ethyltoluene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
<i>p,m</i> -ethyltoluene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
<b>sum BTX</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Trichlorofluoromethane (R11)	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,1,2-Trichlorotrifluoroethane (R113)	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
PCB (28)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (52)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (101)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (138)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (153)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (180)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
<b>Sum PCB (STI-table)</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Acetone	mg/kg	<5	<5	<5	<5	<5
Butylacetate	mg/kg	<1	<1	<1	<1	<1
Ethylacetate	mg/kg	<5 *	<5 *	<5 *	<5 *	<5 *
Methylethylketone	mg/kg	<5	<5	<5	<5	<5
Methylisobutylketone	mg/kg	<5	<5	<5	<5	<5
Tetrahydrofuran	mg/kg	<5	<5	<5	<5	<5
n-Hexane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Octane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Nonane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
n-Decane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
n-Undecane	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0

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	Unit	801461 <small>IKITELLI CSED ELC-3_13-15m</small>	801463 <small>IKITELLI CSED ELC-4_0-3m</small>	801464 <small>IKITELLI CSED ELC-4_12-15m</small>	801465 <small>IKITELLI CSED ELC-3_8-11m</small>	801466 <small>IKITELLI CSED ELC-3_22-30m</small>
<b>Solids</b>						
<i>o</i> -ethyltoluene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
<i>p,m</i> -ethyltoluene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
<b>sum BTX</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Trichlorofluoromethane (R11)	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,1,2-Trichlorotrifluoroethane (R113)	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
PCB (28)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (52)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (101)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (138)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (153)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (180)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
<b>Sum PCB (STI-table)</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Acetone	mg/kg	<5	<5	<5	<5	<5
Butylacetate	mg/kg	<1	<1	<1	<1	<1
Ethylacetate	mg/kg	<5 *	<5 *	<5 *	<5 *	<5 *
Methylethylketone	mg/kg	<5	<5	<5	<5	<5
Methylisobutylketone	mg/kg	<5	<5	<5	<5	<5
Tetrahydrofuran	mg/kg	<5	<5	<5	<5	<5
n-Hexane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Octane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Nonane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
n-Decane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
n-Undecane	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0

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	Unit	801468	801469
		Ikitelli CSED ELC-6_0-2m	Ikitelli CSED ELC-6_2-4m
<b>Solids</b>			
<i>o</i> -ethyltoluene	mg/kg	<0,1	<0,1
<i>p,m</i> -ethyltoluene	mg/kg	<0,1	<0,1
<b>sum BTX</b>	mg/kg	n.q.	n.q.
Trichlorofluoromethane (R11)	mg/kg	<0,1	<0,1
1,1,2-Trichlorotrifluoroethane (R113)	mg/kg	<0,1	<0,1
PCB (28)	mg/kg	<0,01	<0,01
PCB (52)	mg/kg	<0,01	<0,01
PCB (101)	mg/kg	<0,01	<0,01
PCB (138)	mg/kg	<0,01	<0,01
PCB (153)	mg/kg	<0,01	<0,01
PCB (180)	mg/kg	<0,01	<0,01
<b>Sum PCB (STI-table)</b>	mg/kg	n.q.	n.q.
Acetone	mg/kg	<5	<5
Butylacetate	mg/kg	<1	<1
Ethylacetate	mg/kg	<5 *	<5 *
Methylethylketone	mg/kg	<5	<5
Methylisobutylketone	mg/kg	<5	<5
Tetrahydrofuran	mg/kg	<5	<5
n-Hexane	mg/kg	<0,5	<0,5
Octane	mg/kg	<0,5	<0,5
Nonane	mg/kg	<0,5	<0,5
n-Decane	mg/kg	<0,5	<0,5
n-Undecane	mg/kg	<1,0	<1,0

Explanation: "<" or "n.q." represent the fact that the concentration of the analyte is below the limit of quantification (LOQ).

v) One or more target analytes being outside the linear calibration range, the sample had to be measured in dilution. This lead to an increase of the limit of quantification.

All results obtained from analysis on solid matter are based on the dry content except for analytes marked with an \* which are based on the original matter.

Start of testing: 17.01.2014

End of testing: 28.01.2014

The analytical results are only valid for the delivered sample material. A plausibility check is hardly possible for samples of unknown origin. Duplication of this document or of parts of it requires the authorization from laboratory.

*Jan Vizoso*

**AGROLAB Labor Jan Vizoso, Tel. 08765/93996-61**  
 jan.vizoso@agrolab.de  
 Customer relation manager



Order 1093138

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This electronically transmitted report was checked and released. It is in accordance with the requirements of DIN EN ISO/IEC 17025:2005 for simplified reports and is valid with the digital signature.

## Applied methods

### Solids

DIN EN ISO 17294-2 (E29): Antimony (Sb) Tin (Sn)

DIN ISO 11465: dry matter

DIN ISO 22155: sum BTX

DIN 38414-S17: EOX

draft TNRCC method 1006: n) Aromatic Hydrocarbons >C10-C12 Aromatic Hydrocarbons >C12-C16 Aromatic Hydrocarbons >C16-C21  
Aromatic Hydrocarbons >C21-C35 Aliphatic Hydrocarbons >C10-C12 Aliphatic Hydrocarbons >C12-C16  
Aliphatic Hydrocarbons >C16-C21 Aliphatic Hydrocarbons >C21-C35

EN ISO 11885: Arsenic (As) Barium (Ba) Lead (Pb) Cadmium (Cd) Chromium (Cr) Cobalt (Co) Copper (Cu) Molybdenum (Mo)  
Nickel (Ni) Vanadium (V) Zinc (Zn)

EN 13657: Digestion with aqua regia

EN 1483-E12-4: Mercury (Hg)

ISO 10382 / EN 15308: Sum PCB (STI-table)

ISO 22155: volatile halogenated hydrocarbons total Chlorobenzene Tetrahydrofuran Butylacetate Ethylacetate Acetone  
Methyl ethyl ketone Methyl isobutyl ketone n-Hexane Octane Nonane n-Decane n-Undecane

ISO 22155: n) aliphatic hydrocarbons C5-C6 Aliphatic Hydrocarbons >C6-C8 Aliphatic Hydrocarbons >C8-C10

Leaflet LUA NRW No°1: Sum PAHs (EPA)

no object: Analysis on the entire fraction

ISO 22155: n) aromatic hydrocarbons C6-C7 aromatic hydrocarbons C9 aromatic hydrocarbons C8 aromatic hydrocarbons C10

n) Not accredited

# AGROLAB Labor GmbH

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www.agrolab.de



ELC GROUP LTD.  
SEHIT MUSTAFA YAZICI SOK.  
80630 NO:20 KAVACIK / ISTANBUL  
TÜRKEI

Date 28.01.2014  
Customer no. 1110005950  
Order nr. 1094528  
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## REPORT

**Order 1094528**

*Reference* E13C123 Air-Liquide Soil and GW Investigation  
*Client* 1110005950 ELC GROUP LTD.  
*Sample acceptance* 21.01.14

Dear sir, madam,

Please find enclosed the results of the laboratory tests you requested.

Yours sincerely,

A handwritten signature in blue ink that reads 'Jan Vizoso'.

AGROLAB Labor Jan Vizoso, Tel. 08765/93996-61  
jan.vizoso@agrolab.de  
Customer relation manager

Document certified  
by www.agrolab.de



1 Durch die DAKS nach DIN  
EN ISO 17025  
akkreditiertes Prüflaboratorium.  
Die Akkreditierung gilt für die in  
der Liste aufgeführten  
Methoden.

Order 1094528

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Sample no.	Date of sampling	Sample code
803421	not reported	Ikitelli CSED ELC-7_0-3 m
803435	not reported	Ikitelli CSED ELC-7_20-25 m
803436	not reported	Ikitelli CSED ELC-8_0-1.2 m
803437	not reported	Ikitelli CSED ELC-8_1.5-4 m
803441	not reported	Ikitelli CSED ELC-9_0-1.5 m

	Unit	803421	803435	803436	803437	803441
		Ikitelli CSED ELC-7_0-3 m	Ikitelli CSED ELC-7_20-25 m	Ikitelli CSED ELC-8_0-1.2 m	Ikitelli CSED ELC-8_1.5-4 m	Ikitelli CSED ELC-9_0-1.5 m
<b>Solids</b>						
Analysis on the entire fraction		++	++	++	++	++
dry matter	%	75,3 *	81,2 *	83,3 *	88,3 *	78,2 *
aromatic hydrocarbons C6-C7	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C8	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C9	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
aromatic hydrocarbons C10	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0
Aromatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10	<10	<10
Aromatic Hydrocarbons >C21-C35	mg/kg	<10	<10	<10	<10	<10
aliphatic hydrocarbons C5-C6	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C6-C8	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C8-C10	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10	<10	<10
Aliphatic Hydrocarbons >C21-C35	mg/kg	19	<10	<10	<10	<10
EOX	mg/kg	<1,3 <sub>mj</sub> <sup>P</sup>	<1,0	<1,0	<1,0	<1,0
Digestion with aqua regia		++	++	++	++	++
Antimony (Sb)	mg/kg	<2	<2	<2	<2	<2
Arsenic (As)	mg/kg	19	13	14	5,7	20
Barium (Ba)	mg/kg	170	130	83	57	140
Lead (Pb)	mg/kg	28	12	8	5	26
Cadmium (Cd)	mg/kg	0,3	<0,2	4,9	0,5	4,9
Chromium (Cr)	mg/kg	41	59	19	14	52
Cobalt (Co)	mg/kg	15	29	10	3,4	89
Copper (Cu)	mg/kg	29	50	17	10	41
Molybdenum (Mo)	mg/kg	<2,0	<2,0	<2,0	<2,0	<2,0
Nickel (Ni)	mg/kg	62	67	60	19	150
Mercury (Hg)	mg/kg	0,18	0,09	0,23	<0,05	0,06
Selenium (Se)	mg/kg	<2	<2	<2	<2	<2
Vanadium (V)	mg/kg	45	56	40	15	84
Zinc (Zn)	mg/kg	66	110	47	28	130

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Sample no.	Date of sampling	Sample code
803442	not reported	Ikitelli CSED ELC-9_1.5-4 m
803443	not reported	Ikitelli CSED ELC-10_0-1.5 m
803444	not reported	Ikitelli CSED ELC-10_1.5-4 m

	Unit	803442	803443	803444
		Ikitelli CSED ELC-9_1.5-4 m	Ikitelli CSED ELC-10_0-1.5 m	Ikitelli CSED ELC-10_1.5-4 m
<b>Solids</b>				
Analysis on the entire fraction		++	++	++
dry matter	%	88,3 *	86,5 *	80,3 *
aromatic hydrocarbons C6-C7	mg/kg	<1,0	<1,0	<1,0
aromatic hydrocarbons C8	mg/kg	<1,0	<1,0	<1,0
aromatic hydrocarbons C9	mg/kg	<1,0	<1,0	<1,0
aromatic hydrocarbons C10	mg/kg	<1,0	<1,0	<1,0
Aromatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10
Aromatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10
Aromatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10
Aromatic Hydrocarbons >C21-C35	mg/kg	<10	<10	<10
aliphatic hydrocarbons C5-C6	mg/kg	<10	<10	<10
Aliphatic Hydrocarbons >C6-C8	mg/kg	<10	<10	<10
Aliphatic Hydrocarbons >C8-C10	mg/kg	<10	<10	<10
Aliphatic Hydrocarbons >C10-C12	mg/kg	<10	<10	<10
Aliphatic Hydrocarbons >C12-C16	mg/kg	<10	<10	<10
Aliphatic Hydrocarbons >C16-C21	mg/kg	<10	<10	<10
Aliphatic Hydrocarbons >C21-C35	mg/kg	<10	<10	<10
EOX	mg/kg	<1,0	<1,0	<1,0
Digestion with aqua regia		++	++	++
Antimony (Sb)	mg/kg	<2	<2	<2
Arsenic (As)	mg/kg	5,4	10	8,6
Barium (Ba)	mg/kg	15	100	120
Lead (Pb)	mg/kg	<4	15	16
Cadmium (Cd)	mg/kg	0,3	<0,2	<0,2
Chromium (Cr)	mg/kg	6	28	26
Cobalt (Co)	mg/kg	<3,0	8,5	7,7
Copper (Cu)	mg/kg	7,3	19	18
Molybdenum (Mo)	mg/kg	<2,0	<2,0	<2,0
Nickel (Ni)	mg/kg	7,9	28	30
Mercury (Hg)	mg/kg	<0,05	<0,05	0,05
Selenium (Se)	mg/kg	<2	<2	<2
Vanadium (V)	mg/kg	8	37	33
Zinc (Zn)	mg/kg	14	44	36

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	Unit	803421 Ikitelli CSED ELC-7_0-3 m	803435 Ikitelli CSED ELC-7_20-25 m	803436 Ikitelli CSED ELC-8_0-1.2 m	803437 Ikitelli CSED ELC-8_1.5-4 m	803441 Ikitelli CSED ELC-9_0-1.5 m
<b>Solids</b>						
Tin (Sn)	mg/kg	5	<1	<1	<1	<1
Naphthalene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Acenaphthylene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Acenaphthene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Fluorene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Phenanthrene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Anthracene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	0,06
Fluoranthene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	0,09
Pyrene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	0,06
Benzo(a)anthracene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Chrysene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Benzo(b)fluoranthene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	0,05
Benzo(k)fluoranthene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Benzo(a)pyrene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Dibenz(ah)anthracene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Benzo(ghi)perylene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
Indeno(1,2,3-cd)pyrene	mg/kg	<0,08 <sup>P</sup> <sub>mj</sub>	<0,05	<0,05	<0,05	<0,05
<b>Sum PAHs (EPA)</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	0,26
Vinyl chloride	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Dichloromethane	mg/kg	<0,2	<0,2	<0,2	<0,2	<0,2
1,2-Dichloroethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
cis-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
trans-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Trichloromethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,1,1-Trichloroethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Trichloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Tetrachloromethane	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Tetrachloroethene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
<b>volatile halogenated hydrocarbons total</b>	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Chlorobenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Benzene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Toluene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Ethylbenzene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
m,p-Xylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
o-Xylene	mg/kg	<0,05	<0,05	<0,05	<0,05	<0,05
Cumene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
n-Propylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Styrene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
Mesitylene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,2,3-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1



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	Unit	803442	803443	803444
		<small>Ikitelli CSED ELC-9_1-5-4 m</small>	<small>Ikitelli CSED ELC-10_0-1-5 m</small>	<small>Ikitelli CSED ELC-10_1-5-4 m</small>
<b>Solids</b>				
Tin (Sn)	mg/kg	<1	1	1
Naphthalene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Acenaphthylene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Acenaphthene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Fluorene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Phenanthrene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Anthracene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Fluoranthene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Pyrene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Benzo(a)anthracene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Chrysene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Benzo(b)fluoranthene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Benzo(k)fluoranthene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Benzo(a)pyrene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Dibenz(ah)anthracene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Benzo(ghi)perylene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
Indeno(1,2,3-cd)pyrene	mg/kg	<0,05	<0,05	<0,08 <sup>P</sup> <sub>mj</sub>
<b>Sum PAHs (EPA)</b>	mg/kg	n.q.	n.q.	n.q.
Vinyl chloride	mg/kg	<0,1	<0,1	<0,1
Dichloromethane	mg/kg	<0,2	<0,2	<0,2
1,2-Dichloroethane	mg/kg	<0,1	<0,1	<0,1
cis-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1
trans-1,2-Dichloroethene	mg/kg	<0,1	<0,1	<0,1
Trichloromethane	mg/kg	<0,1	<0,1	<0,1
1,1,1-Trichloroethane	mg/kg	<0,1	<0,1	<0,1
Trichloroethene	mg/kg	<0,1	<0,1	<0,1
Tetrachloromethane	mg/kg	<0,1	<0,1	<0,1
Tetrachloroethene	mg/kg	<0,1	<0,1	<0,1
<b>volatile halogenated hydrocarbons total</b>	mg/kg	n.q.	n.q.	n.q.
Chlorobenzene	mg/kg	<0,1	<0,1	<0,1
Benzene	mg/kg	<0,05	<0,05	<0,05
Toluene	mg/kg	<0,05	<0,05	<0,05
Ethylbenzene	mg/kg	<0,05	<0,05	<0,05
m,p-Xylene	mg/kg	<0,05	<0,05	<0,05
o-Xylene	mg/kg	<0,05	<0,05	<0,05
Cumene	mg/kg	<0,1	<0,1	<0,1
n-Propylbenzene	mg/kg	<0,1	<0,1	<0,1
Styrene	mg/kg	<0,1	<0,1	<0,1
Mesitylene	mg/kg	<0,1	<0,1	<0,1
1,2,3-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1



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	Unit	803421 Ikitelli CSED ELC-7_0-3 m	803435 Ikitelli CSED ELC-7_20-25 m	803436 Ikitelli CSED ELC-8_0-1.2 m	803437 Ikitelli CSED ELC-8_1.5-4 m	803441 Ikitelli CSED ELC-9_0-1.5 m
<b>Solids</b>						
1,2,4-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
o-ethyltoluene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
p,m-ethyltoluene	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
sum BTX	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Trichlorofluoromethane (R11)	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
1,1,2-Trichlorotrifluoroethane (R113)	mg/kg	<0,1	<0,1	<0,1	<0,1	<0,1
PCB (28)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (52)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (101)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (138)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (153)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
PCB (180)	mg/kg	<0,01	<0,01	<0,01	<0,01	<0,01
Sum PCB (STI-table)	mg/kg	n.q.	n.q.	n.q.	n.q.	n.q.
Acetone	mg/kg	<5	<5	<5	<5	<5
Butylacetate	mg/kg	<1	<1	<1	<1	<1
Ethylacetate	mg/kg	<5 *	<5 *	<5 *	<5 *	<5 *
Methylethylketone	mg/kg	<5	<5	<5	<5	<5
Methylisobutylketone	mg/kg	<5	<5	<5	<5	<5
Tetrahydrofuran	mg/kg	<5	<5	<5	<5	<5
n-Hexane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Octane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
Nonane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
n-Decane	mg/kg	<0,5	<0,5	<0,5	<0,5	<0,5
n-Undecane	mg/kg	<1,0	<1,0	<1,0	<1,0	<1,0



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	Unit	803442 <small>Ikiteili CSED ELC-9_1.5-4 m</small>	803443 <small>Ikiteili CSED ELC-10_0-1.5 m</small>	803444 <small>Ikiteili CSED ELC-10_1.5-4 m</small>
<b>Solids</b>				
1,2,4-Trimethylbenzene	mg/kg	<0,1	<0,1	<0,1
o-ethyltoluene	mg/kg	<0,1	<0,1	<0,1
p,m-ethyltoluene	mg/kg	<0,1	<0,1	<0,1
sum BTX	mg/kg	n.q.	n.q.	n.q.
Trichlorofluoromethane (R11)	mg/kg	<0,1	<0,1	<0,1
1,1,2-Trichlorotrifluoroethane (R113)	mg/kg	<0,1	<0,1	<0,1
PCB (28)	mg/kg	<0,01	<0,01	<0,02 <sup>p</sup>
PCB (52)	mg/kg	<0,01	<0,01	<0,02 <sup>p</sup>
PCB (101)	mg/kg	<0,01	<0,01	<0,02 <sup>p</sup>
PCB (138)	mg/kg	<0,01	<0,01	<0,02 <sup>p</sup>
PCB (153)	mg/kg	<0,01	<0,01	<0,02 <sup>p</sup>
PCB (180)	mg/kg	<0,01	<0,01	<0,02 <sup>p</sup>
Sum PCB (STI-table)	mg/kg	n.q.	n.q.	n.q.
Acetone	mg/kg	<5	<5	<5
Butylacetate	mg/kg	<1	<1	<1
Ethylacetate	mg/kg	<5 *	<5 *	<5 *
Methylethylketone	mg/kg	<5	<5	<5
Methylisobutylketone	mg/kg	<5	<5	<5
Tetrahydrofuran	mg/kg	<5	<5	<5
n-Hexane	mg/kg	<0,5	<0,5	<0,5
Octane	mg/kg	<0,5	<0,5	<0,5
Nonane	mg/kg	<0,5	<0,5	<0,5
n-Decane	mg/kg	<0,5	<0,5	<0,5
n-Undecane	mg/kg	<1,0	<1,0	<1,0

Explanation: "<" or "n.q." represent the fact that the concentration of the analyte is below the limit of quantification (LOQ).

pm) The limit of detection had to be raised due to insufficient sample material for extraction and analysis

All results obtained from analysis on solid matter are based on the dry content except for analytes marked with an \* which are based on the original matter.

Start of testing: 21.01.2014

End of testing: 28.01.2014

The analytical results are only valid for the delivered sample material. A plausibility check is hardly possible for samples of unknown origin. Duplication of this document or of parts of it requires the authorization from laboratory.

*Jan Vizoso*

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**Customer relation manager**



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This electronically transmitted report was checked and released. It is in accordance with the requirements of DIN EN ISO/IEC 17025:2005 for simplified reports and is valid with the digital signature.

## Applied methods

### Solids

DIN EN ISO 17294-2 (E29): Antimony (Sb) Tin (Sn)

DIN ISO 11465: dry matter

DIN ISO 22155: sum BTX

DIN 38414-S17: EOX

draft TNRCC method 1006: n) Aromatic Hydrocarbons >C12-C16 Aromatic Hydrocarbons >C10-C12 Aromatic Hydrocarbons >C16-C21  
Aromatic Hydrocarbons >C21-C35 Aliphatic Hydrocarbons >C10-C12 Aliphatic Hydrocarbons >C12-C16  
Aliphatic Hydrocarbons >C16-C21 Aliphatic Hydrocarbons >C21-C35

EN ISO 11885: Arsenic (As) Barium (Ba) Lead (Pb) Cadmium (Cd) Chromium (Cr) Cobalt (Co) Copper (Cu) Molybdenum (Mo)  
Nickel (Ni) Selenium (Se) Vanadium (V) Zinc (Zn)

EN 13657: Digestion with aqua regia

EN 1483-E12-4: Mercury (Hg)

ISO 10382 / EN 15308: Sum PCB (STI-table)

ISO 22155: volatile halogenated hydrocarbons total Chlorobenzene Butylacetate Ethylacetate Acetone Tetrahydrofuran  
Methylisobutylketone Methylethylketone n-Hexane Octane Nonane n-Decane n-Undecane

ISO 22155: n) aliphatic hydrocarbons C5-C6 Aliphatic Hydrocarbons >C6-C8 Aliphatic Hydrocarbons >C8-C10

Leaflet LUA NRW No°1: Sum PAHs (EPA)

no object: Analysis on the entire fraction

ISO 22155: n) aromatic hydrocarbons C6-C7 aromatic hydrocarbons C9 aromatic hydrocarbons C8 aromatic hydrocarbons C10

n) Not accredited

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## **ANNEX F-2.2**

### **Evaluation and Summary of Laboratory Analysis Results**

The results of the analysis of the collected soil samples

Soil (mg/kg)	Turkish Limits (mg/kg)				Dutch Limit (mg/kg)	Soil Concentration (mg/kg)																							
	Ingestion of soil and dermal exposure	Inhalation of volatile pollutants in outdoor air	Inhalation of dust in outdoor air	Transport. to groundwater and drinking (SF = 10) <sup>(1)</sup>		Intervention/ Indicative	ELC-1		ELC-2		ELC-3		ELC-4		ELC-5		ELC-6		ELC-7		ELC-8		ELC-9		ELC-10				
							0-3 m	23-25 m	0-1.5 m	13-15 m	0-1.5 m	13-15 m	0-3 m	12-15 m	0-1.5 m	22-24 m	0-2 m	2-4 m	0-3 m	20-25 m	0-1.2 m	1.5-4 m	0-1.5 m	1.5-4 m	0-1.5 m	1.5-4 m			
<b>Aromatic Hydrocarbons</b>																													
C6-C7	Aromatic C5-C9	15,643	-	-	15	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
C8						-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
C9						-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
C10	Aromatic C9-C16	1,564	-	-	1	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
>C10-C12						-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C12-C16						-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C16-C21	Aromatic C16 - C35	2,346	-	-	2	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			
>C21-C35						-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
<b>Aliphatic Hydrocarbons</b>																													
C5-C6	Aliphatic C5 - C8	4,693	-	-	4	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			
>C6-C8						-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C8-C10	Aliphatic C8 - C16	7,821	-	-	7	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			
>C10-C12						-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C12-C16						-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C16-C21	Aliphatic C16 - C35	156,429	-	-	146	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10			
>C21-C35						-	<10	<10	<10	<10	28	<10	<10	<10	<10	22	<10	<10	19	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total TPHs	-	-	-	-	-	5,000 <sup>(2)</sup>	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d			
Extr. Organic Halogens (EOX)	-	-	-	-	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			
<b>Heavy Metals</b>																													
Antimony	31	-	-	2	22	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0			

Soil (mg/kg)	Turkish Limits (mg/kg)				Dutch Limit (mg/kg)	Soil Concentration (mg/kg)																					
	Ingestion of soil and dermal exposure	Inhalation of volatile pollutants in outdoor air	Inhalation of dust in outdoor air	Transport. to groundwater and drinking (SF = 10) <sup>(1)</sup>		Intervention/indicative	ELC-1		ELC-2		ELC-3		ELC-4		ELC-5		ELC-6		ELC-7		ELC-8		ELC-9		ELC-10		
							0-3 m	23-25 m	0-1.5 m	13-15 m	0-1.5 m	13-15 m	0-3 m	12-15 m	0-1.5 m	22-24 m	0-2 m	2-4 m	0-3 m	20-25 m	0-1.2 m	1.5-4 m	0-1.5 m	1.5-4 m	0-1.5 m	1.5-4 m	
Arsenic	0.4	-	471	3	76	45	30	12	11	11	5.2	20	2.8	18	9.0	260 <sup>(1)</sup>	4.1	19	13	14	5.7	20	5.4	10	8.6		
Barium	15,643	-	433,702	288	-	430	220	120	21	82	18	91	33	590	14	97	51	170	130	83	57	140	15	100	120		
Lead	400	-	-	135	530	15	11	<4.0	11	20	8	8	6	37	5	15	8	28	12	8	5	26	<4	15	16		
Cadmium	70	-	1,124	27	13	0,3	0,5	0,4	<0,2	<0,2	<0,2	<0,2	<0,2	0,9	<0,2	0,3	<0,2	0,3	<0,2	4,9	0,5	4,9	0,3	<0,2	<0,2		
Chromium	235**	-	24**	10**	78**	43	60	14	41	43	35	47	32	120	15	17	20	41	59	19	14	52	6	28	26		
Cobalt	23	-	225	5	190	160	14	4,4	48	12	<3.0	6,3	14	35	3,2	<3.0	6,0	15	29	10	3,4	89	<3,0	8,5	7,7		
Copper	3,129	-	-	514	190	130	24	13	32	24	45	16	19	66	9,1	6,2	28	29	50	17	10	41	7,3	19	18		
Molybdenum	391	-	-	14	190	<2.0	9,4	5,7	<2.0	<2.0	<2.0	2,5	<2.0	<2.0	2,0	4,8	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0		
Nickel	1,564	-	-	13	100	220	58	21	63	75	7,0	33	29	130	16	3,2	18	62	67	60	19	150	7,9	28	30		
Mercury	23	3	-	3	36	<0,05	0,1	<0,05	<0,05	<0,05	0,08	0,09	<0,05	<0,05	<0,05	0,06	<0,05	0,18	0,09	0,23	<0,05	0,06	<0,05	<0,05	<0,05		
Vanadium	548	-	-	2,556	250	48	87	27	54	27	49	68	37	170	18	44	35	45	56	40	15	84	8	37	33		
Zinc	23,464	-	-	6,811	720	410	66	32	130	53	26	39	68	130	34	7	75	66	110	47	28	130	14	44	36		
Tin	46,929	-	-	54,794	900	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	5	<1	<1	<1	<1	<1	1	1		
<b>PAHs</b>																											
Naphthalene	1,147	165	-	28	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	
Acenaphthylene	-	-	-	-	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	
Acenaphthene	3,441	-	-	272	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	
Fluorene	2,294	-	-	333	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	
Phenanthrene	-	-	-	-	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	
Anthracene	17,203	-	-	4,490	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	0,06	<0,05	<0,05	<0,08 <sup>(pm)</sup>		
Fluoranthene	2,294	-	-	2,073	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	0,09	<0,05	<0,05	<0,08 <sup>(pm)</sup>		
Pyrene	1,720	-	-	1,522	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,08 <sup>(pm)</sup>	<0,05	<0,05	<0,05	0,06	<0,05	<0,05	<0,08 <sup>(pm)</sup>		



Soil (mg/kg)	Turkish Limits (mg/kg)				Dutch Limit (mg/kg)	Soil Concentration (mg/kg)																				
	Ingestion of soil and dermal exposure	Inhalation of volatile pollutants in outdoor air	Inhalation of dust in outdoor air	Transport. to groundwater and drinking (SF = 10) <sup>(1)</sup>		Intervention/indicative	ELC-1		ELC-2		ELC-3		ELC-4		ELC-5		ELC-6		ELC-7		ELC-8		ELC-9		ELC-10	
							0-3 m	23-25 m	0-1.5 m	13-15 m	0-1.5 m	13-15 m	0-3 m	12-15 m	0-1.5 m	22-24 m	0-2 m	2-4 m	0-3 m	20-25 m	0-1.2 m	1.5-4 m	0-1.5 m	1.5-4 m	0-1.5 m	1.5-4 m
Toluene	6,257	925	-	5	32	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	
Ethylbenzene	7,821	14	-	4	110	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	
m,p-Xylene	-	-	-	-	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	
o-Xylene	156,429	-	-	297	-	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	
Cumene	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
n-Propylbenzene	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
Styrene	15,643	1,001	-	0.2	86	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
Mesitylene	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
1,2,3-Trimethylbenzene	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
1,2,4-Trimethylbenzene	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
o-Ethyltoluene	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
p,m-Ethyltoluene	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
Trichlorofluoromethane (R11)	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
1,1,2-Trichlorotrifluoroethane (R113)	-	-	-	-	-	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	<0,1	
PCB (28)	-	-	-	-	-	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,02 <sup>p m)</sup>	
PCB (52)	-	-	-	-	-	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,02 <sup>p m)</sup>	
PCB (101)	-	-	-	-	-	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,02 <sup>p m)</sup>	
PCB (138)	-	-	-	-	-	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,02 <sup>p m)</sup>	
PCB (153)	-	-	-	-	-	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,02 <sup>p m)</sup>	
PCB (180)	-	-	-	-	-	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,01	<0,02 <sup>p m)</sup>	
Acetone	70,393	-	-	67	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Butylacetate	-	-	-	-	200	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	

Soil (mg/kg)	Turkish Limits (mg/kg)				Dutch Limit (mg/kg)	Soil Concentration (mg/kg)																				
	Ingestion of soil and dermal exposure	Inhalation of volatile pollutants in outdoor air	Inhalation of dust in outdoor air	Transport. to groundwater and drinking (SF = 10) <sup>(1)</sup>		Intervention/indicative	ELC-1		ELC-2		ELC-3		ELC-4		ELC-5		ELC-6		ELC-7		ELC-8		ELC-9		ELC-10	
							0-3 m	23-25 m	0-1.5 m	13-15 m	0-1.5 m	13-15 m	0-3 m	12-15 m	0-1.5 m	22-24 m	0-2 m	2-4 m	0-3 m	20-25 m	0-1.2 m	1.5-4 m	0-1.5 m	1.5-4 m	0-1.5 m	1.5-4 m
Ethylacetate	-	-	-	-	75	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	<5*	
Methylethylketone	-	-	-	-	35	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Methylisobutylketone	-	-	-	-	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Tetrahydrofuran	-	-	-	-	7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	
n-Hexane	-	-	-	-	-	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	
Octane	-	-	-	-	-	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	
Nonane	-	-	-	-	-	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	
n-Decane	-	-	-	-	-	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	<0,5	
n-Undecane	-	-	-	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	

Explanations:

(1) If the depth to the aquifer is less than 3 m, if the aquifer is fractured or carstic, or if the contaminated area is more than 10 hectares, the dilution factor should be taken as SF=1, otherwise the dilution factor should be taken SF=10.

(2) There are no intervention values for total TPHs in Dutch standards, however limit values provided for mineral oil are commonly applied.

"<" or "n.q." represent the fact that the concentration of the analyte is below the limit of quantification (LOQ).

pm) The limit of detection had to be raised due to insufficient sample material for extraction and analysis

v) One or more target analytes being outside the linear calibration range, the sample had to be measured in dilution. This lead to an increase of the limit of quantification.

All results obtained from analysis on solid matter are based on the dry content except for analyses marked with \* which are based on the original matter.

\*\* Limits for Chromium (IV)

blue – indicates exceedance of the Turkish soil quality criteria

highlight – indicates exceedance of the Dutch soil quality criteria



# **İstanbul İkitelli Integrated Health Campus Project Waste Management Plan**

**February 2014**

Prepared for  
IHIC İstanbul İkitelli Uluslararası Sağlık Yatırım ve İşletme A.Ş.



A Company of



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Integrated Health Campus (IHC) Project  
Document short title Waste Management Plan for Project  
Date February 2014  
Project name ESIA for Project  
Project number E13C123

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## 1.0 SCOPE AND PURPOSE OF THE WASTE MANAGEMENT PLAN

The Project Proponent IHIC İstanbul İkitelli Uluslararası Sağlık Hizmetleri Yatırım ve İşletme A.Ş. (IHIC) was established as a Special Purpose Vehicle (SPV) by the members of a joint venture and was selected as the preferred bidder for the design, financing, construction, procurement and operation of the İstanbul İkitelli Integrated Health Campus (İkitelli IHC), under a Public Private Partnership (PPP) Agreement. Currently, IHIC is comprised of ten companies: Emsaş İnşaat Turizm Ticaret ve Sanayi A.Ş., Sürat Bilişim Teknolojileri Sanayi Ticaret A.Ş., PBK Architects Inc., Ascension Group Architects L.P., Allen Shariff Corporation, Meinhardt Group, May Eczane, Forcimsa Empresa Constructora, S.A., Consortio Intenational Engineering Consultants and Şahin Tıp.

The Project will comprise of the construction of a General Hospital, a Children's Hospital, a Women's Hospital, an Oncology Hospital, A Neurological and Orthopedic Sciences Hospital, a Cardiovascular Hospital, a Psychiatric Hospital and A Physical Therapy and Rehabilitation Hospital with a total capacity of 2,682 beds. Project will also include a diagnostic and treatment block, one central plant, administration area and conference hall and a cogeneration unit building.

This Waste Management Plan (WMP) describes how waste that will be generated during the construction and operation phases of the Project will be managed. The aims of the WMP are to:

- Minimize the potential to cause harm to human health and the environment;
- Achieve and maintain compliance with Turkish regulations, and follow guidelines of the International Finance Corporation (IFC)
- Reduce operational costs and reduce any potential liabilities that may arise from waste handling operations.

This WMP identifies wastes that are likely to be generated during the construction and operation of IHC and documents the "cradle to grave" waste management practices to be employed for their collection, segregation, labelling, storage, and transfer to waste management facilities for final recycling and/or disposal.

## 2.0 DESCRIPTION OF PROJECT ACTIVITIES

The Project comprises the development of an integrated health campus with a total capacity of 2,682 beds consisting of eight hospitals which are listed below:

- 443-bed General Hospital
- 451-bed Children’s Hospital
- 451-bed Women’s Hospital
- 359-bed Oncology Hospital
- 347-bed Neurological and Orthopedic Sciences Hospital
- 303-bed Cardiovascular Hospital
- 128-bed Psychiatric Hospital
- 200-bed Physical Therapy and Rehabilitation Hospital.

The Project will be established on a 789,031 m<sup>2</sup> footprint area. The total gross areas of hospitals and technical service are 817,377 m<sup>2</sup>. A total of 8,200 cars will be able to park in the 271,293 m<sup>2</sup> closed car parking area within the Project.

The Project area is separated by a road. The northern part of the Project area will include the main hospitals (General Hospital, Children’s Hospital, Women’s Hospital, Oncology Hospital, Neurological and Orthopedic Sciences Hospital, and Cardiovascular Hospital), a diagnostic and treatment block, a central plant, an administration area and a conference hall. This part will also include a cogeneration unit building. The southern part of the Project area will consist of Psychiatric Hospital and Physical Therapy and Rehabilitation Hospital. Addition to these services a helipad and a heliport will be established in the scope of the Project. The total bed capacities for each hospital is given in Table 1. The general lay-out of the Hospitals are given in Figure 1.

Table 1: Bed distribution of each hospital unit

Land Use	Clinical Services	Intensive Care Unit (ICU)	Cardiovascular ICU	Burn Centre	Children Psychiatry	LDRP*	Newborn ICU	Bone Marrow Transplantation	Transplant	Trauma	Iodine Therapy Unit	VIP Beds	Total Bed Capacities
General Hospital	352	48	-	24	-	-	-	-	-	-	-	19	443
Children’s Hospital	352	48	-	-	32	-	-	-	-	-	-	19	451
Women’s Hospital	256	48	-	-	-	28	100	-	-	-	-	19	451
Oncology Hospital	256	48	-	-	-	-	-	24	-	-	12	19	359
Neurological Sciences and Orthopedic Hospital	256	60	-	-	-	-	-	-	-	12	-	19	347
Cardiovascular Hospital	192	48	24	-	-	-	-	-	20	-	-	19	303
Psychiatric Hospital	128	-	-	-	-	-	-	-	-	-	-	-	128
Physical Therapy and Rehabilitation Hospital	200	-	-	-	-	-	-	-	-	-	-	-	200
<b>Total</b>	<b>1,992</b>	<b>300</b>	<b>24</b>	<b>24</b>	<b>32</b>	<b>28</b>	<b>100</b>	<b>24</b>	<b>20</b>	<b>12</b>	<b>12</b>	<b>114</b>	<b>2,682</b>

\*Labor, Delivery, Recovery and Postpartum Rooms

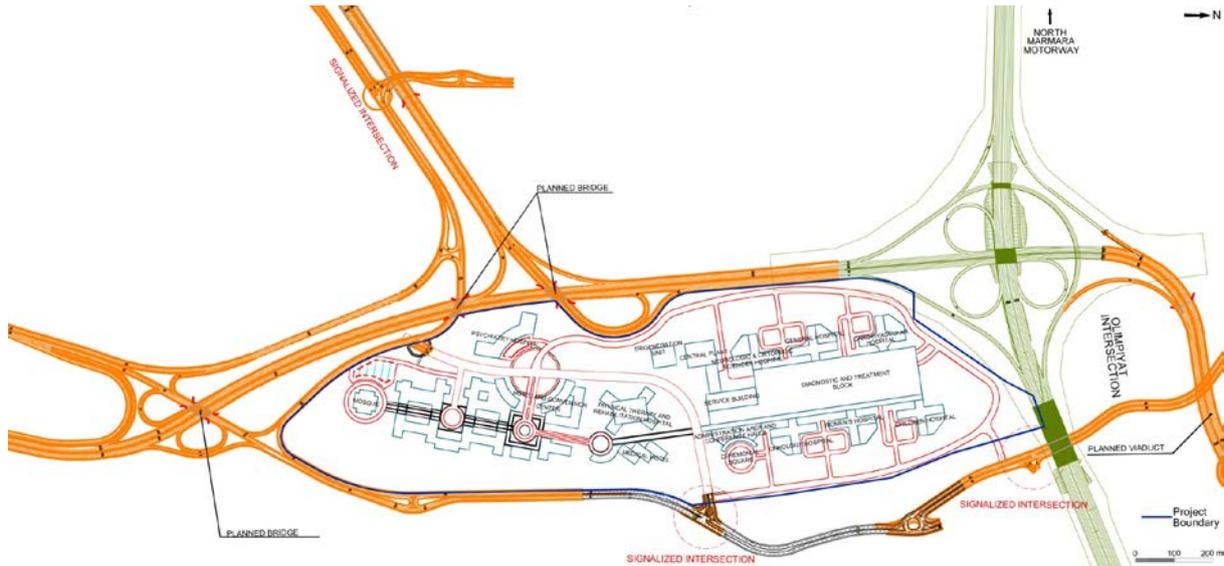


Figure 1: Layout of the Hospitals

### 3.0 LEGAL AND OTHER REQUIREMENTS

Table 2 sets out the key national regulations that are applicable to waste management for the Project.

Table 2: Key national regulations

Regulation	Official Gazette Date/Number
Regulation on General Principles of Waste Management	05.07.2008/26927
Medical Waste Control Regulation	22.07.2005/25883
Solid Waste Control Regulation	14.03.1991/20814
Hazardous Waste Control Regulation	14.03.2005/25755
Packaging Waste Control Regulation	24.07.2007/26562
Waste Oil Control Regulation	30.07.2008/26952
Regulation on Control of Waste Batteries and Accumulators	31.08.2004/25569
Regulation on Control of Excavated Soil, Construction and Demolition Wastes	18.03.2004/25406
Regulation on Control of Waste Vegetable Oils	19.04.2005/25791
Water Pollution Control Regulation	31/12/2004/25687
Regulation on Environmental Permits and Licenses	29.04.2009/27214
Communiqué on Road Transportation of Wastes	18.01.2013/28532
Communiqué on Non-hazardous and Inert Waste Recycling	12.05.2010/27579
Regulation on Control of Waste Electrical and Electronic Equipment	22.05.2012/28300
Wastewater Discharge to Sewerage System Regulation (ISKI)	

In addition to the Turkish regulations, waste management practices for the IHC will also follow the IFC Guidelines as given below:

- IFC General Environmental, Health, and Safety Guidelines
- IFC Environmental, Health, and Safety Guidelines for Health Care Facilities

## 4.0 WASTE MANAGEMENT

### 4.1 General Principles

The responsibilities of medical waste management are allocated between the health care facilities and the Municipalities according to the Medical Waste Control Regulation. Separate collection, handling, and temporary storage of medical waste are under responsibility of the health care facilities, while transportation from temporary storage area to the final disposal location and disposal of medical waste are under the responsibility of the Municipalities.

Health care facilities have to prepare Internal Waste Management Plan according to the Regulations which defines:

- The collection, handling, storage, and collection period of waste,
- Waste amounts,
- Equipment needed,
- Equipment cleaning and disinfection,
- Emergency response,
- Responsibilities and training

The Waste Management Strategy of the Project should be based on Waste Management Hierarchy which aims to produce minimum waste to be sent for final disposal. The hierarchy consists of the following options with priority sequence:

- Prevention – Avoid to generate waste
- Reduction – Minimize the waste generation
- Reuse – Reuse the waste materials
- Recycling and recovery – Convert the waste into usable materials and recover the energy content of waste
- Treatment – If the previous options are not possible then treat the waste before final disposal
- Storage – Store the waste safely prior to final disposal according to the required techniques
- Disposal – Dispose the waste in environmentally acceptable manner at final location/facility.

The basic waste reduction methods should include:

- Environmentally friendly and recyclable products should be chosen during material supplying in order not to dispose the waste as hazardous or special waste,
- Re-use of materials as appropriate,
- Re-use of equipment following sterilization and disinfection,
- Purchase materials that have the least amount of packaging, to minimize packaging waste generation,
- Arrange for timely deliveries to reduce storage and material losses,
- Examine the work method for each activity and identify alternative ways that eliminate or reduce wastes,
- Substitute materials that will help reduce waste produced,
- Avoid equipment containing mercury, PVCs, VOCs, PBT compounds and products that contain carcinogenic, mutagenic and teratogenic substances,
- Properly segregate all waste classes,

- Handle with care w
- hen transferring chemicals to minimize spills,
- Improve transport procedures to reduce damage to materials,
- Use of physical rather than chemical cleaning practices (e.g. using microfiber mops and cloths), where such practices do not affect disinfection and meet relevant standards for hygiene and patient safety,
- Use of efficient stock management practices and monitoring (e.g. for chemical and pharmaceutical stocks), including: small / frequent orders for products that spoil quickly and strict monitoring of expiry dates and complete use of old product before new stock is used,

The medical waste management should be planned and implemented carefully with other waste classes with the support of a Health Care Waste Management System (HWMS) according to IFC Standards.

#### 4.2 Waste Classification

The generated waste will be classified based on the Turkish Regulations. The wastes to be generated during construction phase will include:

1. **Medical Waste:** Trace amount of medical waste such as infectious waste and sharps will be generated from infirmary during construction phase,
2. **Hazardous Waste:** Contaminated packaging materials, contaminated fabrics and filters, paint residues, contaminated soil etc.
3. **Non-hazardous Waste:** Non-contaminated, metal, wood, and plastic scrap materials,
4. **Packaging Waste:** Glass, plastic and metal packaging materials, paper and cardboard,
5. **Domestic Waste:** Solid domestic waste and food waste,
6. **Special Waste:** Waste mineral oils, waste vegetable oils, waste batteries and accumulators, waste electrical and electronic equipment (WEEE),
7. **Excavation Soil, Demolition Waste:** Soil, gravel etc. derived from excavation and demolition,
8. **Domestic Wastewater:** Domestic sewage

The wastes to be generated during the IHC operation phase will include:

1. **Medical Waste:** Infectious waste, pathologic waste, and sharps from health care facilities are covered under medical waste according to the Turkish Regulation on Medical Waste. Thus:
  - *Infectious Waste:* Any and all body fluids, particularly blood and blood products, along with human tissue, organs, anatomic parts, autopsy material, placenta, fetus, and other pathological material that are known or likely to carry infection causing factors; any waste material / objects smeared with the aforementioned, such as gloves, covers, sheets, bandage, adhesive tape, tampons, ecuvion (sticks), or similar waste; body excretions of patients in hemodialysis units or patients placed in isolation or quarantine; air filter used for stopping bacteria or virus; laboratory cultures and culture stocks of infectious agents; infected corpses of test animals as used for research purposes and any and all materials having come in contact with the infected animals or excretions of the same; and any waste originating from veterinary services.
  - *Pathological Waste:* Tissues, organs, body parts, human fetus, or animal corpse originating from surgical intervention, autopsy, or anatomical work.

- **Sharps Waste:** Any waste that could cause a puncture, graze, or wounds, such as syringe, injector, and any other hypodermic needles, lancet, scalpel, blades, serum set needles, surgical suture needles, biopsy needles, catheters, any broken glass, ampoules, micro slides, broken glass tubes, and petri dishes.
2. **Hazardous Waste** such as:
    - Pharmaceutical waste such as expired and unused products and drugs,
    - Chemical waste generated through the use of chemicals during diagnostic/experimental work, cleaning, housekeeping and disinfection which may be hazardous and in solid, liquid or gaseous form such as formaldehyde, photographic chemicals, halogenated and nonhalogenated solvents,
    - Genotoxic/cytotoxic waste that may have mutagenic, teratogenic or carcinogenic properties arising from feces, urine and vomit of patients receiving cytostatic drugs and from treatment with chemicals and radioactive materials,
    - Wastes contaminated with hazardous substances,
    - Waste with high content of heavy metals such as batteries, broken thermometers, blood pressure gauges
    - Pressurized containers including containers, cartridges, cylinders for compressed air and different types of gases
    - Contaminated fabrics and filters from maintenance and repair activities,
    - Contaminated packaging materials,
    - Paint residues.
  3. **Non-hazardous Waste:** Non-contaminated metal, wood, and plastic scrap materials,
  4. **Packaging Waste:** Glass, plastic and metal packaging materials, paper and cardboard,
  5. **Domestic Waste:** Solid domestic waste and food waste,
  6. **Special Waste:** Waste mineral oils, waste vegetable oils, waste batteries and accumulators, WEEE,
  7. **Domestic Wastewater:** Domestic sewage
  8. **Industrial wastewater:** Wastewater from medical wards and operating theatres, laboratories, pharmaceutical and chemical stores, cleaning activities and x-ray development facilities. Wastewater may also result from treatment disposal technologies and techniques including autoclaving, microwave irradiation, and chemical disinfection.
  9. **Radioactive waste:** Solid, liquid and gaseous materials that have been contaminated with radionuclides from activities such as organ imaging, tumor localization, radiotherapy, and research/clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.

#### 4.3 Waste Generation

Waste types which will be generated during construction phase of the project with the waste codes, governing regulation, disposal methods and the final recycling/disposal facilities are given in Table 3.

Table 3: Waste characteristics and disposal methods during construction activities

Waste Class	Waste Type	Waste Code	Governing Regulation	Summary of Temporary Storage Prior to Treatment and Disposal Options / Notes	Waste Transporter / Waste Management Facility	Risks
DOMESTIC WASTE	Solid Wastes: Food waste, general solid waste, toilet papers etc. <i>Source:</i> Accommodation and restaurant	20 03 01	Solid Waste Control Regulation (OG Date/Number: 14.03.1991/20814)	Impermeable and sealed waste containers on-site. (400 lt or 800 lt)	Municipality trucks/ ISTAC Class II Landfill in Kemerburgaz	Low Risk. Facility already in use and has adequate capacity to receive waste.
	Domestic Wastewater <i>Source:</i> Camp activities	20 03 01	Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)	Collection in septic tank and periodically discharge.	n/a ISKI WWTP	Low Risk. Number of workers represent a small increase in the wastewater being generated in the region and for treatment at the WWTP
PACKAGING WASTE	Metal, Glass, Plastic packaging waste <i>Source:</i> packaging of products brought to the site that will include certain plastic, glass and metal.	15 01 04 (metal)	Packaging Waste Control Regulation (24.07.2007/26562)	Impermeable and sealed waste containers	Licensed Packaging Waste Recycling Company	Low Risk. Facilities already in use and has adequate capacity to receive waste
		15 01 07 (glass)				
		15 01 02 (plastic)				
HAZARDOUS WASTE	Paint residues <i>Source:</i> Maintenance and repair	15 02 02*	Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	Hazardous wastes will be segregated and stored based on the waste code. Wastes shall be temporarily stored on a designated area and labeled with special signs. These areas will be covered and sealed area separate from other types of waste generated on the Site for a maximum period of six months. The areas will have an impermeable surface and will be designed to contain any spillages or leakage of hazardous wastes.	Licensed hazardous waste transportation company / Licensed waste recycling and disposal facilities	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	Contaminated fabrics and filters <i>Source:</i> Maintenance and repair					
	Contaminated packaging <i>Source:</i> Maintenance and repair					
SPECIAL WASTE	Waste Mineral Oils <i>Source:</i> Maintenance and repair activities of construction equipment	13 01 ... 13 02 ...	Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)	Waste oils will be collected in red-colored metal drums with "Waste Oil" label. Storage up to 90 days on-site. Recycling of 1st category waste mineral oils; Energy recovery as fuel supplement in cement kilns of 2 <sup>nd</sup> category waste oils; disposal in incineration plants of 3 <sup>rd</sup> category waste oils.	Licensed Transporter / Licensed waste oil recycling facilities, Cement kilns, Incineration Plants	Low Risk. Waste oil collection, transport and disposal recycling are common practice that are well regulated by MEUP.

Waste Class	Waste Type	Waste Code	Governing Regulation	Summary of Temporary Storage Prior to Treatment and Disposal Options / Notes	Waste Transporter / Waste Management Facility	Risks
	Waste Batteries <i>Source:</i> Maintenance and repair activities of construction equipment	20 01 33*	Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)	Separately collect in battery box.	TAP / Surat Kargo / Send to TAP for further recycling in licensed facility	Low Risk since this is an established practice and the waste batteries and accumulators will not represent a large increase in the existing waste stream.
	Waste Accumulators <i>Source:</i> Maintenance and repair activities of construction equipment	16 06 01*		Separately stored in hazardous waste storage area up to 90 days on-site. Treatment: Recycling of the plastic, lead and acid solutions.	Licensed Transporter / Give back to the supplier / Licensed Recycling Facility	
	Waste Vegetable Oils <i>Source:</i> Food processing	20 01 25	Regulation on Control of Waste Vegetable Oils (OG Date/Number: 19.04.2005/25791)	Collect in dedicated plastic drums provided from the licensed recycler.	Licensed Recycling Company / Licensed Recycling Facility	Low Risk. Recycling companies has an effective collection and processing system.
	Waste Electrical and Electronic Equipment	20 01 35* 20 01 36	Regulation on Control of Waste Electrical and Electronic Equipment ( OG Date/Number: 22.05.2012/28300)	Collect in drums, store at the waste storage area.	Licensed Processing Company / Licensed Processing Facility	Low Risk. WEEE processing companies has an effective collection and processing system.
EXCAVATION WASTE	Natural soil <i>Source:</i> Levelling and excavation for foundations	17 05 04	Regulation on Control of Excavated Soil, Construction and Demolition Wastes (OG Date/Number: 18.03.2004/25406)	Temporary piling on ground within construction site with care against dust generation and surface runoff.	Former mining area at the north of the project site which is approved by Municipality.	High Risk. Excavated volume is large and there may not be a suitable area to dispose of the material
MEDICAL WASTE	Infectious waste, Sharps waste <i>Source:</i> Generated from infirmary during construction activities	18 01 01* 18 01 03* 18 02 01* 18 02 02*	Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)	Stored in medical waste bags.		Low Risk since the medical waste generation amounts are negligible during construction phase
NON-HAZARDOUS WASTE	Metal Scrap	20 01 40	Communiqué on Recycling of Certain Non-hazardous Waste (OG Date/Number: 17.06.2011/27967)	Stored in dedicated impermeable base area	Licensed non-hazardous waste recycling facility	Low Risk. Recycling is a common practice at the Licensed facilities.
	Wood scrap	17 02 01				
	Plastic scrap	17 02 03				

Health care waste generation rates according to the World Health Organization (WHO) database are given in Table 4. The daily waste generation unit amount for medical waste assumed as 1.85 kg/bed/day for the private sector hospitals from a research study by Yurtseven et al. in the literature.

Table 4: IHC Project waste generation rates

Waste type	Waste amount per bed (kg/bed/day)	%***	Waste Amount (kg/day)
Medical waste	<b>1.85*</b>	<b>100</b>	<b>4,961</b>
- infectious		37.5	1,860
- pathologic		37.5	1,860
- pharmaceutical		5	248
- sharps		5	248
- Genotoxic/ cytotoxic waste		2	99
- chemical waste		10	496
- high levels of metal content		2	99
- pressurized containers		1	44,5
Domestic Waste	<b>2.35**</b>	<b>100</b>	<b>6,302</b>
- Non-recyclable		95	5,986
- Metal (recyclable)		2.5	158
- Plastics (recyclable)		2.5	158

\*the average value is provided from Yurtseven et al, 2010.

\*\*Literature

\*\*\* Rates are provided from WHO, 1999.

Table 5 provides an estimate of the wastes anticipated to be generated during the IHC operation phase together with waste codes, governing regulation, best practice disposal methods as defined in the IFC EHS Guidelines for Health Care Wastes and the likely disposal method that will be used. Licenced waste management facilities in Istanbul are provided in Table 6.

Table 5: Wastes anticipated to be generated during the operation of the IHC and the management options

Waste Class	Type of Waste	Waste Code	Governing Regulation	Summary of Treatment and Disposal Options / Notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
MEDICAL WASTE	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.	18 01 03* 18 02 02*	Medical Waste Control Regulation (OG Date/Number: 22.07.2005/25883)	<b>Waste Segregation Strategy:</b> Yellow or red colored bag / container, marked "infectious" with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved. <b>Treatment:</b> Chemical disinfection; Wet thermal treatment; Microwave irradiation; Safe burial on hospital premises; Sanitary landfill; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) Highly infectious waste, such as cultures from lab work, should be sterilized using wet thermal treatment, such as autoclaving.	1,860 kg/day	Istanbul Metropolitan Municipality with NWTF (National Waste Transportation Form) / ISTAC Medical Waste Incineration Unit (ISTAC Sterilization Unit-planning phase)	Low Risk. Medical waste management is common practice that is well regulated by the MoEU and the Istanbul Metropolitan Municipality.
	Pathologic waste: 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.	18 01 02*		Anatomical waste should be treated using Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator).	1,860 kg/day		
	Sharps: Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	18 01 01* 18 02 01*		Waste Segregation Strategy: Yellow or red color 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 labeled "infectious waste". <b>Treatment:</b> Chemical disinfection; Wet thermal treatment; Microwave irradiation; Encapsulation; Safe burial on hospital premises; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator) - Following incineration, residues should be landfilled. -Sharps disinfected with chlorinated solutions should not be incinerated due to risk of generating POPs. -Needles and syringes should undergo mechanical mutilation (e.g. milling or crushing) prior to wet thermal treatment	248 kg/day		

Waste Class	Type of Waste	Waste Code	Governing Regulation	Summary of Treatment and Disposal Options / Notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
HAZARDOUS WASTE	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.).	18 01 06*	Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	Waste Segregation Strategy: Brown bag / container. Leak-proof plastic bag or container. Treatment: Sanitary landfill; Encapsulation; Discharge to sewer; Return expired drugs to supplier; Incineration (Rotary kiln; pyrolytic incinerator); Safe burial on hospital premises as a last resort. <b>Small quantities:</b> Landfill disposal acceptable, however cytotoxic and narcotic drugs should not be landfilled. Discharge to sewer only for mild, liquid pharmaceuticals, not antibiotics or cytotoxic drugs, and into a large water flow. Incineration acceptable in pyrolytic or rotary kiln incinerators, provided pharmaceuticals do not exceed one percent of total waste to avoid hazardous air emissions. Intravenous fluids (e.g. salts, amino acids) should be landfilled or discharged to sewer. Ampoules should be crushed and disposed of with sharps. <b>Large quantities:</b> Incineration at temperatures exceeding 1200 °C. Encapsulation in metal drums and groundwater contamination risk is minimal	248 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	<b>Genotoxic / cytotoxic waste:</b> Genotoxic waste may have mutagenic, teratogenic, or carcinogenic properties, and typically arises from the feces, urine, and vomit of patients receiving cytostatic drugs, and from treatment with chemicals and radioactive materials. Cytotoxic drugs are commonly used in oncology and radiology departments as part of cancer treatments.	18 01 08*		<b>Waste Segregation Strategy:</b> See above for “infectious waste”. Cytotoxic waste should be labeled “Cytotoxic waste”. Treatment: Return expired drugs to supplier; Chemical degradation; Encapsulation; Inertization; Incineration (Rotary kiln, pyrolytic incinerator); - Cytotoxic waste should not be landfilled or discharged to sewer systems. - Incineration is preferred disposal option. Waste should be returned to supplier where incineration is not an option. Incineration should be undertaken at specific temperatures and time specifications for particular drugs. Most municipal or single chamber incinerators are not adequate for cytotoxic waste disposal. Open burning of waste is not acceptable. - Chemical degradation may be used for certain cytotoxic drugs - Encapsulation and inertization should be a last resort waste disposal option.	99 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.

Waste Class	Type of Waste	Waste Code	Governing Regulation	Summary of Treatment and Disposal Options / Notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
	<b>Chemical waste:</b> Waste may be hazardous depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Chemical waste may be in solid, liquid, or gaseous form and is generated through use of chemicals during diagnostic / experimental work, cleaning, housekeeping, and disinfection. Chemicals typically include formaldehyde, photographic chemicals, halogenated and non-halogenated solvents, organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).	18 01 06*	Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	<b>Waste Segregation Strategy:</b> Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects.- Facilities should have permits for disposal of general chemical waste (e.g. sugars, amino acids, salts) to sewer systems.- Small hazardous quantities: Pyrolytic incineration, encapsulation, or landfilling.- Large hazardous quantities: Transported to appropriate facilities for disposal, or returned to the original supplier using shipping arrangements that abide by the Basel Convention. Large quantities of chemical waste should not be encapsulated or landfilled.	496 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	<b>Waste with high content of heavy metals:</b> Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).			<b>Waste Segregation Strategy:</b> Waste containing heavy metals should be separated from general health care waste. Treatment: Safe storage site designed for final disposal of hazardous waste. - Waste should not be burned, incinerated, or landfilled. Transport to specialized facilities for metal recovery.	99 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant or Licensed Hazardous waste Recycling Facility	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	<b>Pressurized containers:</b> Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.			<b>Waste Segregation Strategy:</b> Pressurized containers should be separated from general health care waste. Treatment: Recycling and reuse; Crushing followed by landfill - Incineration is not an option due to explosion risks - Halogenated agents in liquid form should be disposed of as chemical waste, as above.	44.5 kg/day	Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS Hazardous Waste Incineration Plant or Licensed Hazardous waste Recycling Facility	Low Risk. Hazardous waste collection, transport and disposal are common practice that is well regulated by MEUP.
	Fluorescent Lamp	20 01 21*	Hazardous Waste Control Regulation (OG Date/Number: 14.03.2005/25755)	<b>Waste Segregation Strategy:</b> Separately collect in cardboard boxes to avoid being broken. Disposal: Crushing in dedicated drums		Licensed Hazardous Waste Transporter with NWTF/ IZAYDAS SUREKO	Low Risk. Hazardous waste collection, transport and disposal are

Waste Class	Type of Waste	Waste Code	Governing Regulation	Summary of Treatment and Disposal Options / Notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
	Contaminated packaging	15 01 10*		<b>Waste Segregation Strategy:</b> Separately collect in containers. Disposal: RDF production or disposal		Licensed Hazardous Waste Transporter with NWTF/ Licensed Hazardous waste Recycling/disposal Facility	common practice that is well regulated by MEUP.
RADIOACTIVE WASTE	<b>Radioactive waste:</b> Includes solid, liquid, and gaseous materials that have been contaminated with radionuclides. Radioactive waste originates from activities such as organ imaging, tumor localization, radiotherapy, and research / clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.		TAEK	<b>Waste Segregation Strategy:</b> Lead box, labeled with the radioactive symbol. Treatment: Radioactive waste should be managed according to national requirements and current guidelines from the International Atomic Energy Agency (IAEA (2003), Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research. IAEA Draft Safety Guide DS 160, 7 February 2003).		Inform TAEK immediately	High Risk.
SPECIAL WASTE	Waste mineral oils	13 01 ..* 13 02 ..*	Waste Oil Control Regulation (OG Date/Number: 30.07.2008/26952)	<b>Waste Segregation Strategy:</b> Red-colored metal drums with "Waste Oil" label. Recycling of 1st category waste mineral oils; Energy recovery as fuel supplement in cement kilns of 2 <sup>nd</sup> category waste oils; disposal in incineration plants of 3 <sup>rd</sup> category waste oils.		Licensed Waste Oil Transporter with NWTF / İssan Kimya San Tic Ltd Şti. or Orüsan Kimya Ve Akaryakit Ürün. San. Tic. Ltd. Şti.	Low Risk. Special waste collection, transport and recycling /disposal are common practice that is well regulated by MEUP and by the related licensed facilities.
	Waste vegetable oils	20 01 25	Regulation on Control of Waste Vegetable Oils (OG Date/Number: 19.04.2005/25791)	<b>Waste Segregation Strategy:</b> Collect in plastic drums Treatment: Recycling to produce biodiesel fuel.		Kolza Biodizel Maysa Yağ	
	Waste accumulators	16 06 01*	Regulation on Control of Waste Batteries and Accumulators (OG Date/Number: 31.08.2004/25569)	<b>Waste Segregation Strategy:</b> Separately store in hazardous waste storage area up to 90 days on-site. Treatment: Recycling of the plastic, lead and acid solutions.		Licensed Waste Transporter / Give waste accumulators back to the supplier.	
	Waste batteries	20 01 33*		<b>Waste Segregation Strategy:</b> Separately collect in battery box. Treatment: Recycling		Licensed Waste Transporter / Give the waste batteries to TAP.	

Waste Class	Type of Waste	Waste Code	Governing Regulation	Summary of Treatment and Disposal Options / Notes	Anticipated Amount	Waste Transporter / Waste Management Facility	Risks
DOMESTIC WASTE	General health care waste (including food waste)	20 03 01	Solid Waste Control Regulation (OG Date/Number: 14.03.1991/20814)	<b>Waste Segregation Strategy:</b> Black bag / container. Halogenated plastics such as PVC should be separated from general health care facility waste to avoid disposal through incineration and associated hazardous air emissions from exhaust gases (e.g. hydrochloric acids and dioxins). Treatment: Disposal as part of domestic waste. Food waste should be segregated and composted. Component wastes (e.g. paper, cardboard, recyclable plastics [PET, PE, PP], glass) should be segregated and sent for recycling.	5,986 kg/day	Istanbul Metropolitan Municipality / ISTAC Class II Landfill Facility	Low Risk. Facility already in use and has adequate capacity to receive waste.
	Domestic wastewater	20 03 01	Water Pollution Control Regulation (OG Date/Number: 31.12.2004/25687)	Direct discharge into the nearby municipal wastewater collection line via permitted collection to the infrastructure. <b>Should be separately collected, should not be mixed with medical wastewater.</b>		n/a ISKI WWTP	Low Risk. Facility already in use and has adequate capacity to receive waste.
PACKAGING WASTE	Metal, Glass, Plastic packaging waste  <i>Source:</i> Generated from packaging of products brought to the site that will include certain plastic, glass and metal.	15 01 04 (metal)	Packaging Waste Control Regulation (24.07.2007/26562)	Impermeable and sealed waste containers	474 kg/day	Licensed Packaging Waste Recycling Company/ Licensed Packaging Waste Recycling Company	Low Risk. Facilities already in use and has adequate capacity to receive waste
		15 01 07 (glass)					
		15 01 02 (plastic)					
NON-HAZARDOUS WASTE	Metal Scrap	20 01 40	Communiqué on Recycling of Certain Non-hazardous Waste (OG Date/Number: 17.06.2011/27967)	Stored in dedicated impermeable base area		Licensed Non-hazardous waste recycling company / Licensed recycling facility	Low Risk. Non-hazardous waste collection, transport and recycling are common practice that is well regulated by MEUP and by the related licensed facilities.
	Wood scrap	17 02 01					
	Plastic scrap	17 02 03					

Table 6: Licenced waste management facilities in Istanbul

No	Name of the Facility	Contact Details	License Subject	License Due Date
1	MERSAN PLASTIK VE BAHCE MOBILYALARI SAN. TIC. LTD. STI.	UZUNDERE MEVKII TURGUT REIS MAH. SELCUK CAD. NO:68 SULTANBEYLI/ISTANBUL tel:02163986521 fax:02163981043	Non-hazardous Waste Recovery Packaging Waste Recovery	11.01.2014
2	GOKSU PLASTIK AMBALAJ SAN.VE TIC.LTD STI.	TERAZIDERE M. FUNDA SOKAK. NO:17 (BODRUM KAT) tel:2126139224 fax:2126139228	Non-hazardous Waste Recovery Packaging Waste Recovery	05.02.2014
3	EMEK ATIK DONUSUM VE NAKLIYAT SANAYI VE DIS TICARET LIMITED SIRKETI	S.CESME MAH. HALKALI CAD. 243 KUCUKCEKMECE tel:2126705026 fax:2126705027	Non-hazardous Waste Recovery Packaging Waste Recovery	06.02.2014
4	BOLIS PLASTIK VE KIMYA SANAYI TICARET LI MITED SIRKETI	TOPSELVI MAH. ESKI YAKACIK YOLU CAD. NO:6 tel:2163068866 fax:2163068828	Non-hazardous Waste Recovery Packaging Waste Recovery	14.02.2014
5	CESUR AMBALAJ SAN.VE TIC.A.S.	YAKACIK YAN YOL SENEM SOK.NO:11 KARTAL ISTANBUL tel:2163772855 fax:2163097891	Non-hazardous Waste Recovery Packaging Waste Recovery	14.02.2014
6	KAZANC PLASTIK SAN.VE TIC.A.S.	ORHANLI ORTA MH. 30 AGUSTOS CAD. NO:5 TUZLA tel:2163042216 fax:2163042257	Non-hazardous Waste Recovery Packaging Waste Recovery	01.04.2014
7	ATILIM PET LEVHA AMBALAJ PLASTIK SANAYI VE TICARET LIMITED SIRKETI	Universite M. SARIGUL SOK. 6 B AVCILAR tel:2125764915 fax:2125766325	Packaging Waste Recovery	03.04.2014
8	SAHINLER METAL SANAYI VE TICARET A.S ISTANBUL SUBESI	ORTA MAH. BULENT ECEVIT CAD. NO:4 34959 ORHANLI tel:02163040506 fax:02163040505	Hazardous Waste Recovery Packaging Waste Recycling Scrap Metal Processing Non-hazardous Waste Recovery Packaging Waste Recovery	24.05.2014
9	KILIC PLASTIK PETROL NAKLIYAT SAN.VE TIC.LTD.STI.	MURAT MAH ISKENT SAN.SIT.D.BLK 13,15,16,17,18,19,20,80,81 BAYRAMPASA tel:2126146727 fax:2125782501	Non-hazardous Waste Recovery Packaging Waste Recovery	29.05.2014
10	DOGUS PALET VE AMBALAJ SAN.TIC.LTD.S TI.	AKCABURGAZ MH 2.CAD. 6 ESENYURT tel:2128869977 fax:2128869777	Packaging Waste Recovery	25.07.2014
11	HALKALI KAGIT KARTON SANAYI VE TICARET ANONIM SIRKETI	HALKALI MERKEZ MAH. DEREBOYU CAD. 72/1 KUCUKCEKMECE tel:2126939334 fax:2125483221	Packaging Waste Recycling Packaging Waste Recovery	30.07.2014
12	EREN PLASTIK TEKSTILITH.IHR.SAN.VE T IC.LTD.STI.	IKITELLI OSB MAH. OTO SANAT. SAN. SIT. SOK. NO:119-120 tel:212 2757545 fax:212 2757881	Packaging Waste Recovery	23.09.2014
13	TUTLUOGLU AHSAP PALET SAN.VE TIC.LTD STI.	ESENKENT MAH. BAYSAL SK. NO:1/1 UMRANIYE ISTANBUL tel:02165275094 fax:02163640480	Packaging Waste Recovery	10.10.2014
14	ONER PLASTIK GERI DONUSUM - KENAN ONER	RAMAZANOGLU MH. SULTAN SK. NO:15 PENDIK tel:2163783501 fax:2163783501	Non-hazardous Waste Recovery Packaging Waste Recovery	24.10.2014
15	UZEYIR DEMIR	TEPEOREN YOLU AKTEPE SAN.ST. 10 TUZLA tel:5327448365 fax:216 5963558	Packaging Waste Recovery	27.10.2014
16	YLC IC VE DIS TICARET LIMITED SIRKETI	BUYUKBAKKALKOY BUYUKBAKKALKOY YOLU S. 31 2 MALTEPE tel:2164279529 fax:2164279529	Packaging Waste Recovery	07.11.2014

No	Name of the Facility	Contact Details	License Subject	License Due Date
17	POLYE PLASTIK VE CEVRE TEKNOLOJILERI SANAYI TICARET LIMITED SIRKETI	ESENKENT M./ORG.SAN. BOLG./2. CD 20 2 UMRANIYE tel:2165406903 fax:2165406906	Packaging Waste Recovery	21.11.2014
18	GURBETCILER PLASTIKSAN.VE TIC.A.S.	HIZIR REIS CAD. NO:9 KURTKOY-PENDIK/ISTANBUL tel:2165950171 fax:2165950176	Non-hazardous Waste Recovery Packaging Waste Recovery	04.12.2014
19	CIGDEMLER HURDA METAL INS.NAK.OTOM.S AN.TIC.LTD.STI.	Alipasa Mah. Erkoc Sk. No:28 tel:2127165294 fax:2127165294	Packaging Waste Recycling	23.05.2014
20	YON TEMIZLIK PEYZAJINSAAT SAN.VE TIC.LT D.STI.	YENI MAHALLE CD.NO:28 ORNEKKOY BEYKOZ tel:2164257338 fax:2164011518	Packaging Waste Recycling	11.07.2014
21	Gultem Cop Nakliyat Ve Temizlik Ambalaj Atigi Toplama Ayıklama	Y.KOY A.H.L. KARGO TERMINALI BOL. YOK BAKIRKOY tel:2124654601 fax:2124656412	Packaging Waste Recycling	30.07.2014
22	TUZLA DERI OSB GERI DONUSUM ANONIM SIRKETI	AYDINLIK OY ORGANIZE DERI SANAYI BOLGESI CEVRE SOKAK NO: 3tel:2163948068 fax:2163948069	Hazardous Waste Recovery Hazardous Waste Temporary Storage Non-hazardous Waste Recovery Packaging Waste Recycling	11.11.2014
23	AKADEMI CEVRE DANISMANLIK HIZ. INS. SAN. VE TIC. LTD. STI.	TEPEOREN ORTA MAH. DEMOKRASI CADDESİ N:92/1 tel:2163042515 fax:2163041975	Hazardous Waste Recovery Hazardous Waste Temporary Storage Non-hazardous Waste Recovery Waste Electronic and Electrical Equipment (WEEE) Processing Scrap Metal Processing	15.02.2014
24	ALTAS YAPI SAN. VE TEM. HIZM. TIC. A.S. (ELEKTRONIK ATIK TESİSİ)	Merdivenkoy Mah. YumurtacıAbdi bey Cad. No:8934732 Kadıkoy / Istanbul tel:2165640604 fax:2165640604	WEEE Processing	29.07.2014
25	EAG GERI DONUSUM SAN. VE TIC. A.S-SULTANGAZI SUBESİ	KUCUK SANAYI SITESİ ESENTEPE MAH. 2951. SOK. NO:28/A SULTANGAZI/ISTANBUL tel:2126060324 fax:2122945577	WEEE Processing	19.08.2014
26	KARAMAN KARDESLER METAL SANAYI VE TICARET LTD. STI.	SELIMPASA MAHALLESİ, 6205. SOKAK, NO:25, SILIVRI/ISTANBUL tel:2125561622 fax:2125050447	WEEE Processing	02.09.2014
27	EMRE METAL DIS TICARET LTD.STI.	ISTIKLAL MAH. BARIS MANCO CAD. NO:9, KIRAC tel:2126898444 fax:2126893299	Hazardous Waste Recovery WEEE Processing	25.11.2014
28	AKCANS A CIMENTO SANAYI VE TIC.A.S. BUYUKCEKMECE FABRIKA	Mimar Sinan Merkez Mah. Marmara cad. 13/1 Aka sok. No:6 34900 Buyukcekmece ISTANBUL tel:0212866100 fax:02128661200	Non-hazardous Waste Recovery Waste Incineration and Co-incineration	29.03.2014
29	ISTAC ISTANBUL CEVRE YONETİMİ SANAYI VE TICARET ANONİM SIRKETİ - KOMURCUODA TESİSLERİ	KOMURCUODA DUZENLI DEPOLAMA ALANI- KOMURCUODA MEVKII, KARAKIRAZ KOYU/SILE /ISTANBUL tel:02167328705 fax:02167328713	Class I Landfill Hazardous Waste Temporary Storage	28.06.2014
30	KOCA METAL PASLANMAZ CELİK GERİ DON.SAN.V E TIC.LTD.STI.	İKİTELLİ O.S.B. DEPO VE ARDIYE KOOP. 784 ADA PARSEL 8/B BASAKSEHIR/ISTANBUL tel:02126750591 fax:02126750594	Scrap Metal Processing	17.12.2014
31	SAYAN METAL	İKİTELLİ ORGANİZE SANAYİ BOLGESİ İSDOK SANAYİ SİTESİ 3. BLOK NO:26 BASAKSEHIR tel:2124855701	Hazardous Waste Recovery	01.02.2014
32	MİSİRLİ KUYUMCULUK RAMATÇILIK SAN.VE TIC.LTD.STI.	İKİTELLİ ORG.SAN.BOL.CEVRE SAN.SİT.2. BLOK NO:2-4-6-8 tel:2124853092 fax:2124853093	Hazardous Waste Recovery Non-hazardous Waste Recovery	01.04.2014

No	Name of the Facility	Contact Details	License Subject	License Due Date
33	AKADEMI GERI DONUSUM SANAYI VE TICARET LIMITED SIRKETI	ISTANBUL DERI ORGANIZE SANAYI BOLGESI 9. YOL D-1 PARSEL TUZLA/ISTANBUL tel:02163941873 fax:02163942166	Hazardous Waste Recovery Non-hazardous Waste Recovery	15.05.2014
34	ONSA MUCEVHERAT IMALATI VE DIS TICARET ANONIM SIRKETI	AKCABURGAZ MAH. 122 SK. 003 ESENYURT tel:02128867100 fax:02128868562	Hazardous Waste Recovery Non-hazardous Waste Recovery	29.05.2014
35	ONDER VARIL VE GERI KAZANIM TICARET LIMITED SIRKETI.	ORHANLI ORTA MAH.T.OREN KOYU MU.AKU YA.IS.BO.VE VER.SAN.SIT. 59 TUZLA tel:2163114194 fax:2163114194	Hazardous Waste Recovery	11.12.2014
36	YILDIRIMLAR PLASTIKSANAYI VE TICARET LTD.STI.	KARAYOLLARI MH K.AKDOGAN CD 29 GAZIOSMANPASA tel:2124798684 fax:2124798490	Non-hazardous Waste Recovery	22.01.2014
37	ONCA PLASTIK SANAYI VE TICARET LIMITED SIRKETI	BEYCILER KOYU ISTASYON CD. NO:32 SILIVRI/ISTANBUL tel:2127453571 fax:2127453574	Non-hazardous Waste Recovery	14.02.2014
38	SAHIN RAMAT VE KUYUMCULUK SANAYI TIC. LTD.STI.	ORG.SAN.BOLG.CEVRE SAN.SIT. 2. BLOK 24 tel:2124862298 fax:2124862599	Non-hazardous Waste Recovery	26.02.2014
39	HAKAN AYDIN AYDIN RAMAT	ISDOK SANAYI SITESI 7 BLOK NO: 2 IKITELLI BASAKSEHIR tel:2124852093 fax:2124852093	Non-hazardous Waste Recovery	28.02.2014
40	KILSAN KIL SANAYI VETIC.A.S.	KEMERBURGAZ ISIKLAR KOYU YOK EYUP tel:2122065206 fax:2122065211	Non-hazardous Waste Recovery	29.03.2014
41	BIRLIK METAL	IKITELLI ORGANIZE SANAYI BOLGESI ISDOK SANAYI SITESI 4.BLOK NO:13 BASAKSEHIR tel:02124858183 fax:02124858183	Non-hazardous Waste Recovery	01.04.2014
42	KENAN METAL DOKUM SANAYI VE TICARET LTD. STI.	IKITELLI OSB ISDOK SANAYI SITESI 4. BLOK NO:14 tel:02124856035 fax:02124856046	Non-hazardous Waste Recovery	29.04.2014
43	CELIK GRANUL SANAYIA.S.	Hastane mah. Istanbul Cad. No: 58 Hadimkoy - Arnavutkoy / ISTANBUL tel:02127714555 fax:02127712057	Non-hazardous Waste Recovery	07.05.2014
44	UZEL KUYUMCULUK SANAYI VE TICARET LIMITED SIRKETI	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 3. BLOK NO:15tel:02124855124 fax:02126385055	Non-hazardous Waste Recovery	14.05.2014
45	VOLKAN RAMATCILIK	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 3.BLOK NO:16 tel:02124856552 fax:02124856552	Non-hazardous Waste Recovery	14.05.2014
46	SIMGE RAMATCILIK IMALAT SANAYI VE TICARET LIMITED SIRKETI	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 3. BLOK NO:1 tel:02124853860 fax:02126030536	Non-hazardous Waste Recovery	10.06.2014
47	NEZIR PLASTIK GRANUL SANAYI ve TIC. (MEHMET ENGIN)	SANAYI MAH. GURBUZ SK. No: 13-15 GUNGOREN tel:2125556611 fax:2125077429	Non-hazardous Waste Recovery	10.06.2014
48	ENES KUYUMCULUK DEGERLI MADENCILIK DAYANIKLI TUKETIM MALLARI INSAAT GIDA TEKSTIL SANAYI VE TICARET LIMITED SIRKETI	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 3.BLOK NO:14 tel:2124853094 fax:2124855061	Non-hazardous Waste Recovery	08.07.2014
49	EFSUN PLASTIK GRANUR HAMMADDE VE KASA IMALATI SANAYI TICARET LIMITED SIRKETI	PIK DOKUMCULER SAN B-3 BLK 13 BASAKSEHIR tel:2124854718 fax:2124854719	Non-hazardous Waste Recovery	21.10.2014

No	Name of the Facility	Contact Details	License Subject	License Due Date
50	NADIR METAL RAFINERİ SANAYİ VE TİCARET ANONİM ŞİRKETİ	Akcaburgaz Mahallesi 119.sokak no 6 Esenyurt İstanbul tel:2128866728 fax:2128866731	Non-hazardous Waste Recovery	11.11.2014
51	CEM METAL TİCARET VE SANAYİ LTD.ŞTİ.	İSTANBUL TUZLA ORGANİZE SANAYİ BOLGESİ 6059 ADA, 4 NOLU PARSEL TUZLA/İSTANBUL tel:2165931200 fax:2165931201	Non-hazardous Waste Recovery	13.12.2014
52	IRGI HURDA TİCARETİ SONER IRGI	Z.GOKALP MH. İSDOK SAN.SİT.4.BLK 11 BASAKSEHIR tel:2124856071 fax:2124856071	Non-hazardous Waste Recovery	16.12.2014
53	UZUNOĞLU PLASTİK SANVE TİC.LTD.ŞTİ.	OSMANGAZI M. ALSANCAK C. 24 SANCAKTEPE tel:2163112064 fax:2163111023	Non-hazardous Waste Recovery	18.12.2014
54	MAVİ PLASTİK GIDA SAN.TİC.LTD.ŞTİ.	İKİTELLİ O.S.B. ATATURK OTO SANAYİ SİTESİ 22.BLOK NO:628-629-630 İKİTELLİ BASAKSEHIR tel:02124859095 fax:02124857557	Packaging Waste Recovery	24.06.2016
55	OBALILAR KAGIT METALPLAS CA TO AY IN SA V TİC LTD ŞTİ	AKCABURGAZ MAH. 1632. SOK NO:38 ESENYURT İST tel:2128866161 fax:02128866763	Packaging Waste Recycling Packaging Waste Recovery	22.09.2016
56	HUR PLASTİK GERİ DONUSUM VE GRANUL İMALATI SAN. TİC. LTD. ŞTİ.	RAMAZANOĞLU MAH. MİMAR SİNAN CAD. NO:2 tel:02163782500 fax:02163785531	Non-hazardous Waste Recovery Packaging Waste Recovery	04.11.2016
57	YENİHUZUR PLASTİK SAN.VE TİC.LTD.ŞTİ.	ORG.SAN.BOLG. TURGUT OZAL CD. 137 BASAKSEHIR tel:2125499961 fax:02125499960	Non-hazardous Waste Recovery Packaging Waste Recovery	22.12.2016
58	ASTS PROFİL MUHENDİSLİK VE PLAST.SAN VE TİC.A.S.	TUZLA KİMYA SANAYİCİLERİ ORGANİZE SANAYİ BOLGESİ MELEK ARAS BLV.TUNA CD. NO: 10 tel:2165930862 fax:2165930863	Non-hazardous Waste Recovery Packaging Waste Recovery	01.03.2017
59	TURANSAN STRAFOR GERİ DONUSUMU TUNCAY TECER	BATTALGAZI MH SULTAN SANAYİ SİT. B BLOK NO.42 SULTANBEYLİ / İSTANBUL tel:02165923845 fax:02165923847	Non-hazardous Waste Recovery Packaging Waste Recovery	02.05.2017
60	VATAN PLASTİK SAN.VE TİC.A.S.	SOGANLIK ORTA MAH.E-5 YANYOL NO:14 KARTAL İSTANBUL tel:0216 377 22 80 fax:0216 377 11 96	Packaging Waste Recovery	14.05.2017
61	BERRA OYUNCAK HEDİYELİK EŞYA SAN VE DIS TİC LTD ŞTİ	FIRUZKOY M. BAĞLARICI C. 77 AVCILAR tel:02124234615 fax:02124234615	Non-hazardous Waste Recovery Packaging Waste Recovery	24.05.2017
62	ADEMOĞLU PLASTİK İTHALAT VE İHRACAT SANAYİ TİCARET LTD.ŞTİ	İOSB İPKAS SANAYİ SİTESİ B BLOK N:1 İKİTELLİ BASAKSEHIR İSTANBUL tel:02126710385 fax:02126711235	Non-hazardous Waste Recovery Packaging Waste Recovery	04.06.2017
63	SİMSEK PLASTİK(HAYRETTİN YILMAZ)	VATAN MAH ELMAS SOK NO:19-21/1 BAYRAMPASA-İST tel:0212 6125476 fax:02126744950	Non-hazardous Waste Recovery Packaging Waste Recovery	13.07.2017
64	UCAL KAGIT SANAYİ VE TİCARET ANONİM ŞİRKETİ	SİRAPINAR KOYU BEYKOZ CAD. NO:89 CEKMEKOY İSTANBUL tel:02164357374 fax:02164357139	Packaging Waste Recovery	13.07.2017
65	POLİREN PLASTİK SAN. VE TİC. LTD. ŞTİ.	SANAYİ MAH. AVCILAR CAD. FUGE İS MERKEZİ NO:3 GÜNGÖREN/İSTANBUL tel:02125063505 fax:02125063515	Non-hazardous Waste Recovery Packaging Waste Recovery	16.08.2017
66	ERGÜLLER PLASTİK KALIP İNŞAAT SAN.VE TİC.LTD.ŞTİ.	VATAN MAH ESENLER CAD. SERAP SOK. NO:9\A BAYRAMPASA-İST tel:2126133061 fax:02125771417	Non-hazardous Waste Recovery Packaging Waste Recovery	14.09.2017
67	HARPUT PLASTİK SAN. VE TİC. LTD.ŞTİ.	HAVUZBASİ MAH. CESME SOK. ZAFER SAN. SİTESİ D BLOK NO: 58 tel:212 615 79 26 fax:02126169233	Non-hazardous Waste Recovery Packaging Waste Recovery	17.09.2017

No	Name of the Facility	Contact Details	License Subject	License Due Date
68	METROPLAST AMBALAJ TEKSTIL SAN.VE TIC. LTD. STI.	MERKEZEFENDI MAH. GUMUSSUYU CAD.FATIH SEHITLERI CAD.NO:13 MALTEPE-TOPKAPI-ZEYTINBURNU /ISTANBULtel:02125019309 fax:02126128352	Packaging Waste Recovery	05.12.2017
69	CILTAS NAKLIYAT TIC.LTD. STI.	ESKI SILIVRI CADDESI NO:34 MIMARSINAN BUYUKCEKMECE-IST tel:2128614437-38 fax:02128614440	Packaging Waste Recycling Packaging Waste Recovery	10.12.2017
70	LIFLI RULO VE LEVHA SANAYI A. S.	IST.DERI ORG.SAN.BOL TABAK S.N7-1 OZ.PAR. 2 TUZLA tel:2163941818 fax:2163941816	Non-hazardous Waste Recovery Packaging Waste Recovery	11.12.2017
71	AKSAN PLASTIK SANAYI VE TICARET LIMIT ED SIRKETI	RAMAZANOGLU M M.SINAN C SULTAN S 17 1 PENDIK tel:02165951357 fax:02163786542	Packaging Waste Recovery	14.12.2017
72	YASIN METAL VE PLASTIK SAN. TIC.(YASIN KUSOGLU)	IKITELLI ORG. SAN. BOL. ZIYA GOKALP MAH. DERSAN KOOP.S6 C BLOK NO:101-103 IKITELLI tel:2125497719 fax:2125497768	Packaging Waste Recycling Packaging Waste Recovery	31.12.2017
73	DOA GERI DONUSUM AMB PLASTIK VE KAGIT SAN TIC.LTD.STI.	MERMERCILER SAN.SIT.5.CAD.NO:8 tel:02128792874 fax:02128792875	Non-hazardous Waste Recovery Packaging Waste Recovery	22.01.2018
74	APEKS AMBALAJ SANAYI VE TIC LTD STI	UNIVERSITE M. FIRUZKOY BULVARI 45/1 AVCILAR tel:2124211800 fax:2124211802	Packaging Waste Recovery	24.01.2018
75	SULEYMAN KILINC	AYDINLI KOYU AYDINLI MAH. IST. DERI SAN. BOLG. Y. G. A. XXVI-6 TUZLA/ISTANBUL tel:02165910470 fax:02642913777	Non-hazardous Waste Recovery Packaging Waste Recovery	29.01.2018
76	OZARPACI PLASTIK GERI DONUSUM GRANUL IMALATI - HEDIYE OZARPACI	Ikiteilli O.S.B Turgut Ozal Cad.Pik Dokum Koop.A3 Blok No:14 tel:02124850730 fax:02124850731	Non-hazardous Waste Recovery Packaging Waste Recovery	08.02.2018
77	PLAZEN PLASTIK DANISMANLIK HIZMETLERI SANAYI VE DIS TICARET LIMITED SIRKETI	ISTANBUL DERI ORGANIZE SANAYI BOLGESI, KAZLICESME CADDESI, 1. YOL, H-15 PARSEL, TUZLA/ISTANBUL tel:2163942569 fax:2163941671	Packaging Waste Recovery	27.02.2018
78	PET SISE GERI DONUSUM TURAN ATES	Y.DUDULLU/SERIFALI CD. DERGAH SK. NO:37 UMRANIYE tel:2163642245 fax:2163651002	Packaging Waste Recovery	16.04.2018
79	BAYRAK DONUSUM PLASTIK TICARET VE SANAYI LTD. STI.	HADIMKOY MAH. BINNUR SOK. NO:3 ARNAVUTKOY / IST tel:2127716181 fax:02127716184	Non-hazardous Waste Recovery Packaging Waste Recovery	30.04.2018
80	OZDEN OZ PLASTIK SAN. VE TIC. LTD. STI.	Maltepe Gumussuyu Cad. Litros Yolu Site Sk. No:21 tel:0212 577 72 74 fax:02125675213	Non-hazardous Waste Recovery Packaging Waste Recovery	15.05.2018
81	OZDEMIRBAGLAR METALINS.AMB.PLAS.IM.GERI DON.SAN.TIC.LTD.STI.	TAHTAKALE M. ISTANBUL C. 32 AVCILAR tel:02126870626 fax:02126878142	Non-hazardous Waste Recovery Packaging Waste Recovery	21.05.2018
82	GUNDOGDU PLASTIK - MUHAMMET GUNDOGDU	SEYHLI MAH. SINE SOK. NO:18 PENDIK tel:2163784822 fax:2163784822	Non-hazardous Waste Recovery Packaging Waste Recovery	09.07.2018
83	ORHAN PLASTIK VE KAGIT AMB. SAN. VE TIC. LTD. STI	CIFTE HAVUZLAR CAD. EMEL SK. NO:9 K:1 BAYRAMPASA tel:2125672728 fax:02125760135	Non-hazardous Waste Recovery Packaging Waste Recovery	01.08.2018

No	Name of the Facility	Contact Details	License Subject	License Due Date
84	ORUCOGULLARI ALUMINYUM KULCE SAN. VE TIC. LTD. STI.	GAZITEPE MAHALLESİ, FABRIKALAR CADDESİ, NO:16, SILIVRI/İSTANBUL tel:02127388489 fax:2127388497	Non-hazardous Waste Recovery Packaging Waste Recovery Hazardous Waste Recovery	13.08.2018
85	AKIN YILDIZ PLASTİK AMBALAJ SAN VE TIC A.S.	Terazidere Mah. Hakan sk. No:18-20-22 tel:02125776210 fax:02125760149	Non-hazardous Waste Recovery Packaging Waste Recovery	23.08.2018
86	ERYURT PLASTİK İNSAATURİZM GIDA OTOM.SAN VE DIS TIC.LTD.S	SANAYİ MAH AVCILAR C 7/1 ZEM GÜNGÖREN tel:2125572995 fax:2125572900	Non-hazardous Waste Recovery Packaging Waste Recovery	11.09.2018
87	DEMİRTAS PLASTİK-İSMET DEMİRTAS	CEKMEKOY HÜSEYİNİ KÖYÜ BEYKÖZ CAD.NO:147 tel:02164345953 fax:02125760660	Non-hazardous Waste Recovery Packaging Waste Recovery	11.09.2018
88	SAGLAM GERİ DONUSUMPLS.PVC GRANUL SAN.V E TIC.LTD.STI.	VATAN M. C.HAVUZLAR C.GİRİS K 16 BAYRAMPASA tel:2124800495 fax:2124800498	Non-hazardous Waste Recovery Packaging Waste Recovery	22.10.2018
89	OZKARDESLER PLASTİK TEKSTİL SAN.TIC.LTD.STI.	VATAN MAH.CUMHURİYET CAD.NO:1 tel:02125766096 fax:02125766096	Non-hazardous Waste Recovery Packaging Waste Recovery	26.10.2018
90	GEMA POLİMER PLASTİK URUNL.SAN. VE TIC A.S.	Yesilce Mah. Dalgıç Sokak No: 31 tel:2122706644 fax:2122843574	Non-hazardous Waste Recovery Packaging Waste Recovery	26.10.2018
91	OZEN CAM GERİ DONUSUM KAZANIM VE İNS SAN LTD STI.	kayabasi koyu fabrikalar mevki no:62 kucukcekmece tel:2126685877 fax:2126685878	Non-hazardous Waste Recovery Packaging Waste Recovery Packaging Waste Recycling	04.12.2018
92	AKDOGAN KAGITCILIK AMBALAJ ATIGI TOPLAMA VE AYIRMA TESİSİ	HASANPASA MAH.DEVELİ SOK.NO:4 SULTANBEYLİ/İSTANBUL tel:02163980972 fax:02163989476	Packaging Waste Recycling	19.01.2016
93	KADIKÖY BEL. AMBALAJ ATIKLARINI TOPLAMA VE AYRISTIRMA TESİSİ(İSLT.ALTAS YAPI SAN.VE TEM.HİZ.TIC.A.S.	MERDİVENKÖY MAH. SAİR ARSİ CAD.DEVAMI E-5 KENARI GOZTEPE/KADIKÖY/İST. tel:02164780915 fax:02164784735	Packaging Waste Recycling	09.02.2016
94	DONKASAN DONUSEN KAGIT HAMMADELERİ SANAYİ VE TİCARET A.S.	CUMHURİYET MH. FERMAN CD. NO: 3 34876 tel:2163770090 fax:2163770012	Packaging Waste Recycling	18.03.2016
95	DONKASAN DONUSEN KAGIT HAMMADELERİ SAN.VE TIC.A.S.	İSTİKLAL MAH. ÇEVRE SK. NO: 4 34904 tel:02126890481 fax:02126890159	Packaging Waste Recycling	31.03.2016
96	TEKNİK KAGIT AMB.PLAS.TEK.SAN. VE TIC.LDT.STI	Namik Kemal Mah. Eksn Cad.No: 1 tel:02124284850 fax:02124284853	Packaging Waste Recycling	16.09.2016
97	HURSAN GERİ DONUSUM VE ÇEVRE TEKNOLOJİLERİ SAN.VE TIC. A.S.ZEYİNBURNU SUBESİ	TOPKAPI MALTEPE MAH. LİTROS YOLU NO:17 ZEYİNBURNU İSTANBUL tel:02125448685 fax:02125447257	Packaging Waste Recycling	19.12.2016
98	EREN KAGIT SAN. ve TIC. AS.(TOPKAPI SB.)	Maltepe Mah. Gumussuyu cad. No:7/1 Topkapi/İstanbul tel:02124814991 fax:02124814987	Packaging Waste Recycling	10.01.2017
99	EREN KAGIT SAN. ve TIC. AS. (MERKEZ TESİS)	Mahmutbey Merkez Mah. Tasocagi Yolu No:10 Bağcılar/İstanbul tel:02124463847 fax:02124463851	Packaging Waste Recycling	10.01.2017

No	Name of the Facility	Contact Details	License Subject	License Due Date
100	TARHAN GERI DONUSUM CUMALI TARHAN	RAMI KISLA CAD. TOPCULAR MAH. BAHCEYOLU SOK. NU:3 tel:02125775701 fax:02125763251	Packaging Waste Recycling	16.01.2017
101	GHS ULUS.TASIMACILIKVETURIZIM DIS TI C.LTD.STI	MERKEZ MAH CEMAL ULUSOYCAD SEHIT YUNUS CACA SOK.NO:6/1 YENIBOSNA-BAHCELIEVLER tel:02126979642 fax:02126976149	Packaging Waste Recycling	20.01.2017
102	OZ KARTALLAR INSAAT SANAYI VE TICARET LIMITED SIRKETI	ESENKENT MAH. ATATURK CAD. BATALALP SOK. NO:30 UMRANIYE ISTANBUL tel:02164660953 fax:02164660953	Packaging Waste Recycling	13.02.2017
103	EREN KAGIT A.S. (ESKISEHIR)	OSB. 8.CAD.NO:29 ODUNPAZARI/ESKISEHIR tel:2124230004 fax:02222362303	Packaging Waste Recycling	15.02.2017
104	CAMLIBEL KAGIT HURDACLILIK NAKLIYAT S AN.VE TIC.LTD.ST	CEBECI MAH. 2602 SOK NO:33 SULTANGAZI-IST tel:02126689446 fax:02126686948	Packaging Waste Recycling	12.03.2017
105	ANDIC TEKSTIL GIDA TEMIZLIK TURIZM VE INS.SAN.TIC.LTD.STI.	BEYICILER KOYU GIRISI HASAN AGANIN SAPLIGI MEVKII 13. PAFTA tel:02127453113 fax:02127453113	Non-hazardous Waste Recovery Packaging Waste Recycling	01.11.2017
106	EROGLU SAC VE DEMIRSAN.TIC.LTD.STI.	ORHANLI BELDESI ANADOLU MAH. KUZEY YAN YOL CAD. NO:06 TUZLA/ISTANBUL tel:02643042927 fax:02163040088	Packaging Waste Recycling	08.11.2017
107	SALLILAR KAGIT AMBALAJ NAKLIYE INSAAT MADENCILIK SAN.VE TIC. LTD. STI.	GULLUBAGLAR M. HURRIYET C. 40 B PENDIK tel:02163079236 fax:02163079181	Packaging Waste Recycling	30.11.2017
108	ISTANBUL GERI KAZANIM VE YAPI ENDUSTIRILERI LIMITED SIRKETI	KARAYOLLARI MAH. K.AKDOGAN CAD.547/1 4C GAZIOSMANPASA tel:2124771727 fax:2124777659	Packaging Waste Recycling	14.12.2017
109	AKSU CEVRE DANISMANLIK VE GERI DONUSUM A.S.	YENI MAHALLE, YAKACIK YOLU ATOLYELER SOKAK NO:7 (HABAS KARSISI) KARTAL/ISTANBUL tel:02164738946 fax:02164738947	Packaging Waste Recycling	24.12.2017
110	AZIM GERI DONUSUM SANAYI VE DIS TICARET LIMITED SIRKETI	EMEK MH ZIRVE SK 3 SANCAKTEPE tel:5323243361 fax:2124700380	Packaging Waste Recycling	01.01.2018
111	TOPCU KAGIT ERIM TOPCU	FIRUZKOY M. ULKER C. 52 AVCILAR tel:2126903465 fax:2126904695	Packaging Waste Recycling	31.01.2018
112	ATLAS INS. SAN. VE TIC. LTD. STI.	PASA MAH. PIYALEPASA BULVARI NO:76/1 FERIKOY/SISLI/ISTANBUL tel:02122475290 fax:02122479922	Packaging Waste Recycling	16.04.2018
113	TASLAR KAGIT INSAAT METAL PLASTIK URUNLERI SANAYI VE TICARET LIMITED SIRKETI	ESENKENT MH. BARAJYOLU CD. SEHIT OSMAN ERGUR SK. NO:1 tel:02163130250 fax:02163130293	Packaging Waste Recycling	14.05.2018
114	BAYFA GERI DONUSUM TURIZM TASIMACILIK SAN.TIC.LTD.STI	Merkez mah. Ayazma cad. No:1 Kagithane/Istanbul tel:2122945286 fax:2122945286	Packaging Waste Recycling	18.06.2018

No	Name of the Facility	Contact Details	License Subject	License Due Date
115	OZ SEKIZLER KAGIT METAL PLASTIK NAKLIYE GERI DONUSUM SAN.TIC.LTD.STI.	AKCABURGAZ MAH.95 SK.NO:7 ESENYURT/ISTANBUL tel:02128868637 fax:02128869970	Packaging Waste Recycling	06.09.2018
116	TASSAN TEMIZLIK MADEN SAN VE DIS TIC LTD STI	MERKEZ MAH. ATATURK CAD. NO:111 ALIBEYKOY-EYUP-IST tel:02126270101 fax:02126250649	Packaging Waste Recycling	01.10.2018
117	D TASLAR METAL KAGIT PLASTIK INSAAT SANAYI VE TICARET LIMITED SIRKETI	FERHATPASA MAH. GAZIPASA CAD. 49 SOK. NO: 46A ATASEHIR tel:2166615976 fax:2166615978	Packaging Waste Recycling	22.12.2018
118	ISSAN KIMYA SAN TIC LTD STI	TUZLA KIMYACILAR ORGANIZE SANAYI BOL.MELEK ARAS BULVAR ORGANIK CAD.NO: 32 TEPEOREN-TULZ-ISTANBUL tel:02165930024 fax:02165933346	Waste Mineral Oil Recycling	04.04.2016
119	ORUSAN KIMYA VE AKARYAKIT URUN. SAN. TIC. LTD. STI.	ISTANBUL TUZLA KIMYA SANAYICILERI ORGANIZE SANAYI BOLGESI, MELEK ARAS BULVARI, ANALITIK CADDESI, N:86 tel:2165931773 fax:2165931774	Waste Mineral Oil Recycling	22.01.2018
120	KOLZA BIODIZEL A.S. BITKISEL ATIK YAG GERIKAZANIM TESISI	Kimya Sanayicileri OSB Aromatik Cad. No: 31 Tuzla-ISTANBUL tel:02165332490 fax:02165932492	WasteVegetable Oil Recycling	09.05.2016
121	MAYSA YAG SANAYI ANONIM SIRKETI	Z.GOKALP M.E.TURGUT OZAL CADDESI 14 B BASAKSEHIR/ISTANBUL tel:02125492020 fax:02125492019	WasteVegetable Oil Recycling	17.04.2017
122	HURSAN PASLANMAZ CELIK GERI DONUS TES.TIC. VE SAN. A.S	YENIBOSNA MERKEZ MH. CEMAL ULUSOY CAD. SEHIT YUNUS CACA SOKAK NO: 4 / 1 tel:2126969761 fax:2126969765	Scrap Metal Processing	08.02.2018
123	TASMETAL KIMYA SAN.VE TIC.LTD.STI.	ORG.SAN.BOLG.GALVANO TEKNIK SAN.SIT. A BL 11 KUCUKCEKMECE tel:02125496819 fax:02126715836	Hazardous Waste Recovery	30.03.2016
124	HASTURK GERI DONUSUM SANAYI TIC. LTD. STI.	KIRAC MERKEZ MAH. MARESAL FEVZI CAKMAK CAD. NO:42 ESENYURT tel:02126899105 fax:02126899106	Hazardous Waste Recovery Non-hazardous Waste Recovery	22.08.2016
125	AYPE MEDIKAL VE GUMUS GERI KAZANIM MAKINALARI	IKITELLI OSB AYKOSAN SAN SIT 6.BLOKLAR C BLOK NO:15 BASAKSEHIR-IST tel:2124150108 fax:02126577778	Hazardous Waste Recovery	06.03.2017
126	SEYHAN MEDIKAL VE GUMUS GERIKAZANIM SAN. TIC. LTD. STI.	IKITELLI OSB. AYKOSAN SAN. SITESI 6'LI BLOK E/105 tel:02125490618 fax:02126713785	Hazardous Waste Recovery	07.03.2017
127	KAHYAOGULLARI HURDACILIK SAN. TIC. LTD. STI. ISTANBUL TUZLA SUBESI	ORGANIZE DERI SANAYI BOLGESI M1/1A TUZLA ISTANBUL tel:02163940525 fax:02163940528	Hazardous Waste Recovery	03.05.2017
128	KURTYILDIZ KIMYA SANAYI-ORHAN KURTOGLU	GALVANOTEKNIK SANAYI SITESI TURGUT OZAL CAD. A BLOK NO: 83 ALT KAT IKITELLI-ISTANBUL tel:02126713069 fax:02126713068	Hazardous Waste Recovery	03.07.2017
129	GOZDE KIMYA MEDIKAL GUMUS GERI DONUSUM - EROL BUYUKGOZ	AYKOSAN SANAYI SITESI E BLOK NO:70 BASAKSEHIR tel:02126716740 fax:02126577778	Hazardous Waste Recovery Non-hazardous Waste Recovery	14.08.2017

No	Name of the Facility	Contact Details	License Subject	License Due Date
130	ERTAS METAL SAN.VE TIC.A.S.	BAGCILAR GUNESLI KOCMAN C. 15 BAGCILAR tel:02125504686 fax:02125504699	Hazardous Waste Recovery Non-hazardous Waste Recovery	09.10.2017
131	KESKINLER ALUMINYUM METAL MAKINA VE ENDUSTRIYEL URUNLERI TIC. LTD. STI.	IKITELLI O.S.B. ISDOK SANAYI SITESI 2.BLOK NO:26-28 tel:02124851005 fax:02124851005	Hazardous Waste Recovery	20.11.2017
132	NERGIS FOTOGRAFICILIK BANYO ATIKSUYU TOPLAMA VE ISLEME- MUSTAFA KASAP	Ikitelli OSB Saraclar San. Sitesi 7.Blok No:501 tel:02126174355 fax:02126174340	Hazardous Waste Recovery Non-hazardous Waste Recovery	22.01.2018
133	NCG METAL VE PLASTIK AMBALAJ YENILEME SAN VE TIC AS ISTANBUL SUBESI	ISTANBUL DERI ORGANIZE SANAYI BOLGESI YAN SANAYI YB-41 PARSEL TUZLA/ISTANBUL tel:2165910627 fax:2165910628	Hazardous Waste Recovery	05.02.2018
134	BILGI METAL METALURJI MAKINA GIDA MADDELERI IHRACAT VE ITHALAT SANAYI TICARET LIMITED Sirketi	RAMAZANOGLU MAH.SANAYI CAD. NO: 44/1A-B-C-D-AG PENDIK/ISTANBUL tel:02165951488 fax:02165951489	Hazardous Waste Recovery	05.02.2018
135	YILDIZ METAL ITHALATIHRACAT SAN. VE TIC. LTD. STI.	RAMAZANOGLU M. SANAYI C. 13 PENDIK tel:02163781716 fax:02163787844	Hazardous Waste Recovery Non-hazardous Waste Recovery	08.02.2018
136	EGEMEN KIMYA ENDUSTRIYEL MALZEMELER SANAYI VE TICARET LIMITED Sirketi	IKITELLI ORGANIZE SANAYI BOLGESI ISDOK SANAYI SITESI 2.BLOK NO:25 tel:02124853474 fax:02124853468	Hazardous Waste Recovery Non-hazardous Waste Recovery	01.03.2018
137	BILGI GERI DONUSUM VE LOJISTIK SANAYI DIS TICARET LIMITED Sirketi	RAMAZANOGLU MH. MUHACIR SK. NO:7 PENDIK tel:2165951488 fax:2165951489	Hazardous Waste Recovery	09.07.2018
138	METAL-KIM METALURJI VE KIMYA TARIM S AN.TIC.LTD.STI.	VELIBABA M. SANAYI C.DOLAYOBA 34 1 PENDIK tel:02163070102 fax:02163070104	Hazardous Waste Recovery	07.08.2018
139	REMLE KIMYA MATBAACILIK TURIZM INSAAT SANAYI VE TICARET LIMITED Sirketi	Ikitelli Organize Sanayi Bolgesi Aykosan Sanayi Sitesi D Blok No:76 Basaksehir/ISTANBUL tel:05072167378 fax:05072167378	Hazardous Waste Recovery Non-hazardous Waste Recovery	21.10.2018
140	PIREKS BAKIR ALASIMLARI SANAYI VE TI C.A.S.	OMERLI MAH. MURATHAN SOK. NO:3 tel:2127982246 fax:2127982193	Hazardous Waste Recovery Non-hazardous Waste Recovery	25.11.2018
141	DEDEOGLU HURDA NAK.VE KIMYASALLARI TIC. LTD. STI.	EVREN OTO SAN KARSISI HURDACILAR MEVKII NO 18 tel:02128869641 fax:02128869641	Hazardous Waste Recovery	25.12.2018
142	IPEK GERI DONUSUM PLASTIK SAN. VE TIC. LTD. STI.	VATAN MAH. ESENLER CAD. BARUT SOK. NO:15-17 tel:02126124265 fax:02125768787	Non-hazardous Waste Recovery	06.07.2016
143	ZUMRUT SUNI DERI SAN VE TIC LTD STI	CIHANGIR MAHALLESİ GÜVERCİN CADDESİ NO:9 AVCILAR İSTANBUL tel:02124228986 fax:02124228985	Non-hazardous Waste Recovery	28.09.2016

No	Name of the Facility	Contact Details	License Subject	License Due Date
144	MAVI MADEN URUNLERIIC VE DIS TICARE T SAN LTD STI	Sanayi mah isiso san sit 15 yolu-1 blok no:3 tel:02126232741 fax:02126232726	Non-hazardous Waste Recovery	24.10.2016
145	MUTLU METAL VE KIMYA SAN.VE TIC.LTD.STI.	BOYA VE VERNIK ORG.SAN.BOL.TEM YANYOLU 1.CD.1.SK.NO.5 TUZLA ISTANBUL tel:2165931157 fax:2165931159	Non-hazardous Waste Recovery	10.11.2016
146	POLIMET KIMYA VE TARIM URUN.SAN.VE T IC.LTD.STI.	TUZLA ORGANIZE SANAYI BOLGESI (ITOSB) 238E14C PAFTA 6510 ADA 6 PARSEL TUZLA/ISTANBUL tel:2165932014 fax:2165932016	Non-hazardous Waste Recovery	07.02.2017
147	KARABULUT DIS TICARET LTD.STI.	ortakoy mah. sanayi mah. tunali sabri cad. no:5 tel:02127343754 fax:02127343762	Non-hazardous Waste Recovery	02.04.2017
148	ONER TEKSTIL SANAYIDIS TICARET LTD. STI.	KADIKOY YOLU UZERI USTUN SOKAK NO: 20 GAZITEPE KOYU tel:02127388282 fax:02127388115	Non-hazardous Waste Recovery	11.04.2017
149	GOZ PLASTIK TEKSTIL INSAAT SAN. VE DIS TIC. LTD. STI.	VATAN MAH. ELMAS SOK. ILTER ISHANI NO:7 BODRUM KAT tel:02125445430 fax:02125674226	Non-hazardous Waste Recovery	24.04.2017
150	DAYI PLASTIK SANAYIVE TICARET LIMIT ED SIRKETI	HASTANE MAH. UGURMUMCU CAD. 221 SK. DEVAMI HADIMKOY CATALCA tel:02127711345 fax:02127714961	Non-hazardous Waste Recovery	06.07.2017
151	MERT PLASTIK YASAR KUCUK	VATAN MAH. ENDER SK. NO:6-7 tel:02125448941 fax:02125671409	Non-hazardous Waste Recovery	30.07.2017
152	ARMASAN VAKUM AMBALAJ SAN.VE TIC.LTD.STI.	KIRAC NAMIK KEMAL MH ATATURK CAD. 16 YO ESENYURT tel:02126899162 fax:02126899167	Non-hazardous Waste Recovery	14.08.2017
153	AKUMSAN PLASTIK URUNLER SAN.VE TIC.A .S.	KIRAC BELDESI ATATURK C 19 BUYUKCEKMECE tel:02126224400 fax:02126897041	Non-hazardous Waste Recovery	06.09.2017
154	CAMOLUK PLASTIK KARABULUT ENVER HUSEYIN	VATAN MAH. EMEL SOK NO:1 BAYRAMPASA tel:2126745816 fax:2126745816	Non-hazardous Waste Recovery	17.09.2017
155	KABLOSAN PLASTIK METAL SAN. VE DIS TIC. LTD. STI.	DOGAN ARASLI CAD.FATIH SANAYI SITESI C 10 BLOK NO:30 ESENYURT/ISTANBUL tel:02124236660 fax:02124236660	Non-hazardous Waste Recovery	07.11.2017
156	SACLIOGULLARI TEKSTIL SAN. VE TIC. LTD. STI.	UGUR MUMCU MH. 2345 SK. NO:9-11 tel:02126193104 fax:02126680896	Non-hazardous Waste Recovery	16.11.2017
157	OZ-KA VAKUM PLASTIKAMB VE MAK KALIP SAN TIC LTD STI	IKITELLI ORG SAN BOL CEVRE SAN SIT 9.BLOK NO:23-25-27 K.CEKMECE IKITELLI/IST tel:4859611 fax:02124859614	Non-hazardous Waste Recovery	19.12.2017
158	YERCIZEN TERLIK SAN.VE TIC.LTD.STI.	BOGAZKOY ISTIKLAL MAH. ISMET INONU CAD. NO:38 tel:2126850011 fax:2126850070	Non-hazardous Waste Recovery	02.01.2018
159	OZLEM RAMAT VE KUYUMCULUK-MEHMET KIVRAK	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 2.BLOK NO:16 tel:02124853882 fax:02124851128	Non-hazardous Waste Recovery	18.02.2018
160	FAB PLASTIK VE KIMYA TIC LTD STI	ORHANLI ORTIM SAN SITESI K BLOK No:1 2 3 4 5 6 tel:2163040600 fax:2163040601	Non-hazardous Waste Recovery	10.04.2018
161	DOGAC PLASTIK ALUMINYUN GERI DONUSUM SANAYI TICARET LIMITED SIRKETI	SELIMPASA KAVAKLI YOLU UZERI 1.KM. 44 1 SILIVRI tel:02127312266 fax:02126070871	Non-hazardous Waste Recovery	12.04.2018

No	Name of the Facility	Contact Details	License Subject	License Due Date
162	KAYA METAL SADETTIN KAYA	IKITELLI O.S.B. BAGCILAR GUNGOREN SAN. SIT. 11. BLOK NO:46-48-50 tel:02125491259 fax:02125491260	Non-hazardous Waste Recovery	24.04.2018
163	GUCLU KAUCUK GERI DONUSUM IMALAT VE SANAYI AHMET CAN GUCLU	SAMANDIRA YOLU CAD. NO:11 tel:02163118380 fax:02163118381	Non-hazardous Waste Recovery	25.04.2018
164	ALI EROGLU EROGLU Plastik ve Metal San.Ikitelli Istanbul Sb.	IKITELLI ORGANIZE SANAYI BOLGESI ATATURK SANAYI SITESI 20 SK. NO: 580 BASAKSEHIR / ISTANBUL tel:02124855516 fax:02124855520	Non-hazardous Waste Recovery	29.05.2018
165	BETEBE MOZAIK VE SERAMIK SAN.A.S.	Davutpasa Cad. Cebealibey Sok. No:11 Topkapi Zeytinburnu/Istanbul tel: 0212 449 00 00 fax:02124490010	Non-hazardous Waste Recovery	09.07.2018
166	GUNES RAMAT-ZEKI GUNES	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 4.BLOK NO:13 tel:02124857306 fax:02124857307	Non-hazardous Waste Recovery	09.07.2018
167	TEZ KUYUMCULUK SAN TIC. LTD. STI.	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SAN SITESI 4. BLOK NO:9-11 tel:2124851633 fax:2124851633	Non-hazardous Waste Recovery	10.07.2018
168	IKILER PLASTIK PROFIL SAN. VE TIC. LTD. STI.	Maltepe Mah. Litros Ayvalidere Sok. No:7/B tel:02124823860 fax:02124813118	Non-hazardous Waste Recovery	12.07.2018
169	AK METAL PLASTIK SAN. VE TIC. LTD. STI	ORG.SAN.BOLG. ISDOK SAN. SIT.5.BLK 18 KUCUKCEKMECE tel:02124852637 fax:02124852637	Non-hazardous Waste Recovery	25.07.2018
170	KALE KAYISLARI SANAYI DIS TICARET LIMITED SIRKETI	CANTA BELDESI FATI H M.BUYUK SANAYI C. 9 . SILIVRI tel:02127465767 fax:02127465880	Non-hazardous Waste Recovery	25.07.2018
171	AYARCI AYAREVI VE RAMATEVI KUYUMCULUK-METIN ALBORA	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 2. BLOK NO:18 tel:02124854726 fax:02125141206	Non-hazardous Waste Recovery	02.08.2018
172	ULUGOL DEGERLI MADENLER SANAYI VE TICARET LTD. STI.	IKITELLI ORGANIZE SANAYI BOLGESI CEVRE SANAYI SITESI 4. BLOK NO:21-23 tel:02124862234 fax:02124855694	Non-hazardous Waste Recovery	02.08.2018
173	TISAN MUHENDISLIK PLAS.SAN.VE TIC.LTD.STI.	EKSIOGLU MH. YAVUZ SELIM C.86.SOK 4 UMRANIYE tel:2164293665 fax:02163121478	Non-hazardous Waste Recovery	23.08.2018
174	AKYUZ INOVASYON VE GERI DONUSUM TEKNOLOJILERI SANAYI VE TICARET A.S.	AKCABURGAZ MAH. 4.CAD.CAKMAKLI 12 ESENYURT tel:2128861366 fax:2125491511	Non-hazardous Waste Recovery	05.09.2018
175	HAZAR TEKSTIL SANAYI VE TICARET A.S.	ORTAKOY M SANAYI BULVARI 011 001 SILIVRI tel:02127343720 fax:02127343716	Non-hazardous Waste Recovery	26.10.2018
176	SARI METAL RAMAZAN TURGUT	IKITELLI ORGANIZE SANAYI BOLGESI ISDOK. SANAYI SITESI 5.BLOK NO:9 tel:2124852629 fax:2124857561	Non-hazardous Waste Recovery	28.10.2018
177	AZIZ METAL GERI DONUSUM SANAYI VE TICARET LTD.	IOSB ATATURK OTO SAN SIT 1.SOKAK 9 BASAKSEHIR tel:2124852023 fax:2124852016	Non-hazardous Waste Recovery	25.11.2018
178	CEVREM ITHALAT IHRACAT MAKINA GERI DONUSUM SANAYI VE TICARET LIMITED SIRKETI	KAYABASI KOYU KUYULAR MEVKII 1 KUCUKCEKMECE tel:2126911066 fax:2126911791	Non-hazardous Waste Recovery	16.12.2018

Source: Ministry of Environment and Urban Planning Website.

## 4.4 Waste Handling

Basic waste handling requirements are as follows:

- Different types of wastes should not be mixed with each other.
- Proper segregation will be ensured by staff training and continuous inspections.
- The different waste types should be collected in different containers.
- All wastes shall be classified with 6-digit waste code set out in the Annex 4 of the Regulation on General Principles of Waste Management.
- The containers should be visibly labelled with the name of the waste type during the usage in hospital building.
- The containers should be labelled with a waste label on which the 6–digit waste code and the other information mentioned on the label are filled out during the storage of waste at the waste storage area.
- In case different waste types are mixed, they have to be classified according to the most hazardous waste type present.
- All staff and contractors involved in handling and transporting of wastes should wear personnel protective equipment (PPE). PPE includes:
  - Gloves,
  - Safety glasses, goggles
  - Coveralls
  - Dust and/or gas masks (where necessary)
  - Boots
- Waste Mineral Oils should be analyzed to determine the oil category and to select the proper waste management option.
- All waste analyses should be conducted at the closest Licensed Laboratory with required sampling procedures.
- M coded hazardous waste should be analyzed by Environmental Licensed Laboratories in order to determine whether the waste is hazardous or not if they are intended to be classified as non-hazardous.
- Hazardous waste from health care activities should not under any circumstances be discharged to sanitation system, or be discharged directly to air, or be burned at low temperatures, or mixed with domestic quality waste, or be disposed by means of storage.

## 4.5 Waste Segregation, Collection, and Labeling

### 4.5.1 Segregation

Medical waste, hazardous waste, non-hazardous waste, special waste, packaging waste, domestic waste should be separated collected at the source of the generation. Different category and different coded wastes should not be mixed with each other. If any waste types are mixed together, the mixture is classified according to the most hazardous waste type present. Waste should be segregated in accordance with legal requirements to facilitate recycling, minimize contamination of non-hazardous waste by hazardous substances, minimize potential for chemical reactions, and ensure proper management of each waste stream to the designated end point. Specifically:

- Effectively segregate mercury containing waste for special disposal. Management of mercury containing products and associated waste should be conducted by specifically trained personnel in segregation and clean up procedures,
- Effectively segregate waste with a high content of heavy metals (e.g. cadmium, thallium, arsenic, lead) to avoid entry into wastewater streams,
- Different types of hazardous chemicals should not be mixed,
- Establish procedures and mechanisms to provide for separate collection of urine, feces, blood, vomits, and other wastes from patients treated with genotoxic drugs. Such wastes are hazardous and should be treated accordingly.

#### 4.5.2 Waste Collection

All types of wastes will be separately collected in different containers. Adequate number of containers /drums will be placed in the floors, laboratories, corridors etc. The waste container types are given in Annex 1.1. Waste containers should be color coded such as:

<b>Red</b>	Medical waste
<b>Blue</b>	Hazardous wastes
<b>Green</b>	Packaging waste
<b>Yellow</b>	Non-hazardous

All types of waste first will be collected at the collection points within the departments and floors then will be transferred to the waste storage areas of the IHC.

##### Collection points

Domestic waste, packaging waste, and hazardous waste will be collected in specially designated points in every unit. Containers will be collected by waste management personnel at regular intervals prescribed by the waste collection schedule and will be transported to the related locations at the temporary waste storage area over the determined route. Household type waste will be collected daily by the Municipality.

Medical waste will be collected in specially designated points in every unit. In addition, there will be small waste buckets for sharp-pointed medical waste in patient treatment vehicles. Containers will be collected and transported by own personnel of every unit at regular intervals prescribed by the waste collection schedule using a pre-determined route:

- Medical waste bags should be red-colored plastic bags resistant to tear, puncture, burst, and impact of transport; made of original MDPE (medium density polyethylene), with double-thread stitch in the bottom and without bellows, having 100 microns of double-layer thickness and at least 10 kilograms of carrying capacity; also bearing, on both sides and in easily visible size, the “International Biohazard Symbol” and the expression “DİKKAT TIBBİ ATIK” (Attention Medical Waste)”.  
• Sharps should be placed, separately from other types of medical waste, inside boxes or containers made of plastic or laminated cardboard with similar properties, bearing on them the “International Biohazard Symbol” and the expression “DİKKAT TIBBİ ATIK” (Attention Medical Waste)”; with such boxes or containers being resistant to puncture, tear, breakage, or burst, and also being waterproof, leak-proof, and impossible to either to open or to

confuse with other boxes or containers. Such waste containers should be filled to at most  $\frac{3}{4}$  capacity, then closed securely and placed in red plastic bags. Once the sharps boxes are filled, they should not under any circumstances be opened, emptied, or recovered.

- Where medical waste is to be sterilized by application of pressurized vapor, the waste should be placed in autoclave bags or autoclavable medical sharps boxes. It should be absolutely necessary for the autoclave bags to be resistant to humidity and high pressure at temperatures up to 140°C, in addition to having the properties of medical waste bags as stipulated above.
- Any x-ray film development liquids that may be generated in the Units should be separately collected, either recovered or disposed of in accordance with provisions of Regulation for Control of Hazardous Waste.
- Waste bags and containers should be sealed and replaced when they are approximately three quarters full. Full bags and containers should be replaced immediately to the storage area.
- Medical waste should be collected and transported by specially trained personnel, inside wheeled containers with lids, made of stainless metal, plastic, or similar material, without any sharp edges that could lead to waste bags' being damaged or punctured during loading and unloading, and such containers should be easy to load, unload, clean, and disinfect, and dedicated to use for the task in question alone. The wheeled containers used for intra-Unit transport of medical waste should have orange color and bear on them the "International Biohazard Symbol" and the expression "DİKKAT TIBBİ ATIK" (Attention Medical Waste)".

Waste containers should:

- Not be exposed to direct sun light and rain,
- Not be filled higher than 75% of its volume capacity,
- Be in good condition, undamaged and leak proof,
- Not be stored more than two rows,
- Not be left on the locations other than the storage area on site,
- Be selected to maximize opportunities for reuse,
- Be covered or enclosed, depending on the nature of wastes.

#### 4.5.3 Labeling

All waste containers at the floors should be labeled with the name of the waste class. The containers will also be labeled with the waste label which is given Annex 1.2. when they transferred to the temporary waste storage area. The 6-digit waste code and the other relevant data will be written in the waste label according to the Regulations. It must be ensured that the hazardous waste container labels contain the following information:

- Amount of waste
- The date of storage of waste
- The "HAZARDOUS WASTE" statement
- Source of waste

Waste Mineral Oils containers should have label which contain the "Waste Mineral Oil" statement.

#### 4.5.4 Suggested Equipment

Suggested fixed and mobile equipment for waste management are given below:

##### 1. Fixed Equipment:

- 800 Medical Waste Containers
- 800 Non-medical Waste Containers
- 34 Waste Transport Devices
- 34 Waste Storage Containers
- 50 Secret Waste Containers

##### 2. Mobile Equipment:

- 1 Hazardous Waste Transport Device

##### 3. Other equipment – at sufficient amount:

- Cleaning and disinfection equipment
- Medical waste bags
- Non-medical waste bags
- Sharp and pointed object containers
- Chemical and dangerous waste containers
- Clothes-gloves-protective materials

#### 4.5.5 Equipment Disinfection

Medical waste transport vehicles will be cleaned with sawdust and then disinfected with household bleach after transport. Temporary waste storage area and containers will also be cleaned with sawdust and then thoroughly disinfected with household bleach and provided for use. Used sawdust must be managed as medical waste.

#### 4.6 Storage of Wastes

Health care facilities that have at least 20 beds should build temporary storage area, while facilities that have less than 20 beds should keep a temporary storage container. Thus, all type of wastes will be stored at two dedicated waste storage areas which have concrete base, closed top, drainage channels and pit. The proposed waste storage areas within the IHC are shown in Figure 2, although the number and locations may be subject to change as the planning proceeds.

The following general principles should be applied during waste storage:

- Medical waste will be stored in specially cooled medical waste storage section. No other class or type of waste will be stored in the medical waste storage section. The medical waste storage section should be easily cleanable and should have water outlet.
- The other waste classes such as hazardous waste, special waste, packaging waste etc. will be stored another place than medical waste and sufficient space will be left between different waste classes during storage.
- Medical waste storage should not be exceeded 48 hours. Such period of waiting in temporary storage may be extended up to one week, if the temperature inside the waste storage facility can be provided that remains under 4°C.

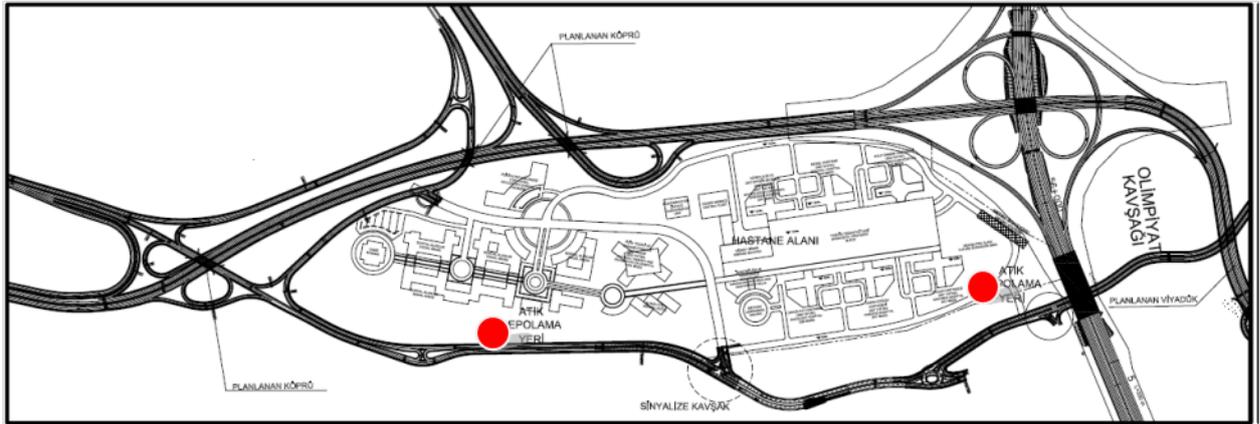


Figure 2: Waste storage areas within the IHC

- Medical waste will be stored in 240 lt. medical waste container in the temporary waste storage area.
- Medical waste trolleys should be used to transport waste to storage area which should be cleaned and disinfected at the end of the day.
- Hazardous waste should be collected in metal and/or plastic drums and all containers will be kept closed. The containers should be compatible with its contents.
- Damaged containers in the temporary waste storage area should be removed from service, repaired and labelling checked before use is resumed.
- Hazardous wastes should not be stored more than 6 months on site and should be sent to the disposal facility at the end of the 6<sup>th</sup> month.
- Waste mineral oils and waste accumulators should not be stored more than 90 days on site.
- Wastes which have not been identified and labeled should not be allowed to the waste storage area.
- Mercury should be stored separately in sealed and impermeable containers in a secured location.
- Cytotoxic waste should be stored separately from other waste in a secure location.
- Waste storage other than designated area/s on the project site is strictly forbidden.
- Containers which contain light materials should be covered with appropriate material such as net, fabric, etc. in order to prevent the wastes being blown out.

The Waste Storage Area should be:

- Labeled, secured and only authorized person access should be maintained. Authorize personnel will be defined and the contact details of them will be indicated at the entrance of the area,
- Located within the facility and sized to the quantities of waste generated,
- Designed with concrete base, closed roof, spill containment, drainage channels, easy access for cleaning vehicles, equipped with necessary water supply for cleaning,
- Provided with warning and directive signage to facilitate proper storage of wastes,
- Managed to ensure that waste accumulators and waste mineral oils are not stored for more than 90 days,
- Stored so that the incompatible wastes can be stored in different places or distance will be left between those waste containers,
- Equipped with spill kits,

- Equipped with appropriate lighting and ventilation,
- Located away from food supplies and preparation areas,
- Equipped with supplies of protective clothing, and spare bags/containers.

#### 4.7 Transportation of wastes

General waste transportation principles are given below:

- Waste should be transported in accordance with Turkish Environmental Legislation requirements and Turkish Road Transport requirements,
- Licensed transportation companies and vehicles by the Turkish Environmental Authorities should be used for waste transportation,
- Waste containers should be fixed in the transportation vehicle in order to avoid the movement and leakage during transportation,
- Where possible waste should be transported with special elevators or tube systems connecting source of waste generation and the temporary storage area directly, limiting the need for man power,
- Containers without waste label should not be loaded to the transportation vehicle,
- Waste should be transported with using Waste Transfer Note (WTN) and National Waste Transportation Form (NWTF) (if required). Moreover the vehicle drivers should keep the NWTF during transportation journey to the waste management facility.

In addition to the general transportation principles the medical waste transport vehicles should have the following properties:

- The section of the vehicle containing the waste load should be constructed as a completely closed section,
- There should not be any mechanism of compression on the vehicle,
- There should be empty space between the driver's cabin and the waste load section,
- The load section should have a sturdy construction enough to prevent damage in case of an accident,
- Interiors of waste load section should have stainless and smooth surfaces that are easy to clean and disinfect,
- Waste load section should not have any perpendicular corners and any adjacent surfaces should be joined by means of smooth corners,
- Exterior surfaces at left, right, and in the rear (*of the vehicle*) should bear the "International Biohazard Symbol" in black color and in visible size and the expression "DİKKAT TIBBİ ATIK" (*Attention Medical Waste*),
- Exterior surfaces should be painted in orange color.

#### 4.8 Documentation, Record Keeping and Reporting

Waste Management Manager and Waste Services Chief will be responsible from recording and reporting. All waste types, waste amounts, and waste transportation details should be recorded and reported in order to:

- Track the waste generation,
- Comply with Turkish Environmental Legislation,

- Provide the data required for the annual ‘declaration of hazardous wastes generated’ that must be provided to the Ministry of Environment and Urban Planning,
- Provide confirmation that each load of waste has reached the intended storage, treatment, recycling or disposal facility,
- Determine the waste management costs.

Hazardous wastes, medical wastes, and special wastes should be transported with National Waste Transportation Form (NWTF). Usage of the NWTF is defined below. Additionally, Waste Transfer Note (WTN) may be used to track the all waste types as a best practice.

#### **4.8.1 National Waste Transportation Form (NWTF)**

Hazardous wastes, special wastes (waste mineral oils, waste vegetable oils, batteries and accumulators, waste electrical and electronical equipment, end-of-life vehicle, end-of-life tires) and medical wastes should be transported to the third party licensed waste management facilities with NWTF. The NWTF has 3 sections and copies in various colors. The waste producer, licensed waste transporter and the third party licensed waste management facility should fill the appropriate sections of the form. Waste producer provides the NWTF from the Local Environmental Authority. The related copy of the form is sent to the Local Environmental Authorities annually and kept for 5 years. NWTF is one of the basic waste movement tracking instruments. Instructions for using the NWTF are given in Annex 3.

#### **4.8.2 Waste Transfer Note (WTN)**

Each load of waste type transferred from the IHC to the waste management facilities will be documented by means of a WTN that will be uniquely numbered and will contain the following information:

- Type and quantity of waste
- Waste code
- Vehicle registration number
- Driver’s name
- Date and time the load was collected
- Name and address of the final destination site including the appropriate licence/permit number.

The WTN will be used by the IHC waste management staff for all waste transfers. A copy of the WTN will accompany the load of waste and a copy will be retained at the IHC. A copy of the completed WTN is to be sent to the IHC by the final destination site as evidence that the waste has been safely received for recycling and/or disposal. The difference between the NWTF and WTN is that the NWTF is an official and mandatory document while the WTN is an internal tracking document. WTN can be seen in Annex 3.

Another waste movement document is the “Excavation, Construction and Demolition Wastes Transportation and Acceptance Document” which should be used for construction, demolition and excavation waste movements. This document is given in Annex 4.

Other than waste movement documents, health records such as personnel health forms, periodical screening records, latex allergy survey etc. of the employees should be kept. Periodical screening will basically include the following tests:

Table 7: Periodical Screening Tests for the Employees

Risk Group	Risks	Follow Up Processes	Period
ALL EMPLOYEES	Infection Trauma Latex	Vaccinations Hepatitis B Tetanus Flu Wounds, inflicted by sharp and pointed objects Anamnesis	Date first started to work When there is incidence

#### 4.9 Manpower Requirements

The IHIC has produced a document entitled “Services, Products and Construction Works to be provided for the PPP IHC- Waste Management Services” as part of the bidding documentation to be submitted to the MoH. According to this document, all department heads, nurses, and other staff should be aware of their responsibilities related to separately collection and storing of the waste.

The required personnel needs to be employed are as follows:

Waste Management Manager	: 1
Waste Services Supervisor	: 3
Storage Personnel	: 10
Field Person	: 40 (Logistics Porters)

The Waste Management Manager will be responsible for reaching the targeted service quality, with cooperation with the unit responsables below.

- Head Doctor
- Managing director of company
- Infection control responsible
- Hospital department heads
- Pharmacy responsible
- Radiology responsible
- Head nurse
- Administrative financial affairs manager

In addition to establishing a good management and organization structure, sufficient knowledge of legislation and active participation of personnel are also very important for implementing medical waste and all other types of waste management appropriately. It is mandatory for all managers and employees of a hospital to receive appropriate training on this subject and to raise their awareness in order to obtain acceptable results, proposed by regulations, in medical waste management. Detailed job descriptions of the personnel are given below:

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Job Definition of Waste Management Manager:

- He/she is responsible for developing waste management plan of the hospital, carrying out daily procedures and monitoring waste disposal system.
- He/she establishes effective communication and cooperation with hospital management (administration), cleaning services provider, municipal authorities and other relevant hospital unit responsible persons
- He/she contacts unit heads of the hospital and always keeps contact with them for responsibilities of all doctors and other clinic personnel, related to separation and storage of waste and for providing the necessary training.
- He/she is experienced regarding medical waste and increases his/her level of knowledge continuously through training in this field and follows relevant regulations closely
- Ensures determining of working procedure and conditions and establishing supervision and improvement of necessary planning.
- He/she is responsible for implementing and supervision of all services related to waste management for the Health Campus
- He/she is responsible for preparing and implementing service training from waste personnel
- He/she ensures that the service is efficient, effective and prompt, and conforms to Waste Management procedures of the hospital,
- He/she is ultimately responsible for all waste management personnel.
- Monitors the waste management service performance in line with Schedule 14 performance parameters. Acts pro-actively to ensure response and corrective times are achieved by their personnel
- He/she will develop & implement a schedule of planned waste activities on a daily, weekly, monthly and yearly basis to achieve the performance parameters as defined within Schedule 14.

Job Definition of Waste Management Services Supervisor:

- He/she will be responsible towards the Waste Management manager.
- Checks collection of waste containers and their transfer to the temporary storage locations in the hospital.
- Ensures constant availability of suitable bags and containers for the waste, and protective clothing and two wheeled transport vehicles.
- Ensures replacement of waste bags and containers before they become full and without delays.
- He/she supervises waste collection personnel of the hospital.
- Prevents unsupervised discharge of waste containers inside and outside the hospital.
- Ensures correct & transportation of waste within the health facility and its transfer to proposed treatment and disposal locations.
- Ensures that their personnel, who collect/carry waste, utilize the correct transportation method and transport as separated at source.
- Ensures that waste is not stored in the storage areas longer than prescribed and there is regular collection of waste by waste transport company /municipality
- Collects customer complaints, suggestions and requests. Records these customer interactions and shares with the Waste Manager to incorporate into the Waste Service improvement plan.

#### Job Definition of Storage Personnel:

- He/she is responsible towards Waste Management Manager and Waste Services Supervisor
- Ensures proper use of temporary waste storage, where medical waste will be stored. These must not be dirty and must be accessible only by personnel, responsible for waste.
- He/she is responsible for cleaning, disinfection and safety of storage areas.
- He/she is responsible for transferring waste from the storage areas to transporters, taking receipts and recording the amount of waste.
- He/she is responsible for implementing waste collection times as required and recording these.

#### Duties and Responsibilities of Field Personnel:

- They are responsible towards Waste Management Manager and Waste Services Supervisor.
- They are responsible for use of collection vehicles
- They will be responsible for maintaining the temporary waste collection areas ensuring they are safe and operable (observing separating rules, whether there are labels on containers, whether containers are locked, their fullness level, container replacement, changing full waste bags etc.).
- They must take the necessary safety precautions during collecting and carrying
- They are responsible for taking all kinds of precautions against behavior and practices, which will harm human health.
- They will be responsible for reporting all issues and incidents during any stage of their daily activity.
- They have to observe the times and routes in the collection chart, given to them by the Waste Services Supervisor.
- If there are heavy, ripped or leaking Household and package Waste bags, they will make them suitable for carrying.
- They will strive to use the same route for carrying and forwarding processes.
- If any injury caused by a sharp or penetrating object occurs during collection and carrying processes, he/she immediately informs the Team leader and consults the Infection Control Committee. They should request support to place the bag, which contains medical waste in a Medical Waste bag as is and follow the Medical waste procedure
- After Household Waste and Package Waste Collection process is completed, he/she prepares Containers and equipment for the next day by cleaning and disinfecting them in accordance with Cleaning instructions

#### 4.10 Emergency Response

Personnel, dealing with waste management especially with medical waste are provided with gloves, boots, goggles and clothing in accordance with the regulations and the necessary precautions will be taken against any injuries and necessary information will be given to the assigned personnel related to this issue. For risks occurring during any accident, Infection Committee will make the necessary analysis and investigation.

- In the case of spilling of medical waste due to any reason, that area must be closed to access by the general public and other health campus personnel other than the relevant cleaning & waste personnel who should immediately disinfect the affected area. In case of any injury,

Work Accident Form (FR/130), shall be completed in accordance with the Administration Infection Committee requirements.

#### 4.11 Waste Management Training

The necessary personnel should be trained for the following subjects by Waste Management Service Officer and/or any other consultant. Waste management training subjects and the related personnel are given in Table 8.

- General environmental awareness
- Obtaining and using appropriate personal protective equipment (PPE) during waste handling
- Learning, classifying and separating of waste at source
- Waste collection in specific containers for different types of waste
- Waste labeling and temporary storage of waste inside health institution
- Waste transportation requirement prior to the transportation
- Cleaning and disinfection of collection and transport equipment
- Legal/regulatory requirements

Table 8: Personnel training for the Waste Management

Personnel	All staff	Waste Management Manager	Waste Management Service Supervisor	Storage Personnel	Field Personnel
Training required					
General environmental awareness	✓	✓	✓	✓	✓
PPE usage	✓	✓	✓	✓	✓
Classifying and separating waste	✓	✓	✓	✓	✓
Waste collection and container types	✓	✓	✓	✓	✓
Labeling and Storage		✓	✓	✓	✓
Waste transportation		✓	✓	✓	
Cleaning and disinfection of the equipment		✓	✓	✓	✓
Legal/regulatory requirements	✓	✓	✓	✓	✓

Retraining will be conducted whenever there are inadequacies in an employee's knowledge or when deviations from the WMP are observed. Personnel may also require retraining whenever there is a change in:

- Their job assignment
- The regulatory requirements

Flyers for waste management in IHC will be available at necessary locations for staff and the visitors.

#### 4.12 Additional Measures

The following additional measures will be implemented related to waste management:

- Necessary permits related with disposal of excavation waste during construction phase of the Project will be obtained from the Municipality and Local Environmental Authorities. An appropriate disposal/storage facility and/or alternative options must be identified prior to

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the excavation process. Regulation on Control of the Excavated Soil, Construction and Demolition Wastes requirements will be applied to excavation waste management.

- Procedures and mechanisms should be in place for the separate collection of urine, feces, blood, and vomit from patients treated with genotoxic drugs to avoid their entry into the wastewater stream. There will most likely be a need for the treatment of contaminated wastewater during the operation of the IHC to meet the discharge limits for connection to municipal sewer line.
- Domestic wastewater discharge will be done to the Municipality infrastructure and the necessary permits and protocols will be maintained for the connection to the municipal sewer system.
- Periodic inspections will be conducted in the waste recycling/ disposal facilities to ensure proper disposal practices are implemented.

## 5.0 REFERENCES AND OTHER DOCUMENTS

The following general documents are used as reference documents in the preparing of this Waste Management Plan.

- Turkish Environmental Legislation and related forms, especially:
  - Regulation on General Principles on Waste Management
  - Hazardous Waste Control Regulation
  - Medical Waste Control Regulation

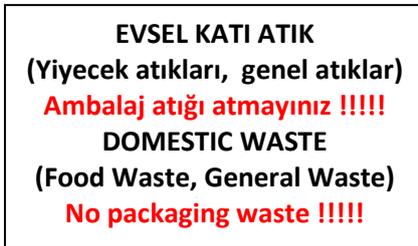
## ANNEX 1. LABELLING

### Annex 1.1. Labelling for Waste Containers within the Campus Buildings

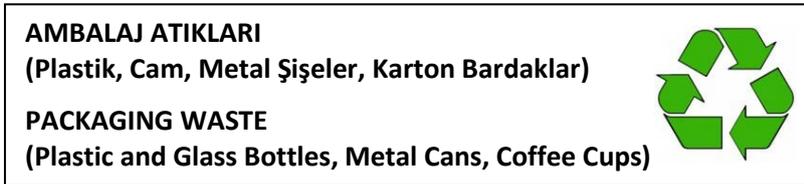
#### 1. Medical Waste Label



#### 2. Domestic Waste Label



#### 3. Recyclable Waste Label (please additionally write the material name such as glass, metal etc.)



#### 4. Hazardous Waste Label



## Annex 1.2. Labelling of Waste Containers

### Waste Container Label (in Turkish and English):

ATIK ETİKETİ			
1. ATIK ÜRETİCİSİ FİRMA ADI:			
2. ADRES		3. YETKİLİ KİŞİNİN İLETİŞİM BİLGİLERİ	
		Ad-Soyad::	
		Görevi:	
		İmza:	
		Atığın Çıkış Tarihi:	
4. ATIK MİKTARI		5. ATIK KATEGORİSİ	
		6. BBF NO:	
7. ATIĞIN FİZİKSEL ÖZELLİKLERİ			
O Toz		O Katı	
O Akışkan / Macunumsu		O Çamur	
O Sıvı		O Gaz	
O Diğer			
8. TEHLİKELİ ÖZELLİK		9. Risk İbaresini ve Açık İfadesi (R)	
O H1		O H8	
O H2		O H9	
OH3A		O H10	
O H3B		O H11	
O H4		O H12	
O H5		O H13	
O H6		O H14	
O H7			
		10. Güvenlik İbaresini ve Açık İfadesi (S)	
11. RİSK KOŞULLARI			
YANGIN	SAĞLIK	ÖZEL TEHLİKE	REAKSİYON
<input type="checkbox"/> 23°C'in altında	<input type="checkbox"/> Ölümcül	<input type="checkbox"/> Oksitleyici	<input type="checkbox"/> Patlayabilir
<input type="checkbox"/> 38°C'in altında	<input type="checkbox"/> Kalıcı etkili	<input type="checkbox"/> Asit	<input type="checkbox"/> Sarsıntıda patlayabilir
<input type="checkbox"/> 43°C'in altında	<input type="checkbox"/> Kısa vadede	<input type="checkbox"/> Alkali	<input type="checkbox"/> Şiddetli kimyasalla değişir
<input type="checkbox"/> 43°C'in üstünde	<input type="checkbox"/> Uzun vadede	<input type="checkbox"/> Aşındırıcı	<input type="checkbox"/> Isıda dengesi bozulur
	<input type="checkbox"/> Zararsız	<input type="checkbox"/> Kanserojen	<input type="checkbox"/> Dengeli malzeme
12. YANGIN SÖNDÜRME			
<input type="checkbox"/> ABC Toz		<input type="checkbox"/> CO <sub>2</sub>	<input type="checkbox"/> Su / Su Sisi
<input type="checkbox"/> Kum		<input type="checkbox"/> Köpük	<input type="checkbox"/> Diğer .....

WASTE LABEL			
1. Company Name of the Waste Producer			
2. Address		3. CONTACT DETAILS of the RESPONSIBLE PERSON:	
		Name-Surname:	
		Duty:	
		Signature:	
		Waste Generation Date:	
4. WASTE QUANTITY		5. WASTE CATEGORY	
		6. BBF NO:	
7. PHYSICAL PROPERTIES OF THE WASTE			
O Dust		O Solid	
O Viscose/ Paste		O Sludge	
O Liquid		O Gaseous	
O Others			
8. HAZARD PROPERTY		9. Risk Class and Definition	
O H1		O H8	
O H2		O H9	
OH3A		O H10	
O H3B		O H11	
O H4		O H12	
O H5		O H13	
O H6		O H14	
O H7			
		10. Safety Class and Definition	
11. RISK CONDITIONS			
FIRE	HEALTH	SPECIAL HAZARD	REACTIONS
<input type="checkbox"/> Below 23°C	<input type="checkbox"/> Fatal	<input type="checkbox"/> Oxidizing	<input type="checkbox"/> Explosive
<input type="checkbox"/> Below 38° C	<input type="checkbox"/> Persistent Effect	<input type="checkbox"/> Acid	<input type="checkbox"/> Explosive with shoks
<input type="checkbox"/> Below 43°C	<input type="checkbox"/> Short-term	<input type="checkbox"/> Alkali	<input type="checkbox"/> Change with strong chemicals
<input type="checkbox"/> Above 43°C	<input type="checkbox"/> Long Term	<input type="checkbox"/> Corrosive	<input type="checkbox"/> Unstable with heat
	<input type="checkbox"/> Harmless	<input type="checkbox"/> Carcinogenic	<input type="checkbox"/> Stable substance
12. FIRE EXTINGUISHER			
<input type="checkbox"/> ABC Dust		<input type="checkbox"/> CO <sub>2</sub>	<input type="checkbox"/> Water / Water Mist
<input type="checkbox"/> Sand		<input type="checkbox"/> Foam	<input type="checkbox"/> Others .....

## ANNEX 2. WASTE CONTAINERS

WASTE TYPE	CONTAINER TYPE	CONTAINER PICTURE	COLOR	WASTE TRANSPORTATION	WASTE MANAGEMENT FACILITY
<b>Medical Waste</b>	Medical Waste containers and bags		<b>RED</b>	ISTAC	ISTAC Medical Waste Incineration Plant
<b>Hazardous Waste</b>	Metal or plastic drums		<b>BLUE</b>	Licensed Waste Transportation Company	Licensed Hazardous Waste Recycling /Disposal Facility
<b>Non-hazardous Waste</b>	Metal or Plastic Drums		<b>YELLOW</b>	Licensed Non-hazardous Waste Recycling Facilities and/or Private transportation companies	Licensed Non-hazardous Waste Recycling Facility
<b>Packaging Waste</b>	Plastic waste bins		<b>GREEN</b>	Licensed Packaging Waste Recycling Facility	Licensed Packaging Waste Recycling Facility

WASTE TYPE	CONTAINER TYPE	CONTAINER PICTURE	COLOR	WASTE TRANSPORTATION	WASTE MANAGEMENT FACILITY
<b>Domestic Waste</b>	Waste bins and Galvanized domestic waste containers		<b>GREY</b>	Municipality	ISTAC Class II Landfill Facility in Kemerburgaz
<b>Special Waste</b> (waste mineral oils, waste vegetable oils, waste batteries and accumulators, WEEE)	Dedicated containers		<b>RED</b> -waste mineral oils	Licensed Waste Transportation Company	Licensed Recycling Facilities and/or Suppliers
<b>Excavation Soil, Demolition Waste</b>	Big-bags or direct loading to the trucks		N/A	Private transportation companies	Former mining area at the north of the project sitewhich is approved by Municipality.
<b>Domestic Wastewater</b>	N/A	N/A	N/A	Municipality sewage infrastructure	ISKI WWTP

### ANNEX 3. NATIONAL WASTE TRANSPORTATION FORM (TURKISH AND ENGLISH VERSIONS)

The Waste Transfer Note/National Waste Transportation Form are shown below.

#### The Usage of NWTF:

The NWTF consists of 4 different color sub-forms. Those are:

1. A sub-form, blue (2 copies),
2. B sub-form, pink (1 copies),
3. C sub-form, white (2 copies),
4. D sub-form, green (1 copies),

All sub-forms have to be filled out prior to waste transportation:

1. "D sub-form" is kept by the waste producer prior to transportation and sent to the Local Environmental Authority.
2. "A, B, C, and D sub-forms" are given to the transporter to be kept during transportation.
3. "A, B, and C sub-forms" are given by the transporter to the representative of the waste management facility to be signed. A and B sub-forms are kept by the waste management facility. The transporter keeps one copy of C sub-form and delivers the second copy of the C sub-form to the waste producer.
4. Waste management facility keeps the "A and B sub-forms" with signature. Waste management facility fills the third section of sub-form A and B with exact waste quantity, disposal area and date and sends one copy of A sub-form to the Ministry. The waste management facility keeps the second copy of the A sub-form.
5. Waste Management facility sends the "B sub-form" to the waste producer.

All sub-forms are kept for 5 years and presented in case of any official audits by the Authorities.

Copies of the NWTF	Who keeps which copy
First copy of white C sub-form	Transporter
Second copy of white C sub-form	Waste Producer
Pink B sub-form	Waste Producer
First copy of blue A sub-form	Waste management facility
Second copy of blue A sub-form	Ministry
Green D sub-form	Local Environmental Authority

Waste Transfer Note will be used similar to NWTF.

FORM-9 A		T.C. ÇEVRE ve ORMAN BAKANLIĞI ULUSAL ATIK TAŞIMA FORMU		Form Seri Numarası	
(A) Kopyası Bertarafıda kalır.Bertarafçı Formun A kopyasının bir suretini Bakanlığa göndermekle yükümlüdür. Form Ulusal Atık Taşıma Kılavuzundaki bilgilere uygun olarak doldurulacaktır.					
<b>1) ÜRETİCİ</b>					
1) Firmanın Unvanı:		12) Atık Kodu <sup>1</sup>			
2) Firmanın sahip veya sahiplerinin adı, soyadı:		13) Atık Adı <sup>2</sup>			
Firmanın Adresi:		14) 20 °C 'de fiziksel özellikleri <sup>4</sup>			
3) İlin Adı ve Kodu: [ ][ ]		15) Renk <sup>5</sup>			
5) Mahalle/Semt		16) Ağırlık <sup>6</sup>			
6) Cadde/Sk:		[ ] ton [ ] kg			
7) Kapı No:		17) Ambalaj ve Konteynir Türü <sup>7</sup>			
8) İşyerinin Vergi Numarası:		18) Ambalaj ve konteynir sayısı <sup>8</sup>			
9) Telefon Numarası		19) Atık Çıkış Tarihi:			
10) Fax Numarası:		20) Sorumlu Kişinin Adı ve Soyadı			
11) H Numarası <sup>3</sup>		21) Sorumlu kişinin imzası			
<b>2) TAŞIYICI</b>					
1) Firmanın Unvanı:		.			
2) Firmanın sahip veya sahiplerinin adı, soyadı:		11) Lisans No			
Firmanın Adresi:		12) Taşıt Plaka No:			
3) İlin Adı ve Kodu: [ ][ ]		13) Taşıma Şekli <sup>9</sup>			
4) İlçenin Adı:		14) Teslim Tarihi			
5) Mahalle/Semt		15) Sorumlu Kişinin Adı ve Soyadı			
6) Cadde/Sk:		16) Sorumlu Kişinin İmzası			
7) Kapı No					
8) İşyerinin Vergi Numarası:					
9) Telefon Numarası					
10) Fax Numarası:					
<b>3).ALICI</b>					
1) Firmanın Unvanı:					
2) Firmanın sahip veya sahiplerinin adı, soyadı:		11)Lisans No			
Firmanın Adresi:		12) Atığın Ağırlığı			
3) İlin Adı ve Kodu: [ ][ ]		[ ] ton [ ] kg			
4) İlçenin Adı:		13) Atık Bertaraf Yöntemi/Geri Kazanım Yöntemi			
5) Mahalle/Semt:		14) Lisanslı Ara Depolama tesisinden Atık Transferi (Kutuya X işareti koyunuz)			
6) Cadde/Sk:		a) Arıtılmadan bertaraf/ geri kazanım tesisine gönderilen atıklar			
7) Kapı No:		b) Arıtılarak bertaraf/ geri kazanım tesisine gönderilen atıklar (başka atık üreterek)			
8) İşyerinin Vergi Numarası:		c) Arıtılarak bertaraf/ geri kazanım tesisine gönderilen atıklar (başka atık üretmeden)			
9) Telefon Numarası		d) Diğer (belirtiniz)			
10) Fax Numarası		14. soru işaretlendiğinde (a, b, c, d) işlemleri için Ara depolama tesisi tarafından yeni bir EK-9-A formu düzenlenmesi zorunludur.			
		15) Atık Kabul Tarihi			
		16) Sorumlu Kişinin Adı , Soyadı ve İmzası:			

FORM- 9A (A)	REPUBLIC OF TURKEY MINISTRY OF ENVIRONMENT&FORESTY INTERNATIONAL WASTE TRANSPORTATION FORM	Form Serial Number			
(A) Copy is kept by disposer. Disposer should send its copy to Ministry. Its list of abbreviations will be used as reference to fill in the form.					
<b>I) WASTE PRODUCER</b>					
1) Title of Firm			12) Waste Code <sup>1</sup>		
2) Address of Firm			13) Description of Waste <sup>2</sup>		
3) Name and Code of Province			14) Consistency at 20°C <sup>4</sup>		
4) District			15) Color <sup>5</sup>		
5) Area			16) Weight of Waste		
6) Street			ton kg		
7) Door Number			17) Type of Packages and Containers <sup>6</sup>		
8) Tax Identification Number			18) Number of Packages and Containers		
9) Telephone Number			19) Dispatch Date of Waste		
10) Facsimile Number			20) Name and Signature of Consignor		
11) H Number <sup>3</sup>					
<b>II) WASTE TRANSPORTER</b>					
1) Title of Firm			11) Vehicle License Number		
2) Owner (s) of Firm			12) Vehicle Plate Number		
Address of Firm			13) Mode(s) of Transport <sup>7</sup>		
3) Name and Code of Province			14) Date of Delivery		
4) District			15) Name of Carrier		
5) Area					
6) Street					
7) Door Number			16) Signature of Carrier		
8) Tax Identification Number					
9) Telephone Number					
10) Facsimile Number					
<b>III) WASTE MANAGEMENT FACILITY</b>					
1) Title of Firm			8) License Number of Firm		
2) Owner (s) of Firm			9) Weight of Waste		
3) Address of Firm			10) Waste Disposal or Recovery Method <sup>8</sup>		
4) Country (Name, Code)			11) Transfer of Waste from an interim storage facility (enter X into related box)		
5) Tax Identification Number			a) Waste not treated passed on to disposal/recovery facility		
6) Telephone Number			b) Waste treated then passed on to disposal/recovery facility( no other type of waste generated)		
7) Facsimile Number			c) Waste treated then passed on to disposal/recovery facility( other type of waste generated )		
			d) Others (specify)		
			15) Waste Acceptance Date		
			16) Name and Signature of Consignee		

**Waste Transfer Note**

<b>A</b>		<b>WASTE PRODUCER</b>	
NAME of the WASTE PRODUCER			
Phone			
DATE		PROJECT SITE/FACILITY	
TYPE of WASTE			
o Hazardous		O Special Waste * -----	
o Domestic (Solid) Waste		o Medical Waste	o Packaging Waste
o Domestic Wastewater		o Non-hazardous Waste	o Others -----
WASTE	QUANTITY, unit	CONTAINER TYPE	REMARKS
Accountable Person Prior to Transfer			
Name		Signature	
Time of Movement			
<b>B</b>		<b>WASTE TRANSPORTER</b>	
NAME of the WASTE TRANSPORTER and the DRIVER			
Phone			
VEHICLE LICENSE NUMBER			
VEHICLE TYPE (Dumper Truck, Vacuum Truck, Container Type etc.			
<b>C</b>		<b>WASTE MANAGEMENT FACILITY</b>	
NAME of the WASTE MANAGEMENT FACILITY			
Phone			
DATE		FACILITY TYPE (Process)	
TYPE of WASTE			
o Hazardous		o Special Waste * -----	
o Domestic (Solid) Waste		o Medical Waste	o Packaging Waste
o Domestic Wastewater		o Non-hazardous Waste	o Others -----
WASTE	QUANTITY, unit	CONTAINER TYPE	REMARKS
Person Accountable for the Waste Management Facility			
Name		Signature	
Time of Acceptance			
* Indicate the type of the special waste such as Waste Mineral Oil, Waste Vegetable Oil, Waste Accumulator, Waste Battery, End of Life Vehicle, End of Life Tyres, Waste Electronic Equipment			

**ANNEX 4. EXCAVATION, CONSTRUCTION AND DEMOLITION WASTES TRANSPORTATION AND ACCEPTANCE DOCUMENT (TURKISH AND ENGLISH VERSIONS)**

<b>HAFRİYAT TOPRAĞI VE İNŞAAT /YIKINTI ATIKLARI TAŞIMA VE KABUL BELGESİ</b>	
<p>Tarih:</p> <p>Documan No:</p> <p><b>HAFRİYAT TOPRAĞI VE İNŞAAT /YIKINTI ATIĞI ÜRETİCİSİNİN:</b></p> <p>Adı</p> <p>Adresi</p> <p>Tel / Fax Numarası</p> <p>Üretileceği Yerin Adresi</p> <p>Üretilecek Atık Miktarı</p> <p>Üretilecek Atığın Cinsi</p>	<p style="text-align: center;">Yukarıdaki bilgilerin doğruluğunu Kabul ve beyan ederim.</p> <p style="text-align: center;">İsim ve İmza</p>
<p><b>TAŞIYICI FİRMANIN/ ŞAHSİN:</b></p> <p>Adı</p> <p>Adresi</p> <p>Tel / Fax Numarası</p> <p>İzin Belge No</p> <p>Nakliyede Kullanılacak Araçların Plakası</p>	<p style="text-align: center;">Yukarıdaki bilgilerin doğruluğunu Kabul ve beyan ederim.</p> <p style="text-align: center;">İsim ve İmza</p>
<p><b>DEPOLAMA /GERİ KAZANIM TESİSİ VE İŞLETMECİSİNİN:</b></p> <p>Tesisin Adı</p> <p>Tesisin Adresi</p> <p>Tel / Fax Numarası</p> <p>Tesis İzin Belge No</p> <p>İşletmecinin Adı</p> <p>İşletmecinin Adresi</p> <p>Tel / Fax Numarası</p>	<p style="text-align: center;">Yukarıdaki bilgilerin doğruluğunu Kabul ve beyan ederim.</p> <p style="text-align: center;">İsim ve İmza</p> <p>Yukarıda üretileceği yer, tahmini miktarı, taşıyıcısı ve depolama/geri kazanım tesisi belirtilen atığın taşınması ve depolama/geri kazanım tesisine kabulü uygundur.</p> <p style="text-align: right;">Onaylayan İmza ve Mühür</p>

**Excavation, Construction and Demolition Wastes Transportation and Acceptance Document**

Date:

Document No:

**Procuder of the Excavation, Construction and Demolition Wastes**

Name

Address

Tel / Fax

Location of the Waste Production

Estimated Waste Quantity

Type of the Waste

I approve and declare the above information is correct.

Name and Signature

**Transportation Company**

Name

Address

Tel / Fax

Permit No:

License Plate of the Vehicles

I approve and declare the above information is correct.

Name and Signature

**Waste Storage Area**

Name of the Facility

Address of the Facility

Tel / Fax

Facility License No

Name of the Operator

Address of the Operator

Tel / Fax

I approve and declare the above information is correct.

Name and Signature

The transportation and the acceptance of the above waste to the facility is suitable.

Approve Authority

Signature and  
Stamp

---

## **ANNEX H**

### **Air Quality Supporting Information**

Annex H-1: Background Air Quality Measurement Report

Annex H-2: Air Quality Assessment and Modeling Report

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## **ANNEX H-1**

### **Background Air Quality Measurement Report**

**EKOTEST Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.**  
**Büklüm Sokak 23/1-11 06660 Kavaklıdere / ANKARA**

Deney Raporu  
Testing Report

AB-0020-T

14-048/  
E-010

01-14

Customer Name/Address	İKİTELLİ ENTEGRATED HEALTH CAMPUS PROJECT AREA / İSTANBUL
Order No.	AGREEMENT
Name and identity of the test item	BACKGROUND AIR QUALITY MEASUREMENTS
The date of receipt of the test item	-
Remarks	AIR QUALITY MEASUREMENTS IN THE CONTEXT OF EIA STUDIES (This report can not be used in official transactions of the environmental legislation.)
Date of Test	06.11.2013 – 06.12.2013
Number of Pages of the Report	44 PAGES INCLUDING ANNEX (3 COPIES)

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

*The test and/or measurement results, the uncertainties ( if applicable ) with confidence probability and test methods are given on the following pages which are part of this report.*

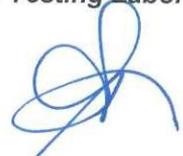


Date

Person in charge of test

Head of the Testing Laboratory

  
AZİZ SEYRAKBASAN

  
AZİZ SEYRAKBASAN

Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.  
İmzasız ve mühürsüz raporlar geçersizdir.

This report shall not be reproduced other than in full except with the permission of the laboratory.  
Testing reports without signature and seal are not valid.

Merkez No: 4315274779357666  
Sicil No :156727  
Web :www.ekotest.com.tr

## **BACKGROUND AIR QUALITY MEASUREMENTS**

**Date Of Measurement** : 06.11.2013 – 06.12.2013  
**Location Of Measurement** : İKİTELLİ ENTEGRAED HEALTH CAMPUS PROJECT AREA / İSTANBUL

### **1) RELATED REGULATION ARTICLES**

#### **1.1.) In accordance with RCAPFIS ANNEX-2;**

In accordance with RCAPFIS ANNEX-2, Value of Contribution to Air Pollution (VCAP)'s calculation using dispersion modeling, establishing air quality measurements and measurement methods in the domain of existing and new facilities are done according to the following principles:

To determine the hourly mass flow rates of emissions which disperse from existing and new facilities' stacks or out of stacks measurements are done in the stacks for existing facilities, emission factors are used for out of stack emissions or new facilities. If the hourly mass flow (kg / h) values exceed the RCAPFIS ANNEX-2 in Table 2.1 values, in the domain of the plant Air Pollution Contribution Value (APCV) of the emissions are measured as hourly if possible, otherwise daily, monthly and yearly basis.

Air quality measurements are done continuously for one month in at least 2 stations (one station for one investigation area) for the different investigation areas which have the highest Air Pollution Contribution Value (APCV).

The competent authority determines the measurement time on the areas which pollution changes and decreases month by month. If the measurement results are % 60 higher than Long-term limit specified in the measurement results for Air Quality Assessment and Management Regulation (AQAMR), air quality measurement time is extended, the measurement period is determined by the competent authority

**Table 2.1.** Mass Flow Value

Emissions	Mass flow rates for the standard operation conditions and the operation hours for work days (kg/hour)	
	From Stack	From Out of Stack
Dust	10	1
Carbon Monoxide	500	50
Nitrogen Dioxide (NO <sub>x</sub> – (as NO <sub>2</sub> ))	40	4

<sup>(1)</sup> RCAPFIS ANNEX-2 Table 2.1

**Note:** The emissions in the table are hourly mass flows disperse from the whole facility (from all stacks).

This report is only valid for the Air Quality Measurements performed in İKİTELLİ ENTEGRAED HEALTH CAMPUS PROJECT AREA dates between of 06.11.2013 and 06.12.2013, can not be partly copied and distributed without the permission of EKOTEST Enviromental Consultancy Testing Co.Limited Unsigned and unstamped reports are invalid. Experiment results are just related to the process conditions during the date of measurement. Our Accreditation is only limited within the context of experiment methods given at General Principles Section. **This report can not be used in official transactions of the environmental legislation.** It is the English translation of the original report.

**Table 2.2.** Long term and short term limit values

Pollutant Type	Period	2013 Limit Values <sup>(2)</sup>	Unit
Particulate Dust (PM <sub>10</sub> )	STLV	100	µg/m <sup>3</sup>
	LTLV	60	
Deposit Dust (DD)	STLV	390	mg/m <sup>2</sup> .day
	LTLV	210	
Carbon Monoxide (CO)	STLV	10	mg/m <sup>3</sup>
	LTLV	10	
Nitrogen Dioxide (NO <sub>2</sub> )	STLV	300	µg/m <sup>3</sup>
	LTLV	60	

<sup>(2)</sup> RCAPFIS ANNEX-2 Table 2.2

For Particulate Dust (PM<sub>10</sub>), Deposit Dust (DD), Carbon Monoxide (CO) and Nitrogen Dioxide (NO<sub>2</sub>), LTV and STV values were calculated for the measured parameter with respect to the specified concentrations and this values were compared with 2013 limit values of LTLV and STLV. Results obtained from the measurements and comparison with the limit values are given in below Tables 5, Table 7, Table 10 and Table 14.

#### **1.1.1.) Determination Of Air Quality Measurement Place and Total Pollution Value:**

Project impact area, investigation area and peak points are taken into consideration to calculate plant's Contribution Value to Air Pollution and to perform air quality measurements.

- 1) Plant Impact Area:** Plant impact area is the area with a radius of 50 times of the stack heights from the center of emissions determined according to RCAPFIS Annex 4. For plants which have emission effective height ( $\Delta h+h$ ) less than 30 m from the ground, plant impact area is calculated as the square area with one side length of 2 km. If the surface distribution of emission sources are higher than 0,04 km<sup>2</sup>, plant impact area is the square area with one side length of 2 km. Plant impact area is taken into consideration to determine the dispersion of emissions on the surface.
- 2) Investigation Area :** It is the square area with one side length of 1 km in the plant impact area. In case of special cases when decision of pollution can not be stated, the length of one side of the investigation area is defined as 0,5 km.
- 3) Peak Point:** Peak Points are the intersection points between the circle drawn from the north of emission source with clockwise consecutive angles of 10° of R m radius and the curve in the square investigation area.

For the grid system used in the modelling study, a total area of 16 km<sup>2</sup> (4 km\*4 km) is divided into sections of 500 m\*500 m. The coordinates of the inspected points are determined including the residential areas close to the area.

This report is only valid for the Air Quality Measurements performed in **İKİTELLİ ENTEGRAED HEALTH CAMPUS PROJECT AREA** dates between of **06.11.2013 and 06.12.2013**, can not be partly copied and distributed without the permission of EKOTEST Enviromental Consultancy Testing Co.Limited Unsigned and unstamped reports are invalid. Experiment results are just related to the process conditions during the date of measurement. Our Accreditation is only limited within the context of experiment methods given at General Principles Section. **This report can not be used in official transactions of the environmental legislation.** It is the English translation of the original report.

**Table 1.** Project Investigation Area

No	Emission Source	Plant Impact Area (Diameter - m)	Investiagation Area (km)
1	All Construction Activities	2000	4 km * 4 km

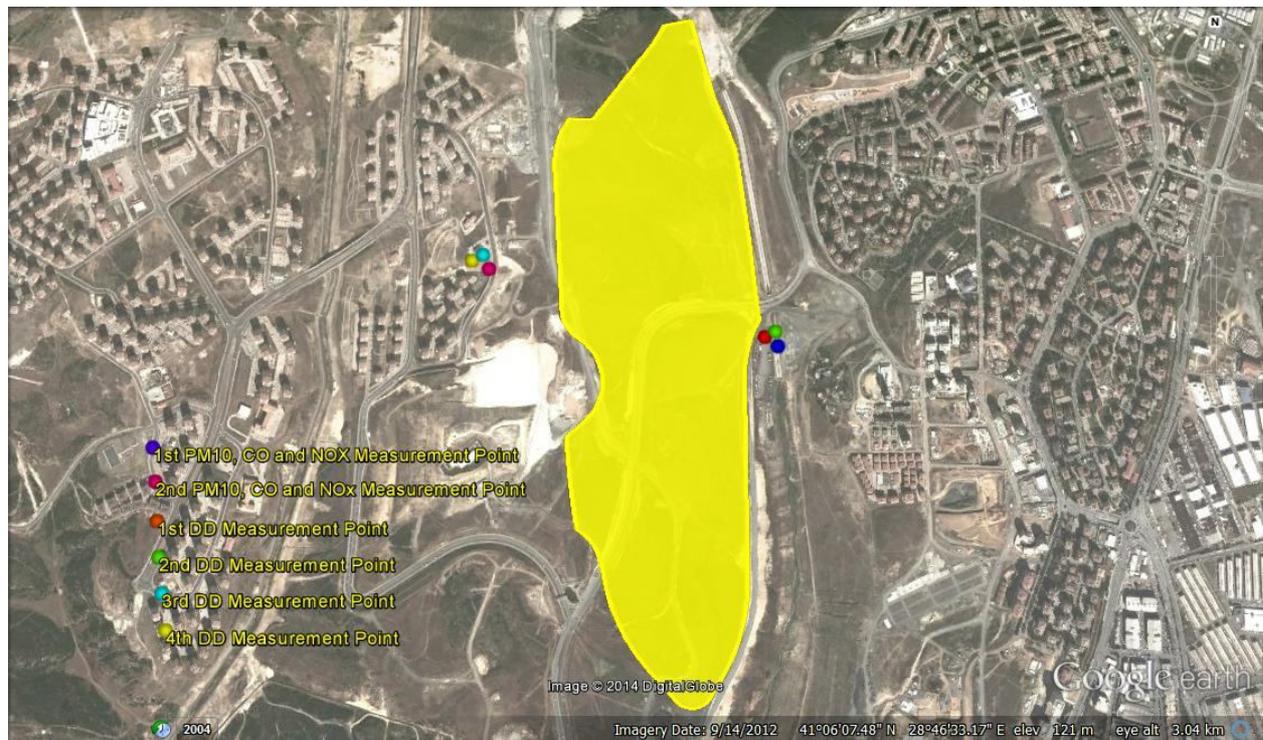
In accordance with Regulation on Control of Air Pollution From Industrial Sources (RCAPFIS);

PM<sub>10</sub>, Carbon Monoxide (CO) and Nitrogen Dioxide (NO<sub>2</sub>) Measurements are conducted lasting 15 days in segments of 24-hours, in 2 different stations.

Deposit Dust sampling is conducted lasting 30 days as 2 samplings in 2 locations.

Information on the sampling stations are given in Figure 1. All of the sampling definitions, sampling dates and coordinate info are presented in Table 2.

**Figure.1.** Layout Showing General Measurement Points



This report is only valid for the Air Quality Measurements performed in **İKİTELLİ ENTEGRAED HEALTH CAMPUS PROJECT AREA** dates between of **06.11.2013 and 06.12.2013**, can not be partly copied and distributed without the permission of EKOTEST Enviromental Consultancy Testing Co.Limited Unsigned and unstamped reports are invalid. Experiment results are just related to the process conditions during the date of measurement. Our Accreditation is only limited within the context of experiment methods given at General Principles Section. **This report can not be used in official transactions of the environmental legislation.** It is the English translation of the original report.

**Table 2.** Measurement Points

Measurement No	Measurement Parameter	Measurement Location	Measurement Date		Measurement Date
			Started	Finished	
1.	PM <sub>10</sub>	1 <sup>st</sup> PM <sub>10</sub> Measurement Location	06.11.2013	21.11.2013	41° 6'11.63"N / 28°46'48.98"E
		2 <sup>nd</sup> PM <sub>10</sub> Measurement Location	21.11.2013	06.12.2013	41° 6'17.71"N / 28°46'14.33"E
2.	Deposite Dust	1 <sup>st</sup> DD Measurement Location	06.11.2013	06.12.2013	41° 6'11.71"N / 28°46'48.80"E
		2 <sup>nd</sup> DD Measurement Location			41° 6'11.88"N / 28°46'48.98"E
		3 <sup>rd</sup> DD Measurement Location			41° 6'17.58"N / 28°46'13.76"E
		4 <sup>th</sup> DD Measurement Location			41° 6'17.35"N / 28°46'13.40"E
3.	Carbon Monoxide	1 <sup>st</sup> CO Measurement Location	06.11.2013	21.11.2013	41° 6'11.63"N / 28°46'48.98"E
		2 <sup>nd</sup> CO Measurement Location	21.11.2013	06.12.2013	41° 6'17.71"N / 28°46'14.33"E
4.	Nitrogen Dioxide	1 <sup>st</sup> NO <sub>x</sub> Measurement Location	06.11.2013	21.11.2013	41° 6'11.63"N / 28°46'48.98"E
		2 <sup>nd</sup> NO <sub>x</sub> Measurement Location	21.11.2013	06.12.2013	41° 6'17.71"N / 28°46'14.33"E

**1.1.2.) Hava Kalitesi Değerleri:**

**Air Quality Values: Long Term Value (LTV) is the arithmetical average value of all measurement values. Short Term Value (STV) is the value that is equal to 95% of the number of measurements when all measurement values are ordered statistically according to their numerical values.**

**1.1.3.) Total Pollution Value: Total Pollution Value (TPV) is the summation of Contribution Value to Air Pollution (CVAP) calculated in Plant Impact Area and Long Term Value (LTV) determined by measurements or calculations for plants that are going to be established.**

$$TPV = CVAP + LTV$$

**1. PM<sub>10</sub> Measurements:**

LTV and STV values were calculated for the measured parameter (PM<sub>10</sub>) with respect to the specified concentrations and this values were compared with LTLV and STLV values. Results obtained from the measurements and comparison with the limit values are given in below Table 3, Table 4 and Table 5.

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**Table 3.** Air Quality (PM10) Measurement Results (Hourly)

Measurement Location	1 <sup>st</sup> Measurement Point										
	06.11.2013	07.11.2013	08.11.2013	09.11.2013	10.11.2013	11.11.2013	12.11.2013	13.11.2013	14.11.2013	15.11.2013	16.11.2013
00:00	-	16.95	37.88	46.59	17.00	57.31	53.66	79.73	20.93	41.05	28.00
01:00	-	14.95	31.02	35.03	16.84	67.24	41.49	69.39	17.98	43.02	28.02
02:00	-	13.14	32.24	35.73	12.03	43.07	23.94	47.00	17.00	44.14	29.07
03:00	-	18.84	42.97	27.94	13.31	52.36	21.89	47.11	17.28	49.98	31.95
04:00	-	12.07	40.93	26.20	24.68	55.55	18.57	52.14	26.92	49.00	29.91
05:00	-	15.05	37.15	32.00	48.68	40.00	37.66	58.05	24.42	49.41	25.98
06:00	-	17.02	45.78	32.07	73.16	39.49	25.69	60.25	38.93	66.77	25.30
07:00	-	18.40	32.97	33.80	63.09	22.00	14.89	70.55	36.00	56.91	38.02
08:00	-	36.77	31.05	28.10	32.16	21.97	10.94	50.80	35.84	52.91	39.11
09:00	-	26.77	33.90	30.86	42.22	20.83	9.20	41.80	29.20	48.89	44.07
10:00	-	17.02	28.05	27.03	53.60	15.11	15.89	32.80	38.05	44.14	47.36
11:00	-	17.85	31.12	28.14	62.84	18.69	11.97	23.95	40.02	49.95	62.73
12:00	17.05	11.02	38.03	31.93	29.86	8.00	10.97	21.84	41.34	48.02	50.93
13:00	18.95	27.98	40.31	30.10	25.24	8.03	10.00	15.14	55.86	48.89	47.98
14:00	16.93	26.97	48.46	32.84	31.63	9.03	40.44	21.00	50.14	43.91	46.75
15:00	12.96	24.86	33.51	28.84	21.00	9.94	36.89	21.32	55.95	39.82	35.82
16:00	10.98	17.08	47.63	23.74	22.32	7.97	33.05	34.91	54.02	32.15	27.93
17:00	10.02	22.05	37.17	16.68	59.05	7.06	35.05	31.02	54.84	38.96	24.11
18:00	10.93	25.00	42.81	36.94	32.24	9.06	37.00	31.77	48.02	36.86	28.77
19:00	7.98	25.02	66.14	34.64	39.27	11.26	37.03	22.20	49.05	30.84	19.14
20:00	7.02	25.97	69.90	23.80	46.49	20.06	38.11	30.75	50.89	24.11	24.95
21:00	8.02	24.07	67.07	17.10	29.28	21.77	41.69	20.23	46.14	28.93	23.02
22:00	9.02	28.05	68.32	20.23	38.89	14.00	31.23	29.70	51.82	25.98	24.07
23:00	10.16	31.10	48.93	26.68	35.62	15.14	40.16	17.09	43.93	25.07	26.82
<b>Daily Mean Value (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>11.67</b>	<b>21.42</b>	<b>43.05</b>	<b>29.46</b>	<b>36.27</b>	<b>24.79</b>	<b>28.23</b>	<b>38.77</b>	<b>39.36</b>	<b>42.49</b>	<b>33.74</b>

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**Table 3.** Air Quality (PM10) Measurement Results (Hourly – continued)

Measurement Location	1 <sup>st</sup> Measurement Point				2 <sup>nd</sup> Measurement Point						
	Hour / Date	17.11.2013	18.11.2013	19.11.2013	20.11.2013	21.11.2013	22.11.2013	23.11.2013	24.11.2013	25.11.2013	26.11.2013
00:00	19.02	60.59	57.66	37.29	16.85	28.76	18.79	14.36	26.86	13.23	8.26
01:00	20.14	46.57	47.97	45.55	17.67	21.88	21.91	20.08	23.54	20.91	17.25
02:00	26.00	61.80	47.75	33.29	17.05	16.88	24.96	19.27	39.14	17.94	25.46
03:00	25.94	50.29	68.86	71.22	17.29	19.80	24.09	16.67	43.68	15.74	6.94
04:00	23.00	67.02	65.37	47.84	20.32	29.14	25.83	17.18	28.83	7.00	5.03
05:00	24.54	67.61	75.05	43.58	41.76	47.71	31.56	22.56	23.09	7.06	6.17
06:00	23.39	44.90	48.75	60.77	31.62	31.03	37.46	19.04	25.52	9.09	11.91
07:00	27.90	39.12	69.76	54.23	20.76	27.00	30.37	17.76	9.26	12.06	8.94
08:00	21.81	46.00	63.20	60.72	20.04	25.48	26.64	18.44	17.77	13.91	7.07
09:00	10.97	46.02	69.76	26.50	18.48	24.06	19.57	17.16	10.03	10.97	9.97
10:00	8.97	47.09	63.17	26.24	17.74	20.22	21.74	14.73	11.00	10.09	9.03
11:00	6.98	51.88	67.76	23.21	21.49	20.33	16.75	16.18	10.90	12.89	9.94
12:00	5.92	44.91	60.63	23.17	18.39	15.34	15.54	15.57	8.41	8.97	7.83
13:00	1.00	40.03	49.93	24.27	15.80	12.28	12.66	15.14	19.97	8.03	1.97
14:00	1.09	41.74	47.73	26.30	11.75	11.27	9.48	15.89	19.08	8.94	1.03
15:00	6.02	27.07	40.07	27.17	11.52	9.08	9.10	21.62	2.97	6.91	2.09
16:00	7.02	31.03	41.86	27.25	13.87	8.37	9.76	21.45	2.06	4.00	5.03
17:00	8.01	33.00	38.31	22.76	13.82	10.07	8.30	21.60	4.06	4.09	5.97
18:00	9.03	33.41	47.03	21.03	13.09	11.23	9.24	40.73	6.31	6.97	4.97
19:00	11.39	45.51	48.56	23.02	15.92	12.44	14.53	32.59	17.00	5.94	4.00
20:00	34.29	60.10	65.13	23.37	19.20	12.91	19.67	21.17	17.06	4.06	4.00
21:00	51.34	62.76	68.64	24.35	17.91	14.36	23.54	26.03	19.06	6.11	3.97
22:00	71.09	55.49	57.58	24.91	21.92	15.38	20.15	26.86	21.45	10.06	3.08
23:00	76.60	41.58	44.74	19.27	20.51	13.48	15.86	23.14	36.32	11.89	6.29
<b>Daily Mean Value (µg/m<sup>3</sup>)</b>	<b>21.73</b>	<b>47.73</b>	<b>56.47</b>	<b>34.06</b>	<b>18.95</b>	<b>19.10</b>	<b>19.48</b>	<b>20.63</b>	<b>18.47</b>	<b>9.87</b>	<b>7.34</b>

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**Table 3.** Air Quality (PM10) Measurement Results (Hourly – continued)

Measurement Location	2 <sup>nd</sup> Measurement Point								
	28.11.2013	29.11.2013	30.11.2013	01.12.2013	02.12.2013	03.12.2013	04.12.2013	05.12.2013	06.12.2013
Hour / Date									
00:00	16.71	37.95	54.43	15.98	31.07	31.96	14.11	13.04	39.72
01:00	6.05	36.07	29.41	15.05	33.85	28.95	18.93	16.10	60.24
02:00	8.03	39.18	5.20	17.11	26.94	25.97	15.03	19.14	65.43
03:00	9.21	47.11	56.07	21.91	24.02	23.86	17.08	23.24	21.14
04:00	16.68	51.68	15.95	18.02	25.00	15.93	21.86	29.66	24.97
05:00	5.11	37.93	14.00	19.05	24.94	11.97	14.00	20.20	26.25
06:00	9.03	34.77	13.95	21.02	21.89	10.02	14.14	26.64	40.42
07:00	10.03	25.00	11.95	21.95	17.00	10.93	21.81	44.15	31.48
08:00	11.05	25.02	10.16	19.91	17.11	6.95	11.00	21.22	29.00
09:00	13.08	25.77	17.05	16.05	22.19	4.09	11.34	55.69	28.90
10:00	16.00	15.86	18.84	18.18	30.88	9.02	30.78	46.31	25.80
11:00	16.30	10.02	12.16	26.14	23.98	10.00	17.93	27.61	20.10
12:00	27.29	11.02	19.05	31.89	23.00	10.03	14.32	44.05	22.80
13:00	37.76	12.00	20.91	27.50	22.98	12.02	32.68	17.10	-
14:00	28.92	12.00	17.05	48.82	21.90	13.00	13.98	20.00	-
15:00	25.71	12.00	18.95	41.10	16.03	13.14	12.98	20.16	-
16:00	14.98	11.97	17.00	47.02	17.81	18.89	12.00	24.70	-
17:00	14.27	11.20	7.34	47.98	7.03	14.11	12.07	16.00	-
18:00	25.98	18.09	21.68	46.68	9.05	18.91	15.98	16.10	-
19:00	24.98	21.84	7.93	33.36	12.14	15.03	14.93	19.00	-
20:00	23.86	15.02	5.57	48.61	20.05	17.07	11.02	19.07	-
21:00	18.34	16.09	30.39	31.91	23.10	19.98	12.02	21.00	-
22:00	32.84	19.91	46.71	27.95	29.12	18.95	13.03	20.86	-
23:00	26.27	16.88	33.59	26.11	35.93	16.93	14.97	17.75	-
<b>Daily Mean Value (µg/m<sup>3</sup>)</b>	<b>18.27</b>	<b>23.52</b>	<b>21.06</b>	<b>28.72</b>	<b>22.38</b>	<b>15.74</b>	<b>16.17</b>	<b>24.95</b>	<b>33.56</b>

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**Table 4.** Air Quality (PM10) Measurement Results (Daily Mean)

Measurement Location	Measurement Date	Concentration of PM <sub>10</sub> Daily Mean (µg/m <sup>3</sup> )
1 <sup>st</sup> Measurement Point	06.11.2013	11.7
	07.11.2013	21.4
	08.11.2013	43.1
	09.11.2013	29.5
	10.11.2013	36.3
	11.11.2013	24.8
	12.11.2013	28.2
	13.11.2013	38.8
	14.11.2013	39.4
	15.11.2013	42.5
	16.11.2013	33.7
	17.11.2013	21.7
	18.11.2013	47.7
	19.11.2013	56.5
20.11.2013	34.1	
2 <sup>nd</sup> Measurement Point	21.11.2013	18.9
	22.11.2013	19.1
	23.11.2013	19.5
	24.11.2013	20.6
	25.11.2013	18.5
	26.11.2013	9.9
	27.11.2013	7.3
	28.11.2013	18.3
	29.11.2013	23.5
	30.11.2013	21.1
	01.12.2013	28.7
	02.12.2013	22.4
	03.12.2013	15.7
	04.12.2013	16.2
05.12.2013	25.0	
06.12.2013	33.6	

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**Table 5.** Long Term Value (LTV) and Short Term Value (STV) Evaluations

	PM <sub>10</sub> Long Term Value (LTV) (µg/m <sup>3</sup> )	PM <sub>10</sub> Long Term Value (LTV) Impact Value (%)	PM <sub>10</sub> Short Term Value (STV) (µg/m <sup>3</sup> )	PM <sub>10</sub> Short Term Value (STV) Impact Value (%)
	26.7	% 44	45.4	% 45
<b>LIMIT VALUES</b>				
<b>RCAPFIS ANNEX-2 Table.2.2. 2013 Limit Values</b>	<b>60</b>	<b>% 60</b>	<b>100</b>	<b>**</b>
<b>Statement</b>	Below The Limit Value.	Below The Limit Value.	Below The Limit Value.	No Limit Value

\*\* In RCAPFIS, there is no limit value for that parameter.

When compared LTV and STV values with limit values, it can be observed that, back ground air quality values of PM<sub>10</sub> result are below the limit value.

## 2. Deposit Dust Measurement:

LTV and STV values were calculated for the measured parameter (PM<sub>10</sub>) with respect to the specified concentrations and this values were compared with LTLV and STLTV values. Results obtained from the measurements and comparison with the limit values are given in below Table 6 and Table 7.

**Table 6.** Air Quality (Deposit Dust) Measurement Results

Measurement Location	Measurement Period	Concentration (mg/m <sup>2</sup> .day)				
		Sampling Cup A	Sampling Cup B	Sampling Cup C	Sampling Cup D	Mean
1 <sup>st</sup> Measurement Point	06.11.2013- 06.12.2013	61.94	42.70	65.61	90.50	<b>65.19</b>
2 <sup>nd</sup> Measurement Point		89.78	271.26	222.51	92.87	<b>169.10</b>
3 <sup>rd</sup> Measurement Point		255.08	209.60	411.35	454.03	<b>332.52</b>
4 <sup>th</sup> Measurement Point		142.43	167.77	403.58	183.59	<b>224.34</b>

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**Table 7.** Long Term Value (LTV) and Short Term Value (STV) Evaluations

	<b>DD Long Term Value (LTV) (mg/m<sup>2</sup>.day)</b>	<b>DD Long Term Value (LTV) Impact Value (%)</b>	<b>DD Short Term Value (STV) (mg/m<sup>2</sup>.day)</b>	<b>DD Short Term Value (STV) Impact Value (%)</b>
	<b>197.8</b>	<b>% 94</b>	<b>332.5</b>	<b>% 85</b>
<b>LIMIT VALUES</b>				
<b>RCAPFIS ANNEX-2 Table.2.2. 2013 Limit Values</b>	<b>210</b>	<b>% 60</b>	<b>390</b>	<b>**</b>
<b>Statement</b>	Below The Limit Value	Above The Limit Value	Below The Limit Value	No Limit Value

\*\* In RCAPFIS, there is no limit value for that parameter.

When compared LTV and STV values with limit values, it can be observed that, LTV and STV results related to respective measurement parameters are below the limit values.

### **3. Carbon Monoxide Measurement:**

LTV and STV values were calculated for the measured parameter (CO) with respect to the specified concentrations and this values were compared with LTLV and STLV values. Results obtained from the measurements and comparison with the limit values are given in below Table 8, Table 9 and Table 10.

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**Table 8.** Air Quality (CO) Measurement Results (Hourly)

Measurement Location	1 <sup>st</sup> Measurement Point										
	06.11.2013	07.11.2013	08.11.2013	09.11.2013	10.11.2013	11.11.2013	12.11.2013	13.11.2013	14.11.2013	15.11.2013	16.11.2013
00:00	-	750.00	525.00	362.50	512.50	700.00	912.50	400.00	450.00	350.00	287.50
01:00	-	725.00	550.00	387.50	525.00	750.00	937.50	387.50	475.00	350.00	250.00
02:00	-	737.50	537.50	462.50	525.00	825.00	900.00	387.50	487.50	325.00	237.50
03:00	-	762.50	500.00	475.00	525.00	912.50	850.00	375.00	487.50	312.50	225.00
04:00	-	700.00	462.50	450.00	512.50	962.50	800.00	337.50	475.00	300.00	212.50
05:00	-	375.00	500.00	450.00	500.00	950.00	762.50	325.00	475.00	287.50	212.50
06:00	-	200.00	587.50	450.00	500.00	900.00	725.00	325.00	450.00	275.00	212.50
07:00	-	175.00	625.00	462.50	525.00	837.50	737.50	325.00	437.50	262.50	350.00
08:00	-	175.00	612.50	450.00	562.50	775.00	737.50	337.50	425.00	250.00	400.00
09:00	-	200.00	625.00	462.50	600.00	762.50	725.00	287.50	437.50	262.50	12.50
10:00	-	237.50	762.50	412.50	662.50	762.50	625.00	237.50	437.50	275.00	175.00
11:00	-	275.00	712.50	350.00	700.00	500.00	475.00	225.00	450.00	287.50	150.00
12:00	225.00	262.50	625.00	387.50	400.00	275.00	412.50	200.00	462.50	300.00	150.00
13:00	225.00	250.00	237.50	375.00	275.00	200.00	387.50	212.50	450.00	312.50	162.50
14:00	175.00	287.50	237.50	325.00	300.00	212.50	375.00	212.50	437.50	300.00	162.50
15:00	575.00	187.50	312.50	225.00	350.00	187.50	362.50	175.00	412.50	287.50	187.50
16:00	1612.50	200.00	225.00	225.00	250.00	225.00	350.00	187.50	350.00	300.00	200.00
17:00	1425.00	200.00	187.50	250.00	287.50	500.00	350.00	200.00	187.50	287.50	225.00
18:00	1200.00	262.50	212.50	262.50	350.00	887.50	337.50	275.00	250.00	275.00	300.00
19:00	1025.00	312.50	287.50	312.50	412.50	887.50	350.00	300.00	287.50	262.50	362.50
20:00	912.50	350.00	350.00	387.50	487.50	887.50	375.00	337.50	325.00	262.50	412.50
21:00	862.50	387.50	362.50	437.50	550.00	900.00	412.50	362.50	350.00	262.50	450.00
22:00	812.50	425.00	362.50	475.00	612.50	900.00	412.50	400.00	362.50	275.00	462.50
23:00	775.00	475.00	362.50	500.00	662.50	887.50	400.00	425.00	337.50	287.50	475.00
<b>Daily Mean Value (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>818.75</b>	<b>371.35</b>	<b>448.44</b>	<b>389.06</b>	<b>482.81</b>	<b>691.15</b>	<b>571.35</b>	<b>301.56</b>	<b>404.17</b>	<b>289.58</b>	<b>261.46</b>

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**Table 8.** Air Quality (CO) Measurement Results (Hourly - continued)

Measurement Location Hour / Date	1 <sup>st</sup> Measurement Point				2 <sup>nd</sup> Measurement Point						
	17.11.2013	18.11.2013	19.11.2013	20.11.2013	21.11.2013	22.11.2013	23.11.2013	24.11.2013	25.11.2013	26.11.2013	27.11.2013
00:00	475.00	525.00	937.50	290.38	289.17	345.35	405.54	340.63	244.05	260.73	217.92
01:00	462.50	525.00	1025.00	304.31	275.49	326.60	378.49	338.77	248.25	283.61	221.56
02:00	462.50	537.50	1112.50	307.57	288.04	328.25	376.53	326.04	257.29	229.50	232.73
03:00	450.00	537.50	1200.00	339.70	298.39	334.83	385.68	321.91	259.03	237.53	229.65
04:00	450.00	537.50	1287.50	315.56	312.53	329.36	395.89	320.59	256.25	272.36	261.68
05:00	437.50	525.00	1325.00	337.80	294.22	329.17	382.53	318.51	269.44	281.88	258.40
06:00	437.50	525.00	1275.00	314.62	291.06	309.24	345.92	296.44	274.17	285.03	254.58
07:00	425.00	525.00	1175.00	321.53	294.44	292.12	363.21	285.90	262.03	284.65	234.44
08:00	400.00	537.50	1162.50	311.75	263.87	576.89	304.98	274.10	232.15	269.43	227.59
09:00	237.50	550.00	750.00	329.50	261.94	648.04	320.83	277.47	260.19	279.62	280.52
10:00	200.00	525.00	200.00	328.26	420.64	641.88	373.06	326.04	271.22	273.40	262.53
11:00	200.00	537.50	512.50	271.25	545.85	624.72	387.31	316.65	287.86	350.75	243.39
12:00	200.00	575.00	675.00	274.67	575.52	579.72	387.38	303.06	299.76	326.23	225.17
13:00	225.00	637.50	462.50	345.64	696.13	934.69	422.12	290.82	314.53	331.58	233.82
14:00	225.00	700.00	1262.50	442.93	554.46	657.19	405.97	289.13	312.80	346.51	240.75
15:00	200.00	687.50	1487.50	460.92	418.51	665.35	392.40	263.49	293.78	318.49	235.24
16:00	200.00	650.00	319.39	545.64	364.55	666.67	339.97	270.28	298.02	311.37	226.98
17:00	262.50	650.00	366.23	442.93	387.47	576.16	332.01	280.63	276.02	293.94	243.87
18:00	325.00	650.00	373.37	425.92	354.17	467.36	312.27	261.16	273.49	288.19	235.56
19:00	375.00	675.00	366.79	425.40	291.04	452.08	299.24	256.98	279.24	268.82	234.31
20:00	412.50	712.50	339.46	407.97	340.75	416.61	335.66	283.25	281.41	236.51	238.84
21:00	462.50	750.00	319.32	372.00	309.83	474.38	312.07	303.77	267.78	257.80	228.47
22:00	500.00	775.00	300.82	338.84	355.52	459.83	340.89	285.50	251.42	275.56	238.73
23:00	512.50	837.50	275.28	278.17	354.15	417.92	350.87	259.05	288.26	218.49	231.16
<b>Daily Mean Value (µg/m<sup>3</sup>)</b>	<b>355.73</b>	<b>611.98</b>	<b>771.28</b>	<b>355.55</b>	<b>368.24</b>	<b>493.93</b>	<b>360.45</b>	<b>295.42</b>	<b>273.27</b>	<b>282.58</b>	<b>239.08</b>

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**Table 8.** Air Quality (CO) Measurement Results (Hourly - continued)

Measurement Location	2 <sup>nd</sup> Measurement Point								
	28.11.2013	29.11.2013	30.11.2013	01.12.2013	02.12.2013	03.12.2013	04.12.2013	05.12.2013	06.12.2013
00:00	249.13	305.54	566.11	596.77	481.06	393.16	335.85	323.73	610.90
01:00	228.84	321.75	558.77	567.15	475.90	372.10	356.77	354.01	577.07
02:00	267.05	473.75	571.67	554.93	477.45	364.08	329.51	323.68	605.61
03:00	250.38	430.82	556.32	552.80	476.35	366.30	331.84	305.07	554.88
04:00	329.32	405.64	556.51	540.69	463.65	372.15	333.49	355.57	526.93
05:00	466.56	409.10	574.46	556.02	439.29	371.15	314.84	420.07	553.04
06:00	357.41	359.24	582.36	547.55	441.23	368.45	346.32	445.45	609.76
07:00	330.59	388.99	525.47	571.86	412.34	353.33	299.22	447.36	625.54
08:00	334.64	388.78	563.52	574.01	401.22	460.63	322.07	513.18	569.17
09:00	310.89	549.27	542.07	535.54	411.56	549.98	338.33	655.50	550.59
10:00	482.99	465.40	534.98	488.18	406.58	558.73	317.60	817.53	552.74
11:00	480.75	439.79	508.44	470.78	410.97	611.35	350.38	719.01	525.21
12:00	532.00	397.99	530.03	446.08	425.59	651.67	501.25	611.67	514.50
13:00	533.39	425.61	565.49	481.13	510.90	699.13	584.08	556.46	-
14:00	525.12	410.45	554.91	530.90	472.95	543.87	514.84	591.86	-
15:00	466.68	372.07	662.52	556.32	458.47	458.63	694.88	581.72	-
16:00	450.49	491.96	668.72	516.02	475.33	418.44	560.61	578.73	-
17:00	416.46	520.23	670.09	496.56	468.37	495.56	530.14	593.98	-
18:00	411.63	571.58	663.63	485.80	447.85	465.05	447.31	639.97	-
19:00	400.69	566.81	637.01	505.80	466.67	425.03	395.14	665.83	-
20:00	333.49	546.20	642.90	508.39	460.73	423.52	375.47	678.92	-
21:00	341.06	592.85	639.44	504.08	440.03	382.38	346.23	633.78	-
22:00	342.53	601.67	687.45	460.02	429.98	348.25	330.99	601.28	-
23:00	357.17	576.30	600.50	504.65	439.05	333.91	326.74	585.75	-
<b>Daily Mean Value (µg/m<sup>3</sup>)</b>	<b>383.30</b>	<b>458.82</b>	<b>590.14</b>	<b>523.00</b>	<b>449.73</b>	<b>449.45</b>	<b>399.33</b>	<b>541.67</b>	<b>567.38</b>

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**Table 9.** Air Quality (CO) Measurement Results (Daily Mean)

Measurement Location	Measurement Date	Concentration of CO Daily Mean ( $\mu\text{g}/\text{m}^3$ )
1 <sup>st</sup> Measurement Point	06.11.2013	818.8
	07.11.2013	371.4
	08.11.2013	448.4
	09.11.2013	389.1
	10.11.2013	482.8
	11.11.2013	691.1
	12.11.2013	571.4
	13.11.2013	301.6
	14.11.2013	404.2
	15.11.2013	289.6
	16.11.2013	261.5
	17.11.2013	355.7
	18.11.2013	612.0
	19.11.2013	771.3
20.11.2013	355.6	
2 <sup>nd</sup> Measurement Point	21.11.2013	368.2
	22.11.2013	493.9
	23.11.2013	360.4
	24.11.2013	295.4
	25.11.2013	273.3
	26.11.2013	282.6
	27.11.2013	239.1
	28.11.2013	383.3
	29.11.2013	458.8
	30.11.2013	590.1
	01.12.2013	523.0
	02.12.2013	449.7
	03.12.2013	449.5
	04.12.2013	399.3
05.12.2013	541.7	
06.12.2013	567.4	

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**Table 10.** Long Term Value (LTV) and Short Term Value (STV) Evaluations

	<b>CO Long Term Value (LTV) (mg/m<sup>3</sup>)</b>	<b>CO Long Term Value (LTV) Impact Value (%)</b>	<b>CO Short Term Value (STV) (mg/m<sup>3</sup>)</b>	<b>CO Short Term Value (STV) Impact Value (%)</b>
	<b>0.445</b>	<b>% 4</b>	<b>0.685</b>	<b>% 7</b>
<b>LIMIT VALUES</b>				
<b>RCAPFIS ANNEX-2 Table.2.2. 2013 Limit Values</b>	<b>10</b>	<b>% 60</b>	<b>10</b>	<b>**</b>
<b>Statement</b>	Below The Limit Value.	Below The Limit Value.	Below The Limit Value.	No Limit Value

\*\* In RCAPFIS, there is no limit value for that parameter.

When compared LTV and STV values with limit values, it can be observed that, back ground air quality value of CO results are below the limit value.

#### **4. Nitrogen Dioxide Measurement:**

LTV and STV values were calculated for the measured parameter (NO<sub>2</sub>) with respect to the specified concentrations and this values were compared with LTLV and STLV values. Results obtained from the measurements and comparison with the limit values are given in below Table 11, Table 12, Table 13 and Table 14.

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**Table 11. Air Quality (Nitrogen Oxides) 1st Measurement Point Results (Hourly)**

Measurement Location	1 <sup>st</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
06.11.2013	12:00	3.83	15.03	18.85
	13:00	4.14	13.62	17.75
	14:00	6.49	16.64	23.13
	15:00	2.42	14.66	17.08
	16:00	1.34	9.03	10.37
	17:00	1.12	7.57	8.69
	18:00	1.10	8.52	9.62
	19:00	0.87	9.11	9.98
	20:00	0.65	7.42	8.07
	21:00	0.47	7.05	7.52
	22:00	0.69	8.13	8.82
23:00	0.52	10.42	10.95	
07.11.2013	00:00	0.49	7.21	7.70
	01:00	0.20	7.48	7.67
	02:00	0.02	10.40	10.42
	03:00	0.10	9.85	9.94
	04:00	0.26	10.56	10.82
	05:00	0.12	11.59	11.71
	06:00	0.84	10.97	11.81
	07:00	0.56	21.31	21.87
	08:00	0.98	17.33	18.31
	09:00	1.17	19.78	20.95
	10:00	0.92	10.50	11.42
	11:00	1.23	14.38	15.60
	12:00	2.75	16.45	19.20
	13:00	3.51	14.38	17.89
	14:00	2.28	12.04	14.32
	15:00	0.95	7.97	8.92
	16:00	0.85	7.46	8.31
	17:00	3.11	9.42	12.53
	18:00	1.29	9.34	10.63
	19:00	1.00	8.51	9.51
	20:00	0.73	7.99	8.72
	21:00	0.27	7.92	8.20
	22:00	0.40	6.93	7.33
23:00	0.56	7.27	7.83	
08.11.2013	00:00	0.35	5.75	6.10
	01:00	0.67	8.32	8.99
	02:00	0.85	19.25	20.09
	03:00	3.00	27.86	30.86
	04:00	7.27	44.46	51.72
	05:00	2.81	24.16	26.98
	06:00	3.86	25.01	28.87
	07:00	2.49	16.52	19.01
	08:00	1.56	14.50	16.06
	09:00	1.09	13.17	14.26
	10:00	1.13	9.95	11.08
	11:00	2.87	13.27	16.13
	12:00	2.65	14.48	17.13
	13:00	7.89	23.27	31.16
	14:00	3.07	14.86	17.94
	15:00	1.99	9.26	11.25
	16:00	0.91	8.40	9.31
17:00	0.85	7.41	8.26	

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**Table 11.** Air Quality (Nitrogen Oxides) 1st Measurement Point Results (Hourly – continued)

Measurement Location	1 <sup>st</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
08.11.2013	14:00	3.07	14.86	17.94
	15:00	1.99	9.26	11.25
	16:00	0.91	8.40	9.31
	17:00	0.85	7.41	8.26
	18:00	0.78	8.80	9.58
	19:00	0.65	7.45	8.10
	20:00	0.72	7.14	7.86
	21:00	0.47	7.99	8.47
	22:00	0.58	6.58	7.16
09.11.2013	23:00	0.90	7.27	8.17
	00:00	1.86	7.24	9.10
	01:00	0.26	4.65	4.91
	02:00	0.16	5.59	5.75
	03:00	0.97	11.34	12.31
	04:00	1.55	16.10	17.66
	05:00	0.94	13.14	14.08
	06:00	1.51	13.38	14.89
	07:00	0.42	7.90	8.32
	08:00	0.26	8.68	8.94
	09:00	0.94	10.80	11.74
	10:00	0.58	12.82	13.41
	11:00	1.11	16.93	18.04
	12:00	2.24	19.36	21.60
	13:00	0.95	10.07	11.02
	14:00	2.18	9.85	12.03
	15:00	0.67	6.48	7.15
	16:00	-0.04	5.69	5.66
	17:00	2.48	10.89	13.36
	18:00	0.31	4.35	4.67
	19:00	0.26	3.55	3.80
	20:00	1.04	2.95	3.99
	21:00	0.45	3.26	3.71
22:00	0.41	2.70	3.11	
23:00	0.62	3.79	4.41	
10.11.2013	00:00	0.78	3.58	4.35
	01:00	0.22	3.34	3.56
	02:00	0.61	4.48	5.08
	03:00	0.36	8.22	8.58
	04:00	6.21	29.38	35.58
	05:00	1.74	16.89	18.63
	06:00	1.84	20.39	22.23
	07:00	2.59	16.85	19.44
	08:00	1.80	18.11	19.90
	09:00	1.77	17.44	19.21
	10:00	4.07	21.87	25.94
	11:00	3.67	18.14	21.82
	12:00	6.11	19.86	25.97
	13:00	6.36	19.56	25.92
	14:00	2.04	8.47	10.51
	15:00	0.97	7.66	8.63
	16:00	2.15	10.27	12.42
	17:00	1.84	8.50	10.34
	18:00	0.77	6.39	7.16
19:00	0.97	5.74	6.72	

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**Table 11.** Air Quality (Nitrogen Oxides) 1st Measurement Point Results (Hourly – continued)

Measurement Location	1 <sup>st</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
10.11.2013	20:00	0.99	6.12	7.11
	21:00	0.92	6.97	7.89
	22:00	1.40	10.59	11.98
	23:00	0.82	12.54	13.36
11.11.2013	00:00	0.86	12.49	13.35
	01:00	1.66	9.75	11.42
	02:00	2.58	14.49	17.06
	03:00	2.94	16.60	19.54
	04:00	2.70	15.90	18.59
	05:00	2.10	14.98	17.07
	06:00	3.16	12.26	15.42
	07:00	1.83	8.30	10.14
	08:00	1.61	7.36	8.97
	09:00	1.13	5.88	7.01
	10:00	0.90	7.09	7.99
	11:00	1.31	5.16	6.47
	12:00	1.60	5.75	7.36
	13:00	2.96	7.53	10.49
	14:00	3.83	9.06	12.89
	15:00	1.96	6.88	8.84
	16:00	1.32	6.40	7.73
	17:00	1.94	10.84	12.78
	18:00	1.63	8.33	9.96
	19:00	1.07	6.77	7.84
	20:00	1.25	5.17	6.42
	21:00	0.81	4.94	5.74
	22:00	0.86	5.96	6.81
23:00	0.89	8.70	9.59	
12.11.2013	00:00	0.61	6.34	6.95
	01:00	0.66	6.92	7.58
	02:00	1.62	22.99	24.61
	03:00	3.66	23.13	26.79
	04:00	5.91	26.95	32.86
	05:00	5.82	26.39	32.21
	06:00	3.80	17.37	21.17
	07:00	2.68	16.83	19.50
	08:00	2.86	14.68	17.54
	09:00	1.96	11.54	13.51
	10:00	2.15	11.24	13.39
	11:00	3.08	11.41	14.49
	12:00	3.23	13.10	16.33
	13:00	2.70	10.36	13.06
	14:00	2.17	7.69	9.86
	15:00	1.74	5.91	7.65
	16:00	1.49	5.83	7.33
	17:00	1.46	7.60	9.06
	18:00	1.31	6.23	7.53
	19:00	1.22	5.94	7.16
	20:00	1.29	5.46	6.75
	21:00	1.25	5.27	6.51
	22:00	1.27	5.01	6.28
23:00	1.24	4.92	6.16	

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**Table 11. Air Quality (Nitrogen Oxides) 1st Measurement Point Results (Hourly – continued)**

Measurement Location	1 <sup>st</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
13.11.2013	00:00	1.17	5.70	6.86
	01:00	1.10	8.03	9.13
	02:00	0.97	10.16	11.13
	03:00	1.66	21.78	23.43
	04:00	3.03	21.36	24.38
	05:00	9.07	36.21	45.28
	06:00	2.20	12.78	14.98
	07:00	3.27	16.92	20.19
	08:00	2.74	15.12	17.86
	09:00	3.14	15.95	19.09
	10:00	5.24	27.03	32.27
	11:00	3.51	12.74	16.24
	12:00	4.00	13.30	17.31
	13:00	3.28	9.98	13.26
	14:00	4.09	16.21	20.30
	15:00	4.06	16.36	20.42
	16:00	1.97	7.65	9.62
	17:00	1.54	6.12	7.66
	18:00	1.55	5.69	7.24
	19:00	1.28	5.59	6.87
	20:00	1.28	5.67	6.95
	21:00	1.19	5.80	6.99
	22:00	1.18	7.41	8.58
23:00	1.22	7.29	8.51	
14.11.2013	00:00	1.51	7.03	8.54
	01:00	1.27	9.15	10.42
	02:00	1.17	9.92	11.09
	03:00	1.15	15.50	16.65
	04:00	1.36	19.06	20.42
	05:00	1.33	10.25	11.57
	06:00	1.36	8.71	10.06
	07:00	1.37	9.41	10.78
	08:00	2.07	15.32	17.39
	09:00	1.90	11.13	13.02
	10:00	1.56	10.77	12.33
	11:00	1.60	7.96	9.56
	12:00	4.72	18.06	22.78
	13:00	4.11	14.54	18.65
	14:00	2.50	9.93	12.43
	15:00	2.17	7.76	9.93
	16:00	2.01	8.87	10.89
	17:00	2.68	9.45	12.12
	18:00	2.31	9.76	12.07
	19:00	1.60	7.91	9.51
	20:00	1.97	9.63	11.59
	21:00	1.75	8.36	10.11
	22:00	1.75	8.99	10.74
23:00	2.58	11.79	14.37	
15.11.2013	00:00	1.79	7.50	9.28
	01:00	1.98	10.11	12.09
	02:00	1.70	11.01	12.71
	03:00	1.91	12.49	14.39
	04:00	2.19	20.31	22.50
	05:00	2.40	25.21	27.61
	06:00	2.79	23.59	26.38

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**Table 11. Air Quality (Nitrogen Oxides) 1st Measurement Point Results (Hourly – continued)**

Measurement Location	1 <sup>st</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
15.11.2013	07:00	2.54	15.61	18.15
	08:00	2.27	13.52	15.79
	09:00	2.37	10.32	12.69
	10:00	1.99	10.09	12.08
	11:00	2.26	12.87	15.12
	12:00	3.30	20.46	23.76
	13:00	3.69	15.45	19.15
	14:00	4.37	12.84	17.21
	15:00	5.21	13.43	18.64
	16:00	3.23	9.88	13.11
	17:00	3.27	10.74	14.02
	18:00	1.95	7.11	9.06
	19:00	1.46	6.05	7.50
	20:00	1.47	6.17	7.64
16.11.2013	21:00	1.69	8.36	10.06
	22:00	1.47	8.13	9.60
	23:00	1.26	6.75	8.01
	00:00	1.24	8.99	10.24
	01:00	1.28	11.17	12.45
	02:00	1.24	11.80	13.04
	03:00	1.38	8.64	10.02
	04:00	1.04	8.61	9.64
	05:00	1.54	8.81	10.36
	06:00	1.56	11.47	13.03
	07:00	1.65	9.95	11.61
	08:00	2.04	14.06	16.10
	09:00	2.14	13.55	15.70
	10:00	1.82	10.60	12.42
11:00	2.30	9.95	12.25	
12:00	4.60	14.94	19.55	
13:00	3.92	10.76	14.68	
14:00	3.83	11.88	15.71	
15:00	3.89	13.75	17.63	
16:00	3.37	10.17	13.53	
17:00	2.38	9.11	11.49	
18:00	1.72	8.37	10.09	
19:00	2.07	9.11	11.19	
20:00	3.13	10.57	13.70	
21:00	1.94	9.07	11.00	
22:00	1.67	9.24	10.91	
23:00	1.98	11.52	13.50	
17.11.2013	00:00	4.28	14.32	18.60
	01:00	4.70	17.36	22.06
	02:00	12.70	19.99	32.69
	03:00	2.56	12.34	14.89
	04:00	2.97	20.84	23.82
	05:00	2.70	23.53	26.23
	06:00	4.63	20.96	25.59
	07:00	2.89	16.07	18.97
	08:00	2.56	12.22	14.78
	09:00	4.04	17.42	21.46
	10:00	2.44	12.01	14.45
	11:00	2.19	13.48	15.67
	12:00	2.85	12.69	15.54
13:00	6.13	17.30	23.43	

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**Table 11. Air Quality (Nitrogen Oxides) 1st Measurement Point Results (Hourly – continued)**

Measurement Location	1 <sup>st</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
17.11.2013	14:00	5.57	14.12	19.69
	15:00	3.57	10.25	13.82
	16:00	3.10	9.59	12.69
	17:00	2.55	7.95	10.50
	18:00	3.36	8.83	12.19
	19:00	2.15	6.27	8.42
	20:00	1.85	6.07	7.92
	21:00	1.55	6.25	7.79
	22:00	1.34	5.71	7.04
18.11.2013	23:00	1.20	6.08	7.28
	00:00	1.20	6.26	7.46
	01:00	1.12	6.52	7.63
	02:00	1.37	7.80	9.16
	03:00	1.48	12.30	13.78
	04:00	1.55	11.92	13.47
	05:00	1.45	13.54	14.99
	06:00	2.12	23.48	25.60
	07:00	2.20	13.56	15.76
	08:00	2.10	10.39	12.49
	09:00	1.99	9.26	11.25
	10:00	1.93	8.83	10.76
	11:00	2.96	9.94	12.90
	12:00	3.28	10.92	14.20
	13:00	4.78	13.72	18.50
	14:00	2.73	9.89	12.62
	15:00	2.09	8.72	10.81
	16:00	2.05	9.06	11.10
	17:00	1.91	8.08	9.99
	18:00	1.88	7.60	9.49
	19:00	1.31	6.24	7.55
	20:00	1.30	6.08	7.38
	21:00	1.30	5.75	7.05
22:00	0.90	5.54	6.45	
23:00	1.17	5.45	6.63	
19.11.2013	00:00	1.07	5.16	6.23
	01:00	1.21	5.75	6.96
	02:00	1.40	10.99	12.38
	03:00	2.42	21.30	23.71
	04:00	1.69	14.15	15.85
	05:00	2.47	16.88	19.35
	06:00	2.32	14.44	16.75
	07:00	2.33	12.08	14.41
	08:00	2.07	11.20	13.27
	09:00	1.91	9.73	11.65
	10:00	2.10	12.11	14.20
	11:00	2.40	8.64	11.04
	12:00	3.43	10.24	13.67
	13:00	7.07	23.24	30.31
	14:00	5.88	19.16	25.04
	15:00	4.88	15.81	20.69
	16:00	2.93	11.70	14.63
	17:00	3.17	14.14	17.31
	18:00	3.85	21.66	25.51
19:00	4.31	15.77	20.08	

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**Table 11.** Air Quality (Nitrogen Oxides) 1st Measurement Point Results (Hourly – continued)

Measurement Location	1 <sup>st</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
19.11.2013	20:00	1.96	12.53	14.50
	21:00	1.78	11.95	13.72
	22:00	1.38	9.52	10.90
	23:00	1.68	9.62	11.30
20.11.2013	00:00	2.69	11.82	14.51
	01:00	2.76	13.95	16.72
	02:00	1.68	10.14	11.82
	03:00	1.49	7.49	8.98
	04:00	1.44	6.43	7.87
	05:00	1.27	4.96	6.23
	06:00	1.55	5.26	6.80
	07:00	2.11	7.02	9.13
	08:00	0.97	4.67	5.64
	09:00	1.84	7.16	9.00
	10:00	3.28	11.74	15.02
	11:00	6.92	23.01	29.93
	12:00	7.87	28.04	35.91
	13:00	5.37	20.34	25.71
	14:00	4.84	19.72	24.56
	15:00	3.83	11.89	15.72
	16:00	2.20	12.78	14.99
	17:00	5.27	31.27	36.54
	18:00	5.20	25.84	31.04
	19:00	11.07	26.77	37.84
20:00	6.43	27.80	34.23	
21:00	7.66	25.49	33.15	
22:00	2.76	19.58	22.34	
23:00	4.53	21.51	26.04	

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**Table 12. Air Quality (Nitrogen Oxides) 2nd Measurement Point Results (Hourly)**

Measurement Location	2 <sup>nd</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
21.11.2013	00:00	1.64	9.92	11.57
	01:00	2.41	10.44	12.85
	02:00	1.34	7.31	8.65
	03:00	1.66	7.51	9.17
	04:00	2.74	9.79	12.54
	05:00	3.68	11.19	14.87
	06:00	4.55	13.46	18.01
	07:00	5.05	14.81	19.86
	08:00	6.07	20.79	26.87
	09:00	6.02	19.69	25.71
	10:00	4.87	16.69	21.56
	11:00	6.51	23.24	29.75
	12:00	10.31	34.33	44.64
	13:00	9.80	36.99	46.79
	14:00	29.65	41.70	71.35
	15:00	17.78	33.42	51.19
	16:00	10.67	19.92	30.59
	17:00	7.55	16.81	24.36
	18:00	6.97	20.17	27.14
	19:00	5.38	16.18	21.56
	20:00	2.22	11.20	13.42
	21:00	2.70	12.54	15.23
	22:00	2.06	10.20	12.26
23:00	2.50	10.57	13.06	
22.11.2013	00:00	3.70	12.88	16.58
	01:00	3.98	13.65	17.63
	02:00	3.60	12.87	16.47
	03:00	3.44	12.22	15.66
	04:00	4.29	12.31	16.60
	05:00	6.26	15.69	21.96
	06:00	7.76	17.91	25.67
	07:00	6.98	17.90	24.88
	08:00	8.32	19.14	27.47
	09:00	9.41	29.39	38.80
	10:00	8.08	32.13	40.21
	11:00	5.54	36.10	41.64
	12:00	3.44	36.98	40.42
	13:00	2.64	33.36	36.00
	14:00	30.07	40.39	70.46
	15:00	13.34	29.86	43.19
	16:00	11.09	28.25	39.34
	17:00	12.71	30.31	43.02
	18:00	10.14	25.73	35.87
	19:00	5.46	21.91	27.37
	20:00	3.79	22.33	26.12
	21:00	2.33	17.67	20.00
	22:00	2.43	16.06	18.49
23:00	2.41	15.26	17.67	
23.11.2013	00:00	2.37	13.39	15.75
	01:00	2.49	12.18	14.67
	02:00	2.53	11.71	14.24
	03:00	2.50	11.43	13.94
	04:00	3.34	10.68	14.02

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**Table 12.** Air Quality (Nitrogen Oxides) 2nd Measurement Point Results (Hourly-continued)

Measurement Location	2 <sup>nd</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
23.11.2013	05:00	6.63	15.08	21.71
	06:00	10.77	23.49	34.26
	07:00	8.65	23.24	31.88
	08:00	8.35	22.51	30.86
	09:00	4.41	16.76	21.17
	10:00	4.45	18.74	23.18
	11:00	4.12	22.36	26.48
	12:00	4.01	26.66	30.67
	13:00	5.08	27.53	32.61
	14:00	6.09	27.68	33.77
	15:00	5.11	21.87	26.98
	16:00	6.74	22.49	29.22
	17:00	4.09	18.58	22.66
	18:00	3.50	17.99	21.48
24.11.2013	19:00	1.84	13.89	15.73
	20:00	1.49	13.88	15.37
	21:00	1.73	14.19	15.92
	22:00	1.61	13.52	15.13
	23:00	1.89	11.96	13.84
	00:00	2.50	11.98	14.48
	01:00	2.34	11.90	14.23
	02:00	2.38	11.70	14.08
	03:00	2.75	12.73	15.48
	04:00	2.90	13.79	16.68
	05:00	4.91	17.40	22.31
	06:00	5.12	17.11	22.23
	07:00	4.74	14.88	19.63
	08:00	5.18	15.00	20.18
09:00	3.98	13.50	17.48	
10:00	4.43	13.89	18.32	
11:00	6.85	19.98	26.83	
12:00	5.98	19.62	25.60	
13:00	7.25	25.28	32.53	
14:00	4.95	19.69	24.63	
15:00	4.09	16.36	20.45	
16:00	2.19	13.89	16.08	
17:00	5.85	18.04	23.89	
18:00	5.77	18.67	24.44	
19:00	2.94	13.73	16.66	
20:00	1.49	13.74	15.23	
21:00	1.71	14.24	15.95	
22:00	2.61	14.10	16.71	
23:00	2.23	12.44	14.67	
25.11.2013	00:00	1.30	9.39	10.70
	01:00	1.22	7.31	8.53
	02:00	1.62	8.16	9.78
	03:00	2.41	9.43	11.84
	04:00	3.03	12.35	15.37
	05:00	3.56	13.85	17.41
	06:00	5.01	15.59	20.60
	07:00	3.49	15.33	18.82
	08:00	4.25	15.15	19.40
	09:00	2.58	11.64	14.22
10:00	3.61	13.42	17.03	

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**Table 12.** Air Quality (Nitrogen Oxides) 2nd Measurement Point Results (Hourly-continued)

Measurement Location	2 <sup>nd</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
25.11.2013	11:00	4.68	15.89	20.56
	12:00	6.01	15.59	21.60
	13:00	4.54	16.92	21.46
	14:00	5.23	17.32	22.55
	15:00	2.43	13.62	16.05
	16:00	2.58	12.42	15.00
	17:00	1.75	10.21	11.96
	18:00	1.83	8.85	10.68
	19:00	3.42	12.68	16.09
	20:00	2.24	10.80	13.04
	21:00	1.39	8.59	9.98
	22:00	1.03	7.03	8.06
23:00	0.87	8.20	9.07	
26.11.2013	00:00	1.33	6.17	7.49
	01:00	0.99	4.42	5.41
	02:00	1.85	5.67	7.52
	03:00	0.67	5.15	5.81
	04:00	1.01	6.77	7.78
	05:00	2.21	6.51	8.71
	06:00	1.36	7.04	8.40
	07:00	1.19	6.80	7.98
	08:00	1.38	7.53	8.91
	09:00	1.50	7.30	8.80
	10:00	1.99	8.66	10.65
	11:00	1.57	11.24	12.81
	12:00	3.58	14.00	17.58
	13:00	1.67	9.73	11.40
	14:00	1.41	8.54	9.95
	15:00	1.80	8.05	9.85
	16:00	1.43	6.62	8.05
	17:00	1.24	6.20	7.44
	18:00	1.29	5.93	7.22
	19:00	1.34	5.63	6.97
	20:00	0.91	5.38	6.29
	21:00	0.55	6.59	7.14
	22:00	0.89	6.46	7.35
	23:00	0.94	4.75	5.69
27.11.2013	00:00	0.30	3.10	3.40
	01:00	0.33	2.90	3.23
	02:00	0.30	3.70	4.00
	03:00	0.64	3.93	4.57
	04:00	1.33	7.63	8.96
	05:00	1.90	8.72	10.62
	06:00	2.98	11.92	14.91
	07:00	1.90	9.40	11.30
	08:00	1.38	8.62	10.00
	09:00	1.75	8.99	10.75
	10:00	1.54	7.73	9.28
	11:00	1.74	8.24	9.98
	12:00	2.80	11.64	14.44
	13:00	2.68	15.27	17.95
14:00	2.05	12.39	14.44	
15:00	0.78	9.64	10.42	
16:00	0.98	11.22	12.21	

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**Table 12.** Air Quality (Nitrogen Oxides) 2nd Measurement Point Results (Hourly-continued)

Measurement Location	2 <sup>nd</sup> Measurement Point				
	Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
			NO	NO <sub>2</sub>	NO <sub>x</sub>
27.11.2013	17:00	0.73	10.00	10.73	
	18:00	0.86	7.66	8.51	
	19:00	0.55	7.52	8.07	
	20:00	1.37	9.65	11.02	
	21:00	1.01	8.27	9.28	
	22:00	0.63	7.96	8.59	
28.11.2013	23:00	0.61	5.65	6.26	
	00:00	0.86	5.29	6.14	
	01:00	0.71	5.74	6.45	
	02:00	0.44	4.83	5.27	
	03:00	0.69	5.39	6.08	
	04:00	0.77	7.40	8.17	
	05:00	3.41	15.63	19.04	
	06:00	12.81	25.14	37.95	
	07:00	9.92	19.59	29.51	
	08:00	4.16	15.09	19.26	
	09:00	3.00	16.46	19.47	
	10:00	1.78	14.05	15.83	
	11:00	4.75	29.42	34.17	
	12:00	2.61	29.78	32.39	
	13:00	16.10	40.43	56.53	
	14:00	8.57	41.57	50.15	
	15:00	7.00	30.15	37.15	
	16:00	9.34	39.98	49.32	
	17:00	11.50	31.05	42.56	
	18:00	3.84	23.23	27.07	
	19:00	1.91	16.31	18.22	
	20:00	1.26	15.21	16.47	
	21:00	1.68	15.89	17.57	
22:00	1.30	12.58	13.88		
23:00	1.62	18.33	19.95		
29.11.2013	00:00	1.80	17.06	18.86	
	01:00	0.99	9.29	10.29	
	02:00	1.14	12.59	13.74	
	03:00	3.56	24.42	27.97	
	04:00	8.78	25.00	33.78	
	05:00	7.16	18.79	25.95	
	06:00	5.81	18.16	23.96	
	07:00	4.24	16.79	21.02	
	08:00	3.10	19.70	22.81	
	09:00	3.18	20.07	23.25	
	10:00	4.96	21.25	26.22	
	11:00	2.37	16.99	19.36	
	12:00	1.88	18.19	20.07	
	13:00	1.43	15.64	17.07	
	14:00	2.82	20.32	23.14	
	15:00	4.31	18.98	23.29	
	16:00	3.92	22.77	26.69	
	17:00	1.71	19.79	21.50	
	18:00	1.97	18.32	20.29	
	19:00	2.43	20.76	23.19	
	20:00	2.54	17.81	20.34	
	21:00	1.78	19.38	21.16	
	22:00	2.60	20.35	22.95	
23:00	1.45	17.26	18.71		

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**Table 12. Air Quality (Nitrogen Oxides) 2nd Measurement Point Results (Hourly-continued)**

Measurement Location	2 <sup>nd</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
30.11.2013	00:00	1.18	12.18	13.36
	01:00	1.17	11.96	13.13
	02:00	0.93	8.66	9.59
	03:00	0.98	9.37	10.35
	04:00	1.25	12.91	14.16
	05:00	1.17	10.49	11.67
	06:00	2.57	13.05	15.62
	07:00	3.99	14.87	18.86
	08:00	2.02	9.48	11.50
	09:00	2.24	11.76	14.00
	10:00	2.23	11.06	13.29
	11:00	2.52	13.03	15.55
	12:00	1.65	10.98	12.62
	13:00	0.94	11.26	12.20
	14:00	1.16	14.17	15.33
	15:00	1.02	14.30	15.32
	16:00	1.97	20.12	22.09
	17:00	2.53	19.67	22.20
	18:00	1.75	18.48	20.24
	19:00	1.18	15.32	16.50
	20:00	1.20	13.65	14.85
	21:00	1.33	12.30	13.63
	22:00	1.24	12.17	13.41
23:00	1.22	13.56	14.79	
01.12.2013	00:00	0.98	11.36	12.34
	01:00	1.15	12.26	13.41
	02:00	1.05	11.25	12.30
	03:00	0.98	11.18	12.16
	04:00	1.03	9.94	10.98
	05:00	1.17	9.79	10.96
	06:00	2.07	10.94	13.01
	07:00	6.67	17.37	24.04
	08:00	6.70	19.46	26.16
	09:00	6.42	20.04	26.46
	10:00	5.12	17.43	22.55
	11:00	3.50	17.08	20.59
	12:00	2.68	15.32	18.00
	13:00	1.28	11.38	12.67
	14:00	0.70	13.25	13.95
	15:00	2.46	15.26	17.73
	16:00	3.01	16.32	19.34
	17:00	2.71	12.23	14.94
	18:00	2.94	10.68	13.63
	19:00	2.30	10.84	13.14
	20:00	2.96	12.99	15.95
	21:00	3.38	13.02	16.40
	22:00	2.18	9.91	12.09
23:00	1.13	8.94	10.08	
02.12.2013	00:00	0.82	7.43	8.26
	01:00	0.75	6.60	7.35
	02:00	0.58	5.44	6.03
	03:00	0.55	5.29	5.84
	04:00	0.51	4.76	5.27
	05:00	0.61	4.90	5.51
	06:00	0.99	5.43	6.42

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**Table 12.** Air Quality (Nitrogen Oxides) 2nd Measurement Point Results (Hourly-continued)

Measurement Location	2 <sup>nd</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
02.12.2013	07:00	1.29	5.75	7.04
	08:00	1.59	5.91	7.50
	09:00	2.81	6.79	9.59
	10:00	1.75	6.79	8.54
	11:00	2.08	7.61	9.69
	12:00	1.72	8.53	10.26
	13:00	1.17	9.51	10.68
	14:00	3.36	14.94	18.30
	15:00	2.63	12.38	15.01
	16:00	1.43	9.92	11.34
	17:00	1.50	12.03	13.53
	18:00	1.69	11.14	12.83
	19:00	1.75	10.61	12.36
	20:00	1.16	9.66	10.81
03.12.2013	21:00	0.99	10.94	11.94
	22:00	0.99	9.70	10.69
	23:00	0.79	7.83	8.62
	00:00	0.27	6.33	6.60
	01:00	0.65	6.38	7.02
	02:00	0.66	6.10	6.76
	03:00	0.30	5.57	5.87
	04:00	0.97	5.94	6.91
	05:00	0.92	6.30	7.22
	06:00	4.45	10.76	15.21
	07:00	5.46	16.01	21.47
	08:00	6.27	18.30	24.57
	09:00	5.52	20.12	25.64
	10:00	7.73	24.72	32.45
04.12.2013	11:00	4.93	22.90	27.83
	12:00	3.49	25.46	28.95
	13:00	5.80	28.26	34.05
	14:00	7.22	29.04	36.26
	15:00	4.79	24.00	28.80
	16:00	2.45	16.68	19.13
	17:00	2.20	14.87	17.06
	18:00	3.19	15.68	18.87
	19:00	3.18	15.10	18.29
	20:00	2.45	13.30	15.75
	21:00	2.55	13.13	15.68
	22:00	1.93	11.41	13.34
	23:00	1.65	9.61	11.25
	04.12.2013	00:00	1.30	7.71
01:00		1.40	8.20	9.60
02:00		1.78	8.31	10.09
03:00		1.40	7.86	9.26
04:00		1.74	11.10	12.83
05:00		2.90	14.40	17.30
06:00		1.83	11.88	13.72
07:00		2.74	12.65	15.38
08:00		2.60	16.08	18.68
09:00		1.82	9.71	11.52
10:00		2.10	10.00	12.10
11:00		1.44	8.54	9.98
12:00	1.32	8.76	10.08	

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**Table 12.** Air Quality (Nitrogen Oxides) 2nd Measurement Point Results (Hourly-continued)

Measurement Location	2 <sup>nd</sup> Measurement Point			
Date	Time	Parameter ( $\mu\text{g}/\text{m}^3$ )		
		NO	NO <sub>2</sub>	NO <sub>x</sub>
04.12.2013	13:00	5.31	17.58	22.89
	14:00	3.41	20.81	24.23
	15:00	2.41	18.12	20.54
	16:00	5.32	24.74	30.07
	17:00	2.98	22.84	25.83
	18:00	2.26	17.92	20.18
	19:00	2.30	17.99	20.29
	20:00	1.78	14.49	16.27
	21:00	1.01	9.47	10.48
	22:00	1.36	9.54	10.90
05.12.2013	23:00	0.67	5.45	6.12
	00:00	0.68	5.20	5.88
	01:00	0.60	4.38	4.97
	02:00	0.80	6.48	7.27
	03:00	0.71	7.12	7.84
	04:00	1.63	6.95	8.59
	05:00	5.93	13.81	19.74
	06:00	5.51	14.81	20.32
	07:00	2.89	15.69	18.58
	08:00	4.48	19.92	24.40
	09:00	6.47	21.42	27.88
	10:00	8.88	27.92	36.80
	11:00	10.22	35.40	45.62
	12:00	5.24	29.20	34.43
	13:00	7.79	23.20	30.98
	14:00	12.64	21.93	34.56
	15:00	2.26	28.99	31.25
	16:00	1.61	24.04	25.65
	17:00	19.29	21.06	40.35
	18:00	4.23	20.49	24.72
	19:00	2.83	20.79	23.62
	20:00	2.05	18.34	20.38
	21:00	1.44	15.42	16.86
22:00	1.19	14.38	15.57	
23:00	0.96	13.00	13.96	
06.12.2013	00:00	0.96	10.92	11.88
	01:00	0.86	13.73	14.60
	02:00	1.02	12.08	13.10
	03:00	0.84	10.75	11.59
	04:00	0.82	9.02	9.84
	05:00	0.95	7.53	8.48
	06:00	1.79	10.02	11.82
	07:00	4.16	13.25	17.41
	08:00	3.67	13.97	17.64
	09:00	3.70	14.35	18.05
	10:00	4.97	15.40	20.36
	11:00	6.18	22.59	28.77
12:00	3.01	17.92	20.93	

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**Table 13.** Air Quality (NO<sub>2</sub>) Measurement Results (Daily Mean)

Measurement Location	Measurement Date	Concentration of NO <sub>2</sub> Daily Mean (µg/m <sup>3</sup> )
1 <sup>st</sup> Measurement Point	06.11.2013	10.60
	07.11.2013	11.13
	08.11.2013	14.38
	09.11.2013	8.81
	10.11.2013	12.56
	11.11.2013	9.02
	12.11.2013	11.63
	13.11.2013	12.95
	14.11.2013	10.80
	15.11.2013	12.42
	16.11.2013	10.67
	17.11.2013	12.99
	18.11.2013	9.62
	19.11.2013	13.24
20.11.2013	16.03	
2 <sup>nd</sup> Measurement Point	21.11.2013	17.87
	22.11.2013	22.93
	23.11.2013	17.99
	24.11.2013	15.57
	25.11.2013	12.07
	26.11.2013	7.13
	27.11.2013	8.41
	28.11.2013	19.94
	29.11.2013	18.74
	30.11.2013	13.12
	01.12.2013	13.26
	02.12.2013	8.33
	03.12.2013	15.25
	04.12.2013	13.09
05.12.2013	17.91	
06.12.2013	13.19	

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**Table 14.** Long Term Value (LTV) and Short Term Value (STV) Evaluations

	NO <sub>2</sub> Long Term Value (LTV) (µg/m <sup>3</sup> )	NO <sub>2</sub> Long Term Value (LTV) Impact Value (%)	NO <sub>2</sub> Short Term Value (STV) (µg/m <sup>3</sup> )	NO <sub>2</sub> Short Term Value (STV) Impact Value (%)
	13.3	% 22	19.3	% 6
<b>LIMIT VALUES</b>				
<b>RCAPFIS ANNEX-2 Table.2.2. 2013 Limit Values</b>	<b>60</b>	<b>% 60</b>	<b>300</b>	<b>**</b>
<b>Statement</b>	Below The Limit Value.	Below The Limit Value.	Below The Limit Value.	No Limit Value

When compared LTV and STV values with limit values, it can be observed that, back ground air quality value of NO<sub>2</sub> results are below the limit value.

## **2) MEASUREMENT METHODOLOGY AND GENERAL INFORMATION REGARDING THE DEVICES**

In the background air quality measurements, following methods are applied for PM<sub>10</sub>, Deposit Dust, Carbon Monoxide And Nitrogen Oxides parameters within the air quality measurements.

**Table 15.** Measurement Methods

MEASUREMENT METHODS	MEASUREMENT METHODS	MEASUREMENT METHODS
PM <sub>10</sub>	Beta Ray Absorption Method	TS ISO 10473-2003
Deposite Dust	Gravimetric Method	BS 1747
Carbon Monoxide (CO)	Determination Of The Mass Concentration Of Carbon Monoxide (CO)-Non Dispersive Infrared Spectrometer	TS EN 14626-2006
NO and NO <sub>2</sub>	Chemiluminescence Method	TS EN 14211-2006

### **2.1. GENERAL INFORMATION ON PM10 DEVICE**

Met One Instruments BAM 1020 automatically measures and records built-in data input and dust density. In order to enable a basic determination of the mass density, Beta ray refining principle is used. A small <sup>14</sup>C (<60 Ci) element, also known as Beta Particles, absorbs high energy electron constant source. It is detected effectively by an ultra-sensitive light vibration meter placed close by. An external pump draws an amount of calculated air via filter line. Placing a filter line injected with an ambient dust in between the source and detector causes the Beta-Particle signal to be refined. Beta-Particle refining degree can be used to determine the mass density of the particle material on the filter line and consequently, determines volume density of the particle element in the ambient air.

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### 2.1.1. Sampling

Air containing dust absorbed during “sampling process” can be pumped via optional PM<sub>10</sub> ( or PM<sub>2.5</sub>) input inlet used to insulate particles with a diameter bigger than 10 (or 2,5)µm. Consequently, air goes through the filter line, where the particles with a diameter of 10 (2.5) µm or smaller are stored (everything smaller than 2.2 µm goes to disposal). Initially filter line is moved to front by four windows from the metering station to the sampling pipe (approx. 50mm). Secondly, pipe inlet line is lowered to surface and suction pump is started. After the sampling period is terminated, the pipe inlet is lifted upwards and pulled back by four windows, same distance.

### 2.1.2. Metering and Calculation

The last part of the ordinary operation mode consists of separating beta particles from the dusted section of the line and calculating/recording the dust density. Later on, the line is moved further by a window to start the next cycle. (Approx. 12.5 mm). In order to separate the cycles that start at midnight or later from the daily cycles, it is forwarded by one extra window.

## 2.2. GENERAL INFORMATION ON DEPOSIT DUST DEVICE

Measuring locations and measuring stations are instituted in order to distinguish emissions from neighbouring sources and to determine values representing the measurement area. Measurement location is determined outside of the source when working on dispersed sources. In these measurements, measuring locations for the examination areas are the closest corner points of the square shaped area. In principle, air quality measurements are conducted 1.5-4.0 m higher than the ground and at least 1,5 m away from the facility. Poles should be used when conducting measurement in forestland.

After sampling, collected particulate matters are dried at 110 °C using distilled water, cooled in the desiccator at least for 2 hours, passed through the tared filter, drying and cooling are applied again and measuring results are recorded. Same procedure is applied also for the assisting filter. Temperature, humidity and pressure values are recorded during the measurement. Before each weighing process, the scale is checked using reference weight. In case of a weighing difference or in case difference of the first and the last weighing of the auxiliary filter is greater than ± 0,2 mg, necessary adjustments are applied checking temperature, humidity and pressure conditions of the initial and final weighing dates.

The points indicated below should be taken into consideration in determining the Deposit Dust quantities:

- \* If measurement is going to be applied to ambient air within the scope of Regulation for Control of Industrial Air Pollution Appendix-1, 4-way dust sampling system, which is the present dust source, is placed taking the wind direction into account.
- \* Devices used should be cleaned before and after measurement by dismounting all the removable parts.
- \* Deposit dust containers to be used should be placed on device, facing 4 directions.

Dust weight, collected by weighing, is to be determined after gravimetric sampling process

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### 2.3. CARBON MONOXIDE MEASUREMENT

APMA370 carbon monoxide (CO) analyser, performs measurement using NDIR gas filter correlation method designed to constantly monitor CO concentrations in the ambient air.

The device, when equipped with an optional active carbon filter used for supplying CO free zero air to the analyser, samples periodically from CO distilled from the air.

In addition to temperature and pressure adjustment, analyser adjusts the ratio based span via gas with a known density used to span the analyser. This feature is not used automatically and should be selected by the device operator.

### 2.4. NO<sub>x</sub> MEASUREMENT

APNA370 NO<sub>x</sub> analyser, is a device used for determining the nitrogen dioxide and nitrogen monoxide concentration with the constant measurement method, within the scope of chemiluminescence measurement principle.

The device includes a pneumatic system, consisting of a NO<sub>2</sub> to NO converter, a reaction cell, a detector and operation electronics. ML®9841 clearly eliminates the zero deviation, with an auto-zero routine that allows periodical checking and correcting of the analyser in order to illuminate the background.

In addition to temperature and pressure adjustment, analyser adjusts the ratio based span via gas with a known density used to span the analyser. There are analog and digital outputs enabling data monitoring.

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# ANNEX 1

## CERTIFICATES OF EKOTEST

This report is only valid for the Air Quality Measurements performed in **İKİTELLİ ENTEGRAED HEALTH CAMPUS PROJECT AREA** dates between of **06.11.2013 and 06.12.2013**, can not be partly copied and distributed without the permission of EKOTEST Enviromental Consultancy Testing Co.Limited. Unsigned and unstamped reports are invalid. Experiment results are just related to the process conditions during the date of measurement. Our Accreditation is only limited within the context of experiment methods given at General Principles Section. **This report can not be used in official transactions of the environmental legislation.** It is the English translation of the original report.



T.C.  
**ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI**  
Çevre Yönetimi Genel Müdürlüğü



## ÇEVRE ÖLÇÜM VE ANALİZLERİ YETERLİK BELGESİ

Belge No : Y-06/002/2010  
Kapsam : Emisyon, İmisyon, Gürültü, Titreşim  
Düzenleme Tarihi : 25.03.2010  
Laboratuvar Adı : Ekotest Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.  
Adres : **Büklüm Sokak No:23/1-11 Kavaklıdere ANKARA**

Yukarıda açık adı ve adresi belirtilen kurum/kuruluş Ek Liste'de belirtilen kapsamda 5 Eylül 2008 tarih ve 26988 sayılı R.G.de yayımlanan Çevre Ölçüm ve Analiz Laboratuvarları Yeterlik Yönetmeliği'ne göre ölçüm ve/veya analiz yapmaya ve bu çerçevede rapor hazırlamaya yetkilidir.

BELGENİN

BAŞLANGIÇ TARİHİ : 25/03/2010

BITİŞ TARİHİ : 25/03/2014

EK: PARAMETRE LİSTESİ (4 sayfa)



Revizyon Tarihi/No:05.03.2013/01  
Yenileme Tarihi/No:25.03.2010/01

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**T.C.**  
**ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI**  
**Çevre Yönetimi Genel Müdürlüğü**  
**ÇEVRE ÖLÇÜM VE ANALİZLERİ YETERLİK BELGESİ**  
**EK LİSTE-1**

Belge No : Y-06/002/2010  
Düzenleme tarihi : 25.03.2010  
Ek Liste  
Başlangıç tarihi : 25.03.2010  
Bitiş tarihi : 25.03.2014  
Revizyon Tarihi/No : 05.03.2013/02  
Laboratuvar Adı : Ekotest Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.

**ÖLÇÜM VE /VEYA ANALİZ İLE İLGİLİ;**

Kapsam	Parametre	Metot adı	Standart Adı
Emisyon <sup>(1)</sup>	SO <sub>2</sub> Tayini	• Elektrokimyasal Hücre Metodu	• TS ISO 7935
	CO Tayini	• Elektrokimyasal Hücre Metodu	• TS ISO 12039
	CO <sub>2</sub> Tayini	• İnfrared Metodu	• TS ISO 12039
	O <sub>2</sub> Tayini	• Elektrokimyasal Hücre Metodu	• TS ISO 12039
	NO NO <sub>x</sub> , NO <sub>2</sub> Tayini	• Elektrokimyasal Hücre Metodu • Elektrokimyasal Hücre Metodu (Hesaplama)	• EPA CTM -022
	İslilik Tayini	• Renk Karşılaştırılması (Bacharach Skalası)	• TS 9503
	Klor Örnekleme ve Tayini	• Spektrofotometrik Metot	• TS EN 1911-1 • TS EN 1911-2 • TS EN 1911-3
	Flor Örnekleme ve Tayini	• Spektrofotometrik Metot	• EPA Metot 13A
	Partikül Madde Tayini	• Baca İçi ve Baca Dışı Örnekleme ve Gravimetrik Metot	• EPA Metot 1 • TS EN 13284-1 • TS ISO 9096 • EPA Metot 5 • VDI 2066
	Nem Tayini	• Gravimetrik Metot • Yaş Kuru Termometre Metodu (100°C'den küçük baca sıcaklıkları için geçerlidir.)	• EPA Metot 4 • TL 154 İşletme İçi Metot



<sup>1</sup>03.07.2009 tarihli ve R.G.No:27277 sayılı "Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği" Kapsamında.

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**T.C.**  
**ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI**  
**Çevre Yönetimi Genel Müdürlüğü**  
**ÇEVRE ÖLÇÜM VE ANALİZLERİ YETERLİK BELGESİ**  
**EK LİSTE-2**

Belge No : Y-06/002/2010  
Düzenleme tarihi : 25.03.2010  
Ek Liste  
Başlangıç tarihi : 25.03.2010  
Bitiş tarihi : 25.03.2014  
Revizyon Tarihi/No : 05.03.2013/02  
Laboratuvar Adı : Ekotest Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.

**ÖLÇÜM VE /VEYA ANALİZ İLE İLGİLİ:**

Kapsam	Parametre	Metot adı	Standart Adı
Emisyon <sup>(1)</sup>	Hız Tayini	• Pitot Tüp ile	• TS ISO 10780 • EPA Metot 2
	Toplam Uçucu Organik Bileşikler (VOC) Tayini	• Alev İyonizasyon Fotoiyonizasyon (FID) Yöntemi	• TS EN 13526 • TS EN 12619
	Uçucu Organik Bileşikler ve Buhar Numune Alma (VOCs)	• Aktif Karbon Sorbenti ile Numune Alma	• TS EN 13649
	Ağır Metal Örnekleme (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, P, Se, Ag, Tl, Zn)	• İzokinetik Numune Alma	• EPA Metot 29 • TS EN 14385
	PAH (Poliaromatik Hidrokarbon) Örnekleme	• XAD-2 Reçineye İzokinetik Numune Alma	• ISO 11338-1
	PCCD/PCDF (Dioksin ve Furan) Örnekleme	• XAD-2 Reçineye İzokinetik Numune Alma	• TS EN 1948-1

T.C.  
ÇEVRE VE ŞEHİRCİLİK  
BAKANLIĞI

Mehmet BAŞ  
Bakan a.  
Genel Müdür V.

<sup>1</sup> 03.07.2009 tarihli ve R.G.No:27277 sayılı "Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği" Kapsamında.

This report is only valid for the Air Quality Measurements performed in **İKİTELLİ ENTEGRAED HEALTH CAMPUS PROJECT AREA** dates between of **06.11.2013 and 06.12.2013**, can not be partly copied and distributed without the permission of EKOTEST Environmental Consultancy Testing Co.Limited. Unsigned and unstamped reports are invalid. Experiment results are just related to the process conditions during the date of measurement. Our Accreditation is only limited within the context of experiment methods given at General Principles Section. **This report can not be used in official transactions of the environmental legislation.** It is the English translation of the original report.

**T.C.**  
**ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI**  
**Çevre Yönetimi Genel Müdürlüğü**  
**ÇEVRE ÖLÇÜM VE ANALİZLERİ YETERLİK BELGESİ**  
**EK LİSTE-3**

Belge No : Y-06/002/2010  
Düzenleme tarihi : 25.03.2010  
Ek Liste  
Başlangıç tarihi : 25.03.2010  
Bitiş tarihi : 25.03.2014  
Revizyon Tarihi/No : 05.03.2013/02  
Laboratuar Adı : Ekotest Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.

**ÖLÇÜM VE /VEYA ANALİZ İLE İLGİLİ;**

Kapsam	Parametre	Metot adı	Standart Adı
İmisyon (0)	Çöken Toz Tayini	• Gravimetrik Metot	• BS 1747
	Partikül Madde (PM 10) Tayini	• Gravimetrik Metot	• EPA 40 CFR Part 50 Appendiks J • TS EN 12341
	SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub> , HF, HCl, VOC (C <sub>2</sub> -C <sub>28</sub> ), BTEX, H <sub>2</sub> S, NH <sub>3</sub> Örnekleme	• Pasif Örnekleme Metodu ile Numune Alma	• EN 13528-1 • EN 13528-2 • EN 13528-3
	CO Tayini	• Dispersif Olmayan IR Spektrometrik Metodu	• TS 11959 ISO 4224 • TS EN 14626
	Tanecikli Madde Kütleli Tayini (PM 10)	• Beta Işını Absorpsiyon Yöntemi	• TS ISO 10473
	SO <sub>2</sub> Tayini	• UV Flüoresans Metodu	• TS ISO/FDIS 10498 • TS EN 14212
	NO <sub>2</sub> , NO Tayini	• Kimyasal Lüminesans Metodu	• TS EN 14211



<sup>1</sup> 03.07.2009 tarihli ve R.G.No:27277 sayılı "Sanayi Kaynaklı Hava Kirliliğinin Kontrolü Yönetmeliği" Kapsamında.

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**T.C.**  
**ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI**  
**Çevre Yönetimi Genel Müdürlüğü**  
**ÇEVRE ÖLÇÜM VE ANALİZLERİ YETERLİK BELGESİ**  
**EK LİSTE-4**

Belge No : Y-06/002/2010  
Düzenleme tarihi : 25.03.2010  
Ek Liste  
Başlangıç tarihi : 25.03.2010  
Bitiş tarihi : 25.03.2014  
Revizyon Tarihi/No : 05.03.2013/02  
Laboratuar Adı : Ekotest Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.

**ÖLÇÜM VE /VEYA ANALİZ İLE İLGİLİ;**

Kapsam	Parametre	Metot adı	Standart Adı
Gürültü <sup>(2)</sup>	Eşdeğer Ses Basınç Düzeyi (DbA)	• Çoklu Gürültü Kaynağına Sahip Sanayi Tesislerinde Çevredeki Ses Basınç Seviyelerinin Değerlendirilmesi İçin Ses Güç Seviyelerinin Tayini- Mühendislik Metodu	• TS ISO 8297
		• Sesin Dışarıda Yayılırken Azalması- Genel Hesaplama Yöntemi	• TS ISO 9613-2
		• Gürültü Kaynaklarının Ses Gücü Seviyelerinin Ses Basıncı Kullanılarak Tayini Bir Yansıtma Düzlemi Boyunca, Esas Olarak Serbest Bir Alan İçinde Uygulanan Mühendislik Metodu	• TS EN ISO 3744
		• Ses Basıncı Kullanarak Gürültü Kaynaklarının Ses Güç Seviyelerinin Tayini-Bir Yansıtma Düzlemi Boyunca Çevreye Ölçme Yüzeyi Kullanılarak Yapılan Gözlem Metodu	• TS EN ISO 3746
		• Çevre Gürültüsünün Tarifi, Ölçülmesi ve Değerlendirilmesi-Bölüm 2:Çevre Gürültü Seviyelerinin Tayini	• TS ISO 1996-2
	• Çevre Gürültüsünün Tarifi, Ölçülmesi ve Değerlendirilmesi-Bölüm 1:Temel Büyüklükler ve Değerlendirme İşaretleri	• TS 9315 ISO 1996-1	
Titreşim Seviyesi	• Madencilik-Hava Şoku ve Yer Titreşimi Ölçümü	• TS 10354	
	• Mekanik Titreşim ve Şok- Binaların Titreşimi-Titreşimin Ölçülmesi ve Binalara Etkilerinin Değerlendirilmesi İçin Klavuz	• TS ISO 4866	



**Mehmet BAŞ**  
**Bakan a.**  
**Genel Müdür V.**

<sup>2</sup> 07.03.2008 tarihli ve 26809 sayılı R.G.'de yayımlanan "Çevresel Gürültünün Değerlendirilmesi ve Yönetimi Yönetmeliği" Kapsamında.

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TÜRK AKREDİTASYON KURUMU

## AKREDİTASYON SERTİFİKASI

Deney Laboratuvarı olarak faaliyet gösteren,

**EKOTEST**  
**Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.**  
Büklüm Sok. No: 23 / 1 - 11 Kavaklıdere  
06660 ANKARA / TÜRKİYE

TÜRKAK tarafından yapılan denetim sonucunda TS EN ISO/IEC 17025:2010 Standardına göre Ek'te yer alan kapsamlarda akredite edilmiştir.

**Akreditasyon No : AB-0020-T**

**Akreditasyon Tarihi : 09-Mart-2004**

**Revizyon Tarihi / No : 03-Temmuz-2012 / 07**

Bu Sertifika, yukarıda açık adı ve adresi yazılı Kuruluşun TS EN ISO/IEC 17025:2010 Standardına, ilgili Yönetmelik ve Tebliğlere uygunluğunu sürdürmesi halinde 02-Temmuz-2016 tarihine kadar geçerlidir.



  
**H.İrfan AKSOY**  
Genel Sekreter Vekili

F701-040

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## Akreditasyon Sertifikası Eki (Sayfa 1/4)

## Akreditasyon Kapsamı

 Test TS EN ISO/IEC 17025 AB-0020-T	<b>EKOTEST</b> <b>Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.</b>	
	Akreditasyon No: AB-0020-T Revizyon No: 07 Tarih: 03-Temmuz-2012	
<b>Deney Laboratuvarının</b>		
<b>Adres</b> : Büklüm Sok. No: 23 / 1 - 11 Kavaklıdere 06660 ANKARA / TÜRKİYE	<b>Tel</b> : 0 312 419 22 82 <b>Faks</b> : 0 312 419 22 84 <b>E-Posta</b> : ekotest@ekotest.com.tr <b>Website</b> : www.ekotest.com.tr	

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standartlar, işletme içi metodlar)
Baca Gazı (TS CEN/TS 15675 ve TS EN 15259 Şartlarına Uygun)	CO Tayini	ISO 12039 TS EN 15058 ASTM D6348-03
	SO2 Tayini	ISO 7935 TS EN 14791 ASTM D6348-03
	NO, NO2, NOx Tayini	EPA CTM-022 TS EN 14792 ASTM D6348-03
	O2 Tayini	ISO 12039 TS EN 14789
	CO2 Tayini	ISO 12039 ASTM D6348-03
	Gravimetrik Metot ile Toz (Partikül Madde) Tayini	VDI 2066 TS ISO 9096 EPA Metot 5 EPA Metot 17 TS EN 13284-1
	Alev İyonlaşma Detektörü (FID) ile Toplam Uçucu Organik Bileşik (VOC) Tayini	TS EN 13526 TS EN 12619
	Flor Tayini	EPA Method 13A ASTM D6348-03
	Klor Tayini	TS EN 1911 ASTM D6348-03
	Pitot Tüp İle Hız Tayini	TS ISO 10780 TS 3417 EPA Metot 2
	Gravimetrik Metot İle Nem Tayini	TS EN 14790 EPA Metot 4 EKOTEST TL 154 (İşletme İçi Metot)
	Renk Karşılaştırma (Bacharach) Metodu ile Islilik Tayini	TS 9503
Sürekli Emisyon Ölçüm Sistemleri	SO2, CO, O2, NOx (NO, NO2), TOZ, VOC, HCl, Hız, Nem Tayini	TS EN 14181 (QAL2 ve AST)
Çevre Havası	Gravimetrik Metot ile Toz (PM2.5, PM10, TSP) Tayini	EN 12341
	Çevre Havasında Gravimetrik Metot ile Toz (PM10) Tayini	EPA 40 CFR Part 50 Appendix J

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Akreditasyon Sertifikası Eki (Sayfa 2/4)  
Akreditasyon Kapsamı

 <p>Test TS EN ISO/IEC 17025 AB-0020-T</p>	<p><b>EKOTEST</b> <b>Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.</b></p> <p>Akreditasyon No: AB-0020-T Revizyon No: 07 Tarih: 03-Temmuz-2012</p>
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Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standartlar, işletme içi metodlar)
( Çevre Havası Devam )	Gravimetrik Metot ile Çöken Toz Tayini	BS 1747 TS 2341
	UV Flüoresans Metodu ile SO2 Tayini	TS ISO /FDIS 10498 TS EN 14212
	Kimyasal Lüminesans Metodu ile NO2, NO Tayini	TS EN 14211
	Dispersif Olmayan IR Spektrometri Metodu ile CO Tayini	TS 11959 ISO 4224 TS EN 14626
	Beta Işını Absorpsiyon Yöntemi ile Tanecikli Madde Kütlesi Tayini	TS ISO 10473
İç ortam havası	Toz, Gaz ve Buhar analizleri için örneklenmesi ve gravimetrik tayini	CEN/TR 15230 TS EN 689 MDHS 14/3 MDHS 70
	Renk Karşılaştırma Metodu ile Toksik Gaz ve Buhar Tayini	TS EN 1231
	Işık Saçılması Metodu ve Gravimetrik Metot ile Toz (PM2.5, PM10, TSP, solunabilir) Tayini	TS 2361
	Silikon Diyot Sensör ile Işık Şiddeti Tayini	ISO/CIE 8995
	Platinyum Direnç Sensörü, Nem Sensörü ve Hız Sensörü yoluyla Termal Konfor (Yaş hazne sıcaklığı, nem, hava akım hızı)	BS 1339 TS EN 27243
Çevresel Gürültü	Alıcıda Çevresel Gürültü Düzeyinin Ölçülmesi	TS ISO 1996-2
	Alıcıda çevresel gürültü düzeyinin değerlendirilmesi	TS 9315 ISO 1996-1
	Sesin Alansal Dağılımının Hesaplanması (Gürültü Haritasının Hazırlanması)	TS ISO 9613-2 ISO 13474
	Çoklu gürültü kaynağına sahip sanayi tesisleri etrafında yapılacak ses basıncı ölçümlerinden ses gücü düzeyinin hesaplanması	TS ISO 8297
	Makine-ekipmanların etrafında bir yansıtma düzleminde serbest bir alanda yapılacak ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin hesaplanması (Mühendislik metodu)	TS EN ISO 3744



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Akreditasyon Sertifikası Eki (Sayfa 3/4)  
Akreditasyon Kapsamı

 <p>Test TS EN ISO IEC 17025 AB-0020-T</p>	<p><b>EKOTEST</b> <b>Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.</b></p> <p>Akreditasyon No: AB-0020-T Revizyon No: 07 Tarih: 03-Temmuz-2012</p>
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Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standartlar, işletme içi metodlar)
(Çevresel Gürültü Devam )	Makine-ekipmanların etrafında bir yansıtma düzlemi boyunca çevreleyici ölçme yüzeyinde yapılacak ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin hesaplanması (gözlem metodu)	TS EN ISO 3746
	Bir İş Mahallinde ve Belirtilen Diğer Konumlarda Makine ve Donanımlardan Yayılan Ses Basınç Seviyelerinin Bir Yansıtma Düzlemi Boyunca Açık bir Alanda Ölçülmesi (Mühendislik Metodu)	TS EN ISO 11201
	Bir İş Mahallinde ve Belirtilen Diğer Konumlarda Makine ve Donanımlardan Yayılan Ses Basınç Seviyelerinin Bir Yansıtma Düzlemi Boyunca Açık bir Alanda Ölçülmesi ve Çevresel Düzeltme Faktörlerinin Hesaplanması	TS EN ISO 11204
Mekanik Çevresel Titreşimi	Madencilik faaliyetleri sonucunda oluşan hava şoku ve yer titreşiminin ölçülmesi	TS 10354
	Makine ve ekipmanlardan kaynaklanan mekanik titreşim sonucu oluşan yapı titreşiminin ölçülmesi ve binalara etkilerinin değerlendirilmesi	TS ISO 4866 BS 7385-2
	Deneye tabi tutulan hareketli makinelerin oluşturduğu mekanik titreşimin ölçülmesi ve değerlendirilmesi	TS EN 1032+A1
	Hidrolik güç üretme ve pompalama tesislerindeki makine setlerinde mekanik titreşimin ölçümü ve değerlendirilmesi	ISO 10816-5
Kişisel Maruziyet (Gürültü ve Titreşim)	İş yerinde çalışanların maruz kaldığı gürültünün ölçülmesi ve bu gürültünün sebep olduğu işitme kaybının tahmini	TS 2607 ISO 1999
	Tüm vücudun titreşim altında kalmasının değerlendirilmesi	TS 2775
	Mekanik Titreşime Maruz Kalan Kişilerin Maruz Kaldığı El Titreşiminin Ölçülmesi ve Değerlendirilmesi	TS EN ISO 5349-1



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Akreditasyon Sertifikası Eki (Sayfa 4/4)  
Akreditasyon Kapsamı

	<p><b>EKOTEST</b> <b>Çevre Danışmanlık Ölçüm Hizmetleri Ltd. Şti.</b></p> <p>Akreditasyon No: AB-0020-T Revizyon No: 07 Tarih: 03-Temmuz-2012</p>
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Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standartlar, işletme içi metodlar)
( Kişisel Maruziyet (Gürültü ve Titreşim) Devam )	Mekanik Titreşime Maruz Kalan Kişilerin Maruz Kaldığı El Titreşiminin Ölçülmesi ve Değerlendirilmesi için Kılavuz	TS EN ISO 5349-2
	İşyerlerindeki makine ve ekipmanların kapalı ve açık alanlarında oluşturduğu gürültü düzeyi ve gürültü yoğunluk dağılımının tespiti	EKOTEST TL 14:2010 (İşletme İçi Metot)
	İşyerlerindeki makine ve ekipmanların kapalı ve açık alanlarında oluşturduğu titreşim düzeyi ve titreşim yoğunluk dağılımının tespiti	EKOTEST TL 59:2010 (İşletme İçi Metot)

KAPSAM SONU



  
**H. İrfan AKSOY**  
Genel Sekreter V.

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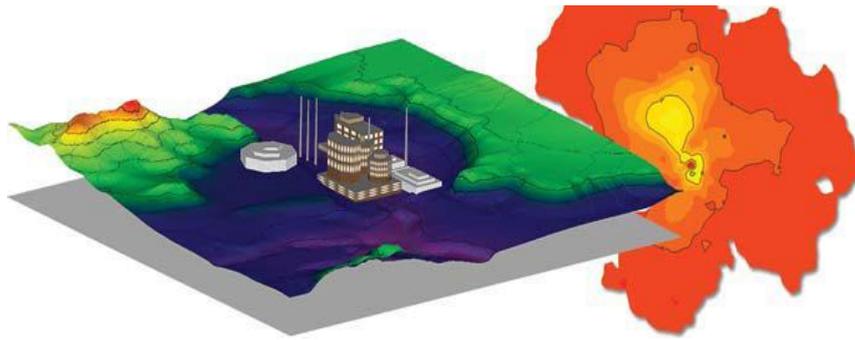
## **ANNEX H-2**

### **Air Quality Assessment and Modeling Report**

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# İKİTELLİ INTEGRATED HEALTH CAMPUS PROJECT

## AIR QUALITY ASSESSMENT AND MODELING REPORT



Istanbul / TURKEY

Prepared By



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## ABBREVIATIONS

<b>%</b>	Percent
<b>µg/m<sup>3</sup></b>	Microgram/cubic meter
<b>µm</b>	Micrometer
<b>AERMOD</b>	AERMOD Atmospheric Dispersion Modeling System
<b>CO</b>	Carbon monoxide
<b>EU</b>	European Union
<b>GLC</b>	Ground Level Concentration
<b>kg</b>	Kilogram
<b>Kcal</b>	Kilocalorie
<b>kJ</b>	Kilojoule
<b>km</b>	Kilometer
<b>m</b>	meter
<b>m/s</b>	meter/second
<b>mg</b>	Milligram
<b>mg/Nm<sup>3</sup></b>	Milligram/normal cubic meter
<b>MoEUP</b>	Turkish Ministry of Environment and Urban Planning
<b>NO</b>	Nitrogen monoxide
<b>NO<sub>2</sub></b>	Nitrogen dioxide
<b>NO<sub>x</sub></b>	Nitrogen oxides
<b>O<sub>2</sub></b>	Oxygen
<b>PM<sub>10</sub></b>	Particulate matter with diameter smaller than 10 micrometer
<b>Project</b>	Ikitelli Integrated Health Campus Project
<b>RAMAQ</b>	Regulation on the Assessment and Management of Air Quality
<b>RCAPOI</b>	Regulation on the Control of Air Pollution Originating from Industry
<b>RPAQ</b>	Regulation on the Protection of Air Quality
<b>SO<sub>2</sub></b>	Sulfur dioxide
<b>WHO</b>	World Health Organization

## 1. INTRODUCTION

The Project will involve construction of a General Hospital, an Oncology Hospital, a Children's Hospital, a Woman's Hospital, a Cardia-vascular Hospital, a Neurological Sciences and Orthopedic Hospital, a Psychiatric Hospital, a Physical Therapy and Rehabilitation Hospital, with a total capacity of 2,682 beds. This report is prepared with the aim of determining the air pollutants and their effects on ambient air quality occurring from project components during the construction and operation phases.

Air pollutants and their approximate quantities are calculated by emission factors. Contribution to air pollution level and air quality levels in the impact area of the Project are estimated by air quality modeling studies and compared with the pertinent standards. The results of the modeling study were assessed according to the Regulation on the Assessment and Management of Air Quality (RAMAQ), Regulation on the Control of Air Pollution Originating from Industry (RCAPOI), EU Council Directive 2008/50/EC and WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide.

The following section briefly explains resulting emissions from the project. Section 3 covers air quality standards and their definitions as stipulated in the Turkish Regulations. Methods and emission values used in the modeling study are discussed in Section 4. Background emission results are shown in Section 5. Results of the modeling study that is carried out according to the RCAPOI instructions and overall assessment of their possible impacts to the air quality of the region are illustrated in Section 6.

## 2. EMISSIONS AND EMISSION CONTROL

As mentioned in previous section, Ikitelli Integrated Health Campus Project is an extensive hospital investment which brings different special hospitals together in one campus. Project will comprise of construction and operation phases; therefore air quality effects of the project have been considered for these two phases. These effects are explained in the following section.

### 2.1. Construction Phase

The construction activities cover both earthwork and main construction activities. Earthwork activities refer the land arrangement (land preparation and excavation) activities of the project area. Significant pollutant of this step will be dust generated from excavation, load on trucks and transportation and the release of engine emissions from construction equipment and vehicles at the construction sites. During, building construction (main construction) activities equipment's movements such as concrete production, cement mixers, trucks, backhoes, asphalt pavers etc. will cause particulate matter emissions from land and engine emissions. Earthworks will continue for 8 months. During the earthwork activities, construction activities will also start. After earthwork activities are completed, main construction activities will continue about 2 years.

In order to calculate dust and engine emissions, emission factors were used. Particulate matter emission factors are taken from Regulation on the Control of Air Pollution Originating from Industry Annex-12 Table 12: Emission Factors Used to Calculate Dust Emissions. Engine emissions are considered in two categories as road and non-road machine emissions. Road emissions cover emissions from vehicles which are used for transportation/carrying operations. Non-road emissions arise from mobile machinery which do not travel on road. Road emission factors are derived from *The EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013-Exhaust Emissions From Road Transport-Tier 3 Emission Factors* and non-road emission factors are taken from *The EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013-Exhaust Emissions From Road Transport-Table 3-10 Tier 3 Baseline emission factors for uncontrolled diesel engines*. Since the dust emission specifications have important differences between land based emissions and engine emissions, they have not been evaluated under same context.

Dust emissions emitted from excavation, loading, and vehicle movements are calculated by using RCAPOI Annex-12 emission factors which are shown in Table 1.

**Table 1.**Emission Factors Used to Calculate Dust Emissions

Sources	Emission Factors kg/ton	
	Uncontrolled	Controlled
Excavating	0.025	0.0125
Loading/Unloading	0.010	0.005
Carrying	0.7	0.35
Storage	5.8 (kg/ha-day)	2.9 (kg/ha-day)

Road and non-road equipment emissions are calculated as shown in Table 2. To calculate emission factors, it is assumed that trucks are rigid, heavier than 32 tons with full capacity

and have Euro 4 technology. No corrections (age, engine type etc.) have been made on emission factors. Engine power of non-road equipment is taken as 130 kWh.

**Table 2.** Construction Equipment Emission Factors

Parameter	Emission Factor	
	Road (g/km-vehicle)	Non-Road (g/kWh-equipment)
NO <sub>x</sub>	4.70902	3.5
CO	0.74319	3.5
PM	0.03544	0.2
SO <sub>2</sub>	0.0016 (kg/h-vehicle)	0.0016 (kg/h-equipment)*
VOC	ND	0.5
HC	0.04639	ND

\*Non-Road SO<sub>2</sub> emission factors are derived from Tier-1 Emission Factors

### 2.1.1. Dust Emissions

In order to calculate land based dust emissions from earthwork and main construction activities such as excavation, loading/unloading, carrying, storage and vehicle movements, emission factors mentioned in previous section are used.

#### a) Earthwork Activities

Due to the fact that the excavation activities within earthwork activities will take 6 months, calculations considered the period of 6 months instead to 8 months in order to assess worst case conditions.

In this phase, 5,000,000 m<sup>3</sup> soil will be excavated. 1,500,000 m<sup>3</sup> soil (%30 of total) will be used for filling activities in the project area. Remaining soil will be carried to a disposal site.

Earthwork phase dust emissions are calculated in accordance with following assumptions.

Total Excavation: 5,000,000 m<sup>3</sup>

Soil Density: 1.6 ton/m<sup>3</sup>

Total Excavation: 5,000,000 m<sup>3</sup> x 1.6 ton/m<sup>3</sup> = 8,000,000 ton

Working Period: 6 months

Daily Working Time: 14 hours

Approx. Hourly Excavation: 8,000,000 ton /6 months/ 30 day / 14 hours = 3,175 ton/h

Trucks will be travelling approx. 500 m within project site for carrying both filling material and residual soil and 1200 m outside of the project site for carrying residual material to storage site.

Outside Carrying=3,175 x 0.7= 2,223 ton/h

Trucks carry approx. 25 m<sup>3</sup>=40 ton

According to these assumptions, emissions are calculated as shown in Table 3.

**Table 3.**Dust emission calculations for earthwork activities

Activity	Uncontrolled	Controlled
Excavation	3,175 ton/h x 0.025 kg/ton= <b>79.4 kg/h</b>	3,175 ton/h x 0.0125 kg/ton = <b>39.7 kg/h</b>
Loading to Trucks	3,175 ton/h x 0.01 kg/ton= <b>31.75 kg/h</b>	3,175 ton/h x 0.005 kg/ton = <b>15.9 kg/h</b>
Carrying (In-Site)	3,175 ton/h / 40 ton/vehicle x 0.7 kg/km-vehicle x 0.5 km = <b>27.8 kg/h</b>	3,175 ton/h / 40 ton/vehicle x 0.35 kg/km-vehicle x 0.5 km = <b>13.9 kg/h</b>
Unloading (Insite)	3,175 ton/h x 0.01 kg/ton= <b>31.75 kg/h</b>	3,175 ton/h x 0.005 kg/ton = <b>15.9 kg/h</b>
Carrying (Out-Site)	2,223 ton/h / 40 ton/vehicle x 0.7 kg/km-vehicle x 1.2 km = <b>46.7 kg/h</b>	2,223 ton/h / 25 ton/vehicle x 0.35 kg/km-vehicle x 1.2 km = <b>23.35 kg/h</b>
Unloading (Out-site)	2,223 ton/h x 0.01 kg/ton= <b>22.23 kg/h</b>	2,223 ton/h x 0.005 kg/ton = <b>11.12 kg/h</b>
<b>Total</b>	<b>239.63 kg/h</b>	<b>119.87 kg/h</b>

### b) Main Construction Activities

Main construction covers ready-mix concrete plant activities, rough construction, mechanical works, electricity works, trim works and landscape works. Building construction activity emissions are calculated in accordance with the following assumptions for both controlled and uncontrolled working conditions.

Aggregate will be used to produce ready mixed concrete. There are 2 ready mixed concrete plant with capacities 65 m<sup>3</sup>/h. and 30 m<sup>3</sup>/h. It is assumed that density of ready mixed concrete is 2.6 t/m<sup>3</sup> and consists %80 aggregate. According to this; 95 m<sup>3</sup>/h x 2.6 t/m<sup>3</sup> x 0.8 = 197.6 t/ h aggregate will be used. It is planned that aggregate will be stocked in a 1,000 m<sup>2</sup> area. Trucks will be traveling 500 meters within the project site. Trucks will be traveling 1.500 meters outside of the project site.

According to these assumptions, emissions are calculated as shown in Table 4.

**Table 4.**Main construction dust emission calculations

Activity	Uncontrolled	Controlled
Unloading the Aggregate to Storage	197.6 ton/h x 0.01 kg/ton = <b>1,976 kg/h</b>	197.6 ton/h x 0.005 kg/ton = <b>0.988 kg/h</b>
Storage (1,000 m <sup>2</sup> )	5.8 kg/ha-d x (0.1 ha/ (24 h/1d))= <b>0.024 kg/h</b>	2.9 kg/ha-d x (0.1 ha/ (24 h/1d))= <b>0.012 kg/h</b>
Carrying (In-Site)	197.6 ton/h / 40 ton/vehicle x 0.7 kg/km-vehicle x 0.5 km = <b>1,729 kg/h</b>	197.6 ton/h / 40 ton/vehicle x 0.35 kg/km-vehicle x 0.5 km = <b>0.8645 kg/h</b>
Carrying (Out-Site)	197.6 ton/h / 40 ton/vehicle x 0.7 kg/km-vehicle x 1.5 km = <b>5.187 kg/h</b>	197.6 ton/h / 40 ton/vehicle x 0.35 kg/km-vehicle x 1.5 km = <b>2.5935 kg/h</b>
<b>Total</b>	<b>8.916 kg/h</b>	<b>4.458 kg/h</b>

### 2.1.2. Engine Emissions

As mentioned in the previous section, engine emissions are split into two categories as road and non-road vehicle emissions. Vehicle types, quantities and working times during the construction phase are shown in Table 5. Numbers represents total amount of the equipment that will be used in the project site during per hour.

**Table 5.** Equipment that will be used during the construction phase in the project site during 1-hour period

Phase	Stage	Road		Non-Road	
		Equipment	Number	Equipment	Number
Earthworks	Land Preparation	Truck	10	Excavator	2
				Loader	1
				Grader	1
				Bulldozer	1
	<b>Total</b>		<b>10</b>	<b>5</b>	
	Excavation Works	Truck	75	Excavator	15
Bulldozer				1	
Loader				2	
<b>Total</b>		<b>75</b>	<b>18</b>		
Main Construction	Main Construction	Truck	12	Crane (Mobile)	4
				Concrete Mixer	3
				Mobile Concrete Pump	4
				Backhoe	2
				Grader	3
				Sprinkler	2
				Hi-Up Crane	2
				Pick-Up	25
				Roller	4
				<b>Total</b>	

Table 6 shows emission calculations for equipment shown in Table 5.

**Table 6.** Engine Emissions

Pollutant	Type	Emission Factor	Emission Per Vehicle (kg/h)	Phase			
				Earthwork		Main construction	
				Number of Vehicle	Total Emission (kg/h)	Number of Vehicle	Total Emission (kg/h)
NO <sub>x</sub>	Road	4.70902	0.002354	85	<b>0.2</b>	12	<b>4.2372</b>
	Non-Road	3.5	0.455	23	<b>10.465</b>	49	<b>401.31</b>
CO	Road	0.74319	0.003716	75	<b>0.2787</b>	12	<b>6.6888</b>
	Non-Road	3.5	0.455	23	<b>10.465</b>	49	<b>401.31</b>
PM	Road	0.03544	0.000017	75	<b>0.001275</b>	12	<b>0.0306</b>
	Non-Road	0.2	0.026	23	<b>0.598</b>	49	<b>22.932</b>
SO <sub>2</sub>	Road	0.0016	0.0016	75	<b>0.12</b>	12	<b>2.88</b>
	Non-Road	0.0016	0.0016	23	<b>0.0368</b>	49	<b>1.4112</b>
VOC	Non-Road	0.5	0.065	75	<b>4.875</b>	12	<b>117</b>
HC	Road	0.04639	0.000023	23	<b>0.000529</b>	49	<b>0.020286</b>

Results are calculated for the worst case situation which considers operation of all vehicles at the same time, which usually does not happen.

## 2.2. Operation Phase

There will be a trigeneration system during operation phase, which is planned to include 5 natural gas fired gas turbines each with a capacity of 3.349 MW electrical power. Since the

fuel to be used at the proposed trigeneration system is natural gas, main pollutant resulting from combustion process will be NO<sub>x</sub>. In order to calculate these emissions, *The EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013-Small Combustion-Table 3-34 Tier 2 Emission Factors for Non-Residential Sources, Gas Turbines Burning Natural Gas* emission factors were used. These emission factors are shown in Table 7.

**Table 7.** EMEP/EEA Emission Factors for Gas Turbines

Parameter	Emission Factor	Unit	Reference
NO <sub>x</sub>	48	g/GJ	Nielsen et al. (2010)
CO	4,8	g/GJ	Nielsen et al. (2010)
SO <sub>x</sub>	0,5	g/GJ	Nielsen et al. (2010)
PM <sub>10</sub>	0,2	g/GJ	BUWAL (2001)

The technical information about the 3.349 MW engine unit is obtained from the manufacturer. Every gas turbine has 7,462 kW (27 GJ) natural gas consumption. Total gas consumption will be;

$$7,462 \times 5 = 37,310 \text{ kW} = 135 \text{ GJ}$$

According to emission factors which are shown on Table 7, emission values are calculated and presented in Table 8.

**Table 8.** Emission values for operation phase

Parameter		Emissions of Per Unit	Total Emissions
NO <sub>x</sub>	Uncontrolled	48 g/GJ x 27 GJ/h=1.3 kg/h	6.5 kg/h
	Controlled	6.48 kg/h x %45 = 0.58 kg/h	2.9 kg/h
CO		4.8 g/GJ x 27 GJ/h=0.13 kg/h	0.65 kg/h
SO <sub>x</sub>		0.5 g/GJ x 27 GJ/h=0.013 kg/h	0.065 kg/h
PM <sub>10</sub>		0.2 g/GJ x 27 GJ/h=0.005 kg/h	0.025 kg/h

### 2.2.1. Stack Height

Minimum stack height of the proposed trigeneration system is calculated using PK 3781 software developed by the German Air pollution control regulation TA LUFT in accordance with VDI 3781 standard. Calculation steps are shown on the nomogram provided in RCAPOI as Annex-4.

In accordance with the RCAPOI Annex-4.b.3b1; conversion factor for NO to NO<sub>2</sub> is 60%. It means mass flow of the NO is multiplied by 0.92 and used in the nomogram as NO<sub>2</sub> mass flow.

NO<sub>x</sub> emission as NO<sub>2</sub> of the proposed plant is calculated as 0.58 kg/h. Accordingly, mole value of the stack gas;

$$0.58 \text{ kg/h} * 1000 \text{ g/kg} / 46 \text{ g NO}_2/\text{mole} = 12.60 \text{ mole/h}$$

It is assumed that all NO<sub>x</sub> emission from stack is NO. It means;

$12.60 \text{ mole/h} * 30 \text{ g NO/mole} / 1000 \text{ g/kg} = 0.378 \text{ kg/h NO}$  release to atmosphere

According to the RCAPOI, NO<sub>2</sub> emission is calculated as follows;

$0.378 \text{ kg/h} * 0.92 = 0.38 \text{ kg/h}$

Design values used in the nomogram are shown in Table 9.

**Table 9.** Values used in nomogram

Parameter	Q Value (kg/h)	s Value*	“Q/s” Value (kg/h)	Stack Diameter (m)	Stack Gas Temperature (°C)	Stack Gas Flow Rate (Nm <sup>3</sup> /h)
NO <sub>2</sub>	0.38	0.1	3.8	0.6	125	12,926

\* s value is taken from RCAPOI Annex-4

In the view of these values, stack height determination steps are shown on the nomogram with a red line. According to the nomogram, minimum stack height is calculated as 10 m. After all, based on the information obtained from the manufacturer, the trigeneration system will have 5 stacks, each with a stack height of 12 m.

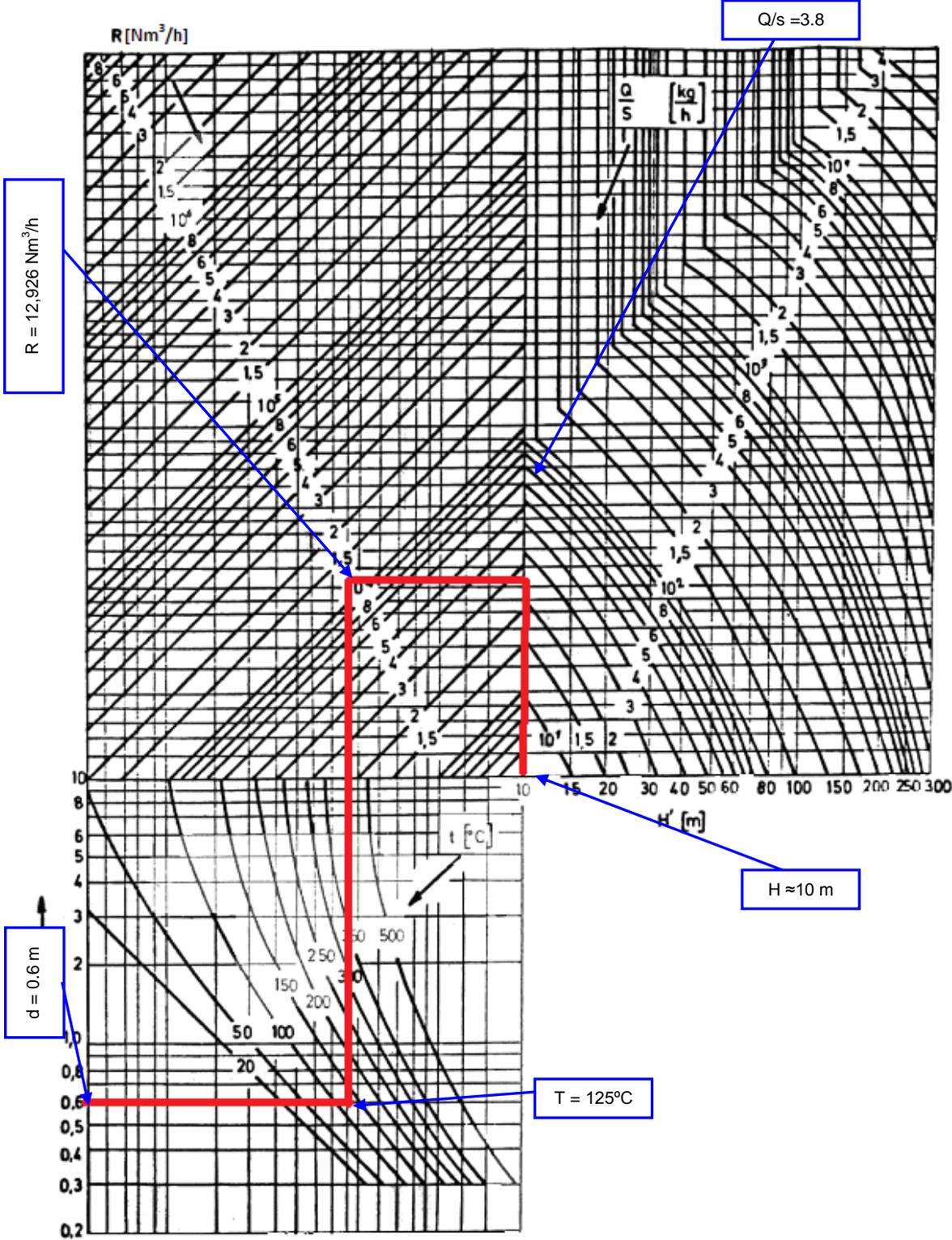


Figure 1. Nomogram

Amount of pollutants and the characteristics of the stack gas are summarized in Table 10. Pollutants, mitigation measures and emissions are discussed in detail in the following subsections.

**Table 10.** Mass Flow Rates and Concentrations of Pollutants<sup>(1)</sup>

Parameter	Value	Limit Values	
		Concentration <sup>(2)</sup> (mg/Nm <sup>3</sup> )	Mass Flow Rate <sup>(3)</sup> (kg/hour)
NO <sub>x</sub>	45 mg/Nm <sup>3</sup> (dry, 15% O <sub>2</sub> ) 0.58 kg/hour NO <sub>x</sub> as NO <sub>2</sub>	300	40
CO	10 mg/Nm <sup>3</sup> (dry, 15% O <sub>2</sub> ) 0.13 kg/hour	100	500
SO <sub>x</sub>	1 mg/Nm <sup>3</sup> (dry, 15% O <sub>2</sub> ) 0.013 kg/hour	60	60
PM <sub>10</sub>	0.2 mg/Nm <sup>3</sup> (dry, 15% O <sub>2</sub> ) 0.005 kg/hour	-	10
Stack Gas Flow Rate	12,926 Nm <sup>3</sup> /hour (dry)	-	-
Stack Gas Temperature	125 °C	-	-
Stack Gas Velocity <sup>(4)</sup>	14.13 m/s	-	-
Stack Height	12 m	-	-
Stack Internal Diameter <sup>(4)</sup>	0.6 m	-	-

- (1) There will be 5 stacks in the proposed trigeneration system as reported by the supplier. The values given in the column titled as "Value" are design values of the proposed trigeneration system.
- (2) Limits for concentration values are mentioned in the RCAPOI, Annex-5 and those for mass flow rate values are mentioned in the Table 2.1 of RCAPOI, Annex-2.
- (3) Limits that define whether air quality modeling study is required or not (RCAPOI, Annex-2).
- (4) Based on experience on working with similar facilities.

### 2.2.2. NO<sub>x</sub> Emissions

There are two factors causing NO<sub>x</sub> emissions through combustion process. First one of these factors is the nitrogen content of the fuel. Nevertheless, other NO<sub>x</sub> emission source of higher concern is the oxidation of free nitrogen in the air at high temperature during combustion. The factors, which will determine the mentioned emissions from the proposed trigeneration system are boiler firing technique, combustion temperature and pressure, etc.

According to RCAPOI, Annex-5, stack gas NO<sub>x</sub> emission standard for gas-fired plants is 300 mg/Nm<sup>3</sup> with 15% O<sub>2</sub> in volume. NO<sub>x</sub> emissions from the proposed plant will be approximately 45 mg/Nm<sup>3</sup> in dry base (see Table 9). Therefore, the emission level complies with the pertinent limit value.

### 2.2.3. Dust Emissions

The amount of dust emissions originating from combustion units depend on ash contents of fuel. In this regard, fuels with lower ash content generate lower amount of dust emissions. Since the ash content of the natural gas is very low, dust emission of the proposed trigeneration system will be negligible.

Dust emission from the unit of the proposed plant will be approximately 0.2 mg/Nm<sup>3</sup> in dry base with 15% O<sub>2</sub> in volume and there are no limit values for dust concentration in RCAPOI.

#### **2.2.4. CO Emissions**

CO emissions are formed as a result of incomplete combustion of fuel. The control of CO is accomplished by providing adequate fuel residence time and high temperature to ensure complete combustion. Gas fired plants have high combustion efficiency up to 99%. Hence CO emissions from proposed trigeneration system will be negligible.

The limit value for CO emissions mentioned in RCAPOI Annex-5 is 100 mg/Nm<sup>3</sup>. CO emissions to be emitted from the stack of the proposed plant will be below 100 mg/Nm<sup>3</sup>.

#### **2.2.5. SO<sub>2</sub> Emissions**

The amount of SO<sub>2</sub> emissions originating from combustion units depend on sulfur contents of fuel. In this regard, fuels with lower sulfur content generate lower amount of SO<sub>2</sub> emissions. Because of the trace sulfur content of the natural gas, SO<sub>2</sub> emissions of the proposed trigeneration system will be negligible.

### 3. AMBIENT AIR QUALITY STANDARDS

RAMAQ aims to improve air quality gradually. Therefore, two types of air quality standards for gaseous pollutants and particulate matters are mentioned: transition period limit values and target limit values. Transition period limit values came into force as of 06.06.2008 and have decreased gradually over the years and transition period limit values were abolished by 01.01.2014. Target limit values, mentioned in RAMAQ Annex-1, will be in force as of 01.01.2014. Target limit values are presented in Table 11.

**Table 11.** Limit Values Stipulated in the Regulation on the Assessment and Management of Air Quality

Parameter	Averaging Period	Limit Value ( $\mu\text{g}/\text{m}^3$ )	Margin of Tolerance	Date by which limit value is to be met
NO <sub>2</sub>	1 hour (for the protection of the human health)	200 (not to be exceeded more than 18 times a calendar year) <sup>1</sup>	100 $\mu\text{g}/\text{m}^3$ on 1.1.2014 (50% of the limit value), reducing every 12 months thereafter by equal amounts to reach 0 by 1.1.2024.	1.1.2024
	Calendar year (for the protection of the human health)	40	20 $\mu\text{g}/\text{m}^3$ on 1.1.2014 (50% of the limit value), reducing every 12 months thereafter by equal amounts to reach 0 by 1.1.2024.	1.1.2024
PM <sub>10</sub>	24 hours (for the protection of the human health)	50 (not to be exceeded more than 35 times a calendar year) <sup>2</sup>	50 $\mu\text{g}/\text{m}^3$ on 1.1.2014 (100% of the limit value), reducing every 12 months thereafter by equal amounts to reach 0 by 1.1.2019.	1.1.2019
	Calendar year (for the protection of the human health)	40	20 $\mu\text{g}/\text{m}^3$ on 1.1.2014 (50% of the limit value), reducing every 12 months thereafter by equal amounts to reach 0 by 1.1.2019.	1.1.2019

1 It can be defined as the value not to be exceeded by 99.79% of the results when they are sorted with respect to magnitude.

2 It can be defined as the value not to be exceeded by 90.73% of the results when they are sorted with respect to magnitude.

On the other hand, limit values for industrial activities such as trigeneration plants are given in the RCAPOI. Ambient air limit values are provided in Annex-2 Table 2.2 of RCAPOI and similarly to the RAMAQ, these limit values decrease gradually over the years until 01/01/2014. Since the new air quality limit values for the industrial plants have not been released yet, 2013 limit values have been used to evaluate emissions. RCAPOI 2013 Limit Values are shown in Table 12. It can be seen that RAMAQ limit values are stricter than the RCAPOI limit values and for this reason model results are only compared with RAMAQ limit values.

Two different categories of air quality standards for the gaseous pollutants and particulate matter are explained below:

“Long Term Limit Value” (LTL) is defined as the value of the arithmetic average of the total measurement results, not to be exceeded at a particular measurement point.

“Short Term Limit Value” (STL) is defined as the value not to be exceeded by 95% of the results when they are sorted with respect to magnitude or the value not to be exceeded by the maximum daily average for any point.

**Table 12.** Limit Values Stipulated in the RCAPOI\*

Parameter	Period	Limit Value [ $\mu\text{g}/\text{m}^3$ ] [Deposition $\text{mg}/\text{m}^2\text{day}$ ]
		2013
NO <sub>2</sub>	STL	300
	LTL	60
Particulate Matter (PM 10)	STL	100
	LTL	60
PM Deposition	STL	390
	LTL	210

\*These limit values are valid until 01/01/2014 and thereafter new limit values will be released.

European Union directives and World Health Organization also have limit values for air pollution prevention (EU Council Directive 2008/50/EC relating to health based standards and objectives for a number of pollutants in ambient air). WHO defines limit values in “Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide” document. IFC Guidelines refers to WHO limit values to evaluate emissions. These limit values are shown in Table 13.

**Table 13.** Limit Values Stipulated in the International Legislation

Parameter	Averaging Period	EU Limit Value ( $\mu\text{g}/\text{m}^3$ ) <sup>1</sup>	WHO Limit Value ( $\mu\text{g}/\text{m}^3$ ) <sup>2</sup>
NO <sub>2</sub>	1 hour (for the protection of the human health)	200 (not to be exceeded more than 18 times a calendar year)	200
	Calendar year (for the protection of the human health)	40	40
PM <sub>10</sub>	24 hours (for the protection of the human health)	50 (not to be exceeded more than 35 times a calendar year)	50
	Calendar year (for the protection of the human health)	40	20
CO	Maximum 8-hour average (for the protection of the human health)	10,000	-

<sup>1</sup> Limit Values Stipulated in the “EU Council Directive “2008/50/EC”

<sup>2</sup> Limit Values Stipulated in the “WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide”

#### 4. METHODS USED IN MODELING STUDIES

Modeling studies were carried out for both construction phase dust emissions (PM<sub>10</sub> and PM deposition) and operation phase NO<sub>x</sub> emissions. While the impact area defined in the RCAPOI for the modeling study is an area with a radius of 50 times of the stack height (which makes 1.2 km x 1.2 km), an area of 10 km x 10 km covering the required impact area of 1.2 km x 1.2 km by the RCAPOI, was used in this modeling study.

##### 4.1. Definition of the Dispersion Model

Air quality modelling studies were conducted by Ennotes Çevre Mühendislik Danışmanlık San. ve Tic. Ltd. Şti.(Ennotes Environmental Engineering Consultancy Contracting Co.) with the use of “Lakes Environmental AERMOD View” dispersion model software (under License No: AER0005591).

AERMOD model is one of the most developed computer models estimating hourly, daily and yearly GLC's on the basis of the real time values. Model comprises the calculations of different dispersion models for different sources (point, volume, line) from isolated stacks to fugitive pollutants. Additionally, it considers conditions like aerodynamic waves and turbulence.

Emission dispersions are calculated by using hourly meteorological data which covers all hours of one year meaning all best and worst meteorological conditions are considered in the modeling study for the project area.

AERMOD model works in a network system defined by the user and calculations are made for corner points of each receiving environment segments forming the network. The network system used by AERMOD model can be defined as polar or Cartesian. Additionally, detailed calculations can be made at the discrete receptor points, which can be determined out of the network system. In the dispersion calculations, Planetary boundary layer theory is used. In the model, there is also an option for hilly areas. AERMOD model uses four different data given below:

- Wind direction, wind speed, temperature, mixing height, (depends on user's choice) hourly meteorological data set including wind profile exponential and potential vertical temperature difference.
- Coordinates and heights of each element in the network system defined as receiving environment.
- Data sets including source coordinates based on a starting point determined by the user, source height, diameter, emission rate, temperature and flow rate.

The results of the model are suitable for the preparation of dispersion maps including whole dispersion area. Therefore, the assessment of regional air quality under different scenarios (e.g. different treatment conditions, various pollution sources or varying seasonal conditions) is possible.

The modeling study that estimates gas pollutants and dust concentrations in ambient air by the help of mathematical calculations is comprised of following items:

- “Dispersion Area” for analyzed source is determined.
- A rectangular grid system for the determined dispersion area is prepared with a grid system of 250 m x 250 m or 500 m x 500 m and information on latitude, longitude and elevation is obtained. The corners of these grids are nodes.
- Information about the pollutant sources in the dispersion area is obtained.
- Hourly meteorological data of a representative year is obtained.

Hourly, daily and annual average GLC values of pollutants in the ambient air can be estimated by running the model after transferring the information stated in the above steps.

#### 4.2. Meteorological Data Set

Long term meteorological data needed for modeling studies is obtained from the regional meteorological stations. In this study, Florya Meteorological Station of the Turkish State Meteorological Service is considered as suitable and the meteorological data recorded in this station was used in the modeling study. Since upper air observation values of the region are not measured by this station, these records were obtained from Goztepe Meteorological Station. Meteorological data year was chosen by comparing long term wind direction frequency distribution to the wind direction frequency distribution of the last 10 years. Year 2004 was determined as the most appropriate year. Long term and year 2004 wind direction distribution diagrams are shown in Figure 2.

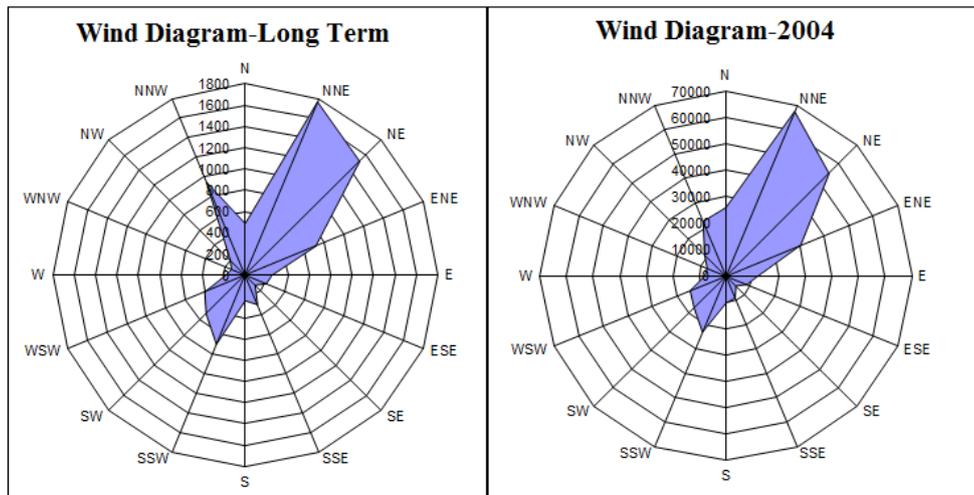


Figure 2. Wind Direction Frequency Distribution Diagrams for Florya Station

## 5. BACKGROUND AIR QUALITY ASSESSMENT

In order to determine background air quality, the air quality monitoring station of Ministry Of Environment and Urbanization and baseline measurement results of Ekotest Environmental Laboratory were used. These values are shown in Table 14 and Table 15 respectively.

**Table 14.** Average concentrations of air pollutants in Istanbul Province in 2012 (data given in  $\mu\text{g}/\text{m}^3$ ).

Months	SO <sub>2</sub>	PM <sub>10</sub>	CO	NO	NO <sub>2</sub>	NO <sub>x</sub>	O <sub>3</sub>
January	8	46	685	55	50	135	19
February	9	57	655	48	60	134	28
March	6	55	597	42	55	115	31
April	7	60	595	44	68	135	28
May	5	54	458	29	55	100	28
June	4	56	499	31	55	103	39
July	3	58	532	21	50	81	41
August	3	44	537	27	57	98	42
September	4	53	518	44	59	129	32
October	3	56	540	60	60	152	19
November	4	45	621	48	52	125	13
December	5	53	765	60	62	153	14

**Table 15.** PM<sub>10</sub>, PM Deposition and NO<sub>2</sub> Results of Ekotest

Parameter	Location	Coordinates	Results	
			STV	LTV
PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )	1.	41° 6'11.63"K / 28°46'48.98"D	56.50	33.96
	2.	41° 6'17.71"K / 28°46'14.33"D	33.60	19.89
PM Deposition ( $\text{mg}/\text{m}^2/\text{d}$ )	1.	41° 6'11.71"K / 28°46'48.80"D	65.19	90.50
	2.	41° 6'11.88"K / 28°46'48.98"D	169.10	271.26
	3.	41° 6'17.58"K / 28°46'13.76"D	332.52	454.03
	4.	41° 6'17.35"K / 28°46'13.40"D	224.34	403.58
NO <sub>2</sub> ( $\mu\text{g}/\text{m}^3$ )	1.	41° 6'11.63"K / 28°46'48.98"D	36.21	11.62
	2.	41° 6'17.71"K / 28°46'14.33"D	41.70	14.71

## 6. RESULTS OF MODELING STUDIES

### 6.1. Construction Phase - Ground Level PM<sub>10</sub> and PM Deposition Concentrations

Modeling studies are carried out for dust parameters for construction activities. Ground level concentrations (GLC) of PM<sub>10</sub> and PM Deposition, determined from the modeling studies are listed in Table 16 for uncontrolled working conditions and Table 17 for controlled working conditions. PM<sub>10</sub> Air Pollution Contribution Values (APCV) and Total Pollution Values which are calculated according to background monitoring results are shown in Table 18.

As mentioned on previous sections, earthwork activities will be carried in parallel with main construction activities during 8 months. After earthworks finish, main construction activities will continue. For this reason, modeling studies were carried out for emissions which include earthwork and main construction activities (Phase 1) and single main construction activities (Phase 2).

**Table 16.** Construction Phase Maximum GLC Values Determined from the Modeling Studies for Uncontrolled Conditions

Parameter	Averaging Period	Maximum GLC Values and Coordinates ( $\mu\text{g}/\text{m}^3$ for PM <sub>10</sub> ) ( $\text{mg}/\text{m}^2.\text{day}$ for PM Deposition)		National Limit Values* ( $\mu\text{g}/\text{m}^3$ )				EU Limit Values* ( $\mu\text{g}/\text{m}^3$ )	WHO Limit Values* ( $\mu\text{g}/\text{m}^3$ )
		Phase 1: (Earthworks and Main Construction)	Phase 2: Main construction	2014	2015	2016	2017		
PM <sub>10</sub>	Hourly (max.)	280.74 (648666, 4551982)	82,50 (688949, 4550462)	-	-	-	-	-	-
	Daily (90.41%)	105.70 (648687, 4551994)	44,63 (688449, 4550712)	100	90	80	70	50	50
	Yearly	51.88 (648687, 4551994)	22,30 (648449, 4550712)	60	56	52	48	40	20
PM Deposition	Monthly	51.48 (648449, 4550712)	32,46 (648449, 4550712)	390				-	-
	Yearly	53.95 (648687, 4551994)	29,67 (648449, 4550712)	210				-	-

**Table 17.** Construction Phase Maximum GLC Values Determined from the Modeling Studies for Controlled Conditions

Parameter	Averaging Period	Maximum GLC Values and Coordinates ( $\mu\text{g}/\text{m}^3$ for PM <sub>10</sub> ) ( $\text{mg}/\text{m}^2.\text{day}$ for PM Deposition)		National Limit Values* ( $\mu\text{g}/\text{m}^3$ )				EU Limit Values* ( $\mu\text{g}/\text{m}^3$ )	WHO Limit Values* ( $\mu\text{g}/\text{m}^3$ )
		Phase 1: (Earthworks and Main Construction)	Phase 2: Main construction	2014	2015	2016	2017		
PM <sub>10</sub>	Hourly (max.)	140.80 (648666, 4551982)	41,41 (648449, 4550462)	-	-	-	-	-	-
	Daily (90.41%)	53.06 (648687, 4551994)	22,78 (688449, 4550712)	100	90	80	70	50	50
	Yearly	26.07 (648687, 4551994)	11,42 (648449, 4550712)	60	56	52	48	40	20
PM Deposition	Monthly	26.04 (648449, 4550712)	16,60 (648449, 4550712)	390				-	-
	Yearly	27.30 (648687, 4551994)	15,21 (648449, 4550712)	210				-	-

**Table 18.** PM<sub>10</sub> Air Pollution Contribution Values (APCV) and Total Pollution Values (TPV) of Construction Phase for Controlled Conditions\*

Location	Background Concentration (µg/m <sup>3</sup> )	APCV (µg/m <sup>3</sup> )		Total Pollution Value (TPV) (µg/m <sup>3</sup> )			
	LTV	LTV		LTV		Contribution(%)	
		Phase-1	Phase-2	Phase-1	Phase-2	Phase-1	Phase-2
Monitoring Average	53	26.07	11.42	79.07	64.42	32.97	17.73
Baseline Measurement Location 1	33.96	23.71	12.86	57.67	46.82	41.11	27.47
Baseline Measurement Location 2	19.89	24.53	13.28	44.42	33.17	55.22	40.04

\*APCV and TPV values represent the modeled concentrations at measurement locations

Dispersion of PM<sub>10</sub> and PM deposition GLC values for Phase 1 (earthworks and main construction) is shown from Figure 3 through Figure 18. PM<sub>10</sub> emission dispersion is to the south west direction as a result of the prevailing winds and the topography. In accordance with Table 16, daily and yearly GLC values of PM<sub>10</sub> to be originated during Phase 1 in uncontrolled working conditions are 105.70 µg/m<sup>3</sup> and 51.88 µg/m<sup>3</sup>, respectively and 44.63 µg/m<sup>3</sup> and 22.30 µg/m<sup>3</sup>, respectively during Phase 2. The daily GLC value of PM<sub>10</sub> during Phase 1 is higher than the limit values to comply with the RAMAQ and higher than the limit values of EU Directives and WHO Guidelines. Yearly GLC value of PM<sub>10</sub> during Phase 1 complies with RAMAQ values (for year 2014 and 2015 as Phase is expected to be completed by 2015 or early 2015) but exceeds the international legislation limit values.

Monthly and yearly PM Deposition values during Phase 1 are 51.48 mg/m<sup>2</sup>.day and 53.95 mg/m<sup>2</sup>.day respectively and 32.46 mg/m<sup>2</sup>.day and 29.67 mg/m<sup>2</sup>.day during Phase 2, respectively and these values are lower than the limit values to be complied with the RCAPOI.

In accordance with Table 17, daily and yearly GLC values of PM<sub>10</sub> to be originated during Phase 1 in controlled working conditions are 53.06 µg/m<sup>3</sup> and 26.07 µg/m<sup>3</sup>, respectively and 22.78 µg/m<sup>3</sup> and 11.42 µg/m<sup>3</sup>, respectively during Phase 2. These values (both daily and yearly) are lower than the limit values to comply with the national limit values stipulated in RAMAQ. Daily GLC value of PM<sub>10</sub> during Phase 1 exceeds EU Directive and WHO Guideline limit values.

Monthly and yearly PM Deposition values during Phase 1 are 26.04 mg/m<sup>2</sup>.day and 27.30 mg/m<sup>2</sup>.day respectively and 16.60 mg/m<sup>2</sup>.day and 15.21 mg/m<sup>2</sup>.day during Phase 2, respectively and these values are lower than the limit values to be complied with the RCAPOI.

GLC values of PM<sub>10</sub> originated from the construction phase in the PM<sub>10</sub> air quality monitoring points are presented in Table 18 for controlled conditions. In accordance with the Table 18, Total Pollution Value of PM<sub>10</sub> originated from Phase-1 activities is lower than the decreasing limit values. According to table, Phase-2 Total Pollution Value of PM<sub>10</sub> originated from Phase-1 activities is lower than the limit values of working period. Based on the monitoring average results, it can be concluded that the background PM<sub>10</sub> value is close to the national limit value. For this reason, even though APCVs are quite lower than these limits and their contributions are very low, total pollution values exceed limit values.

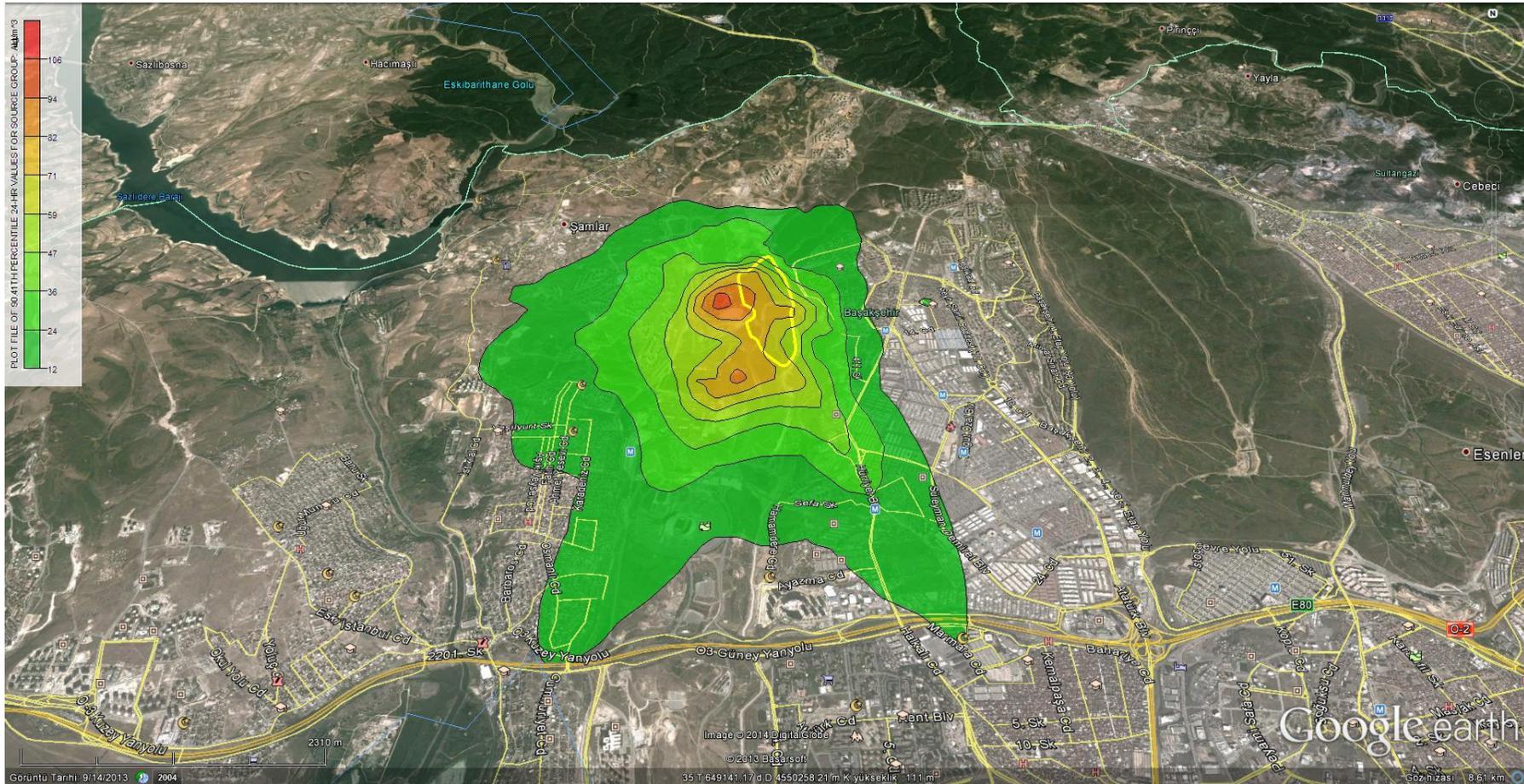
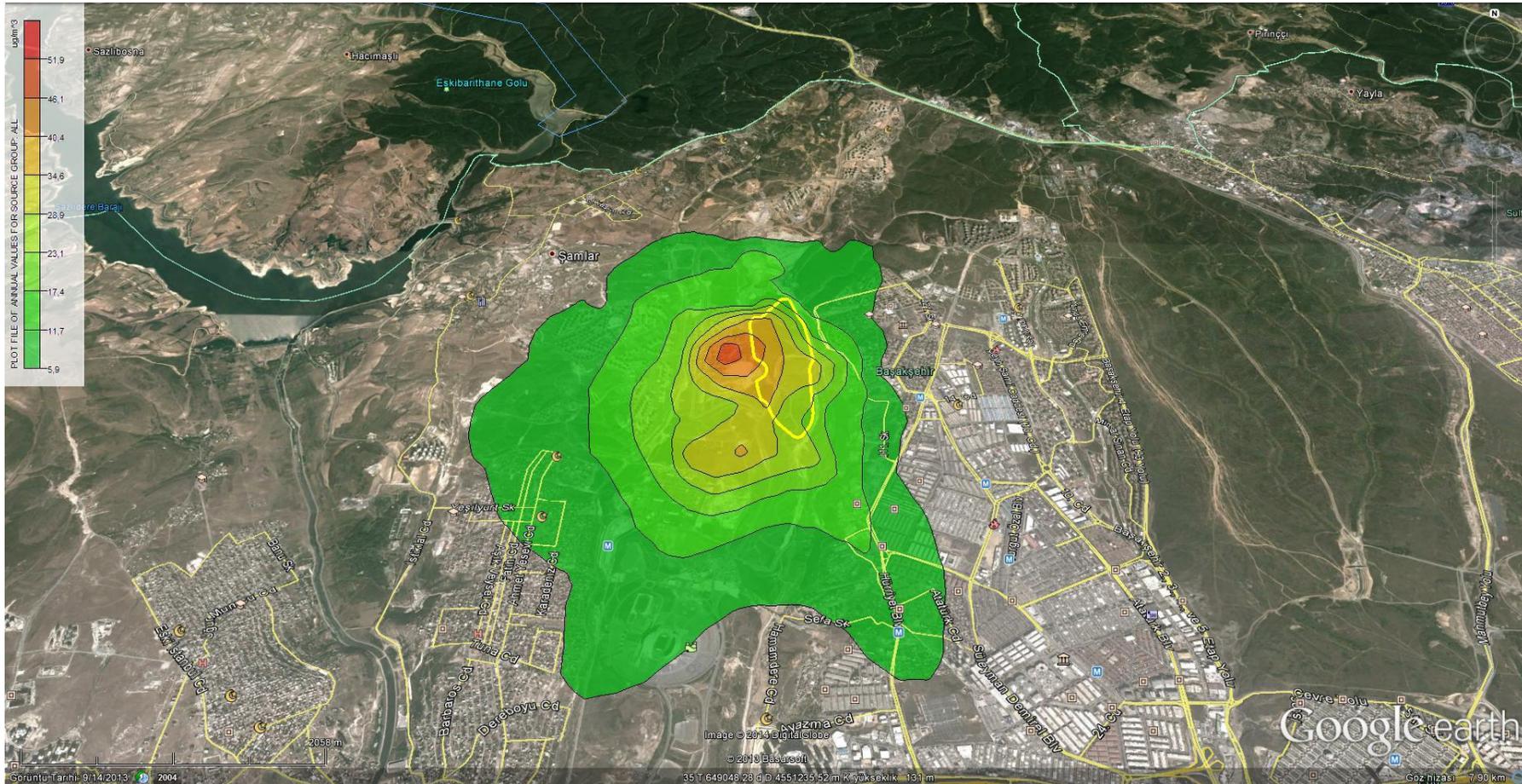
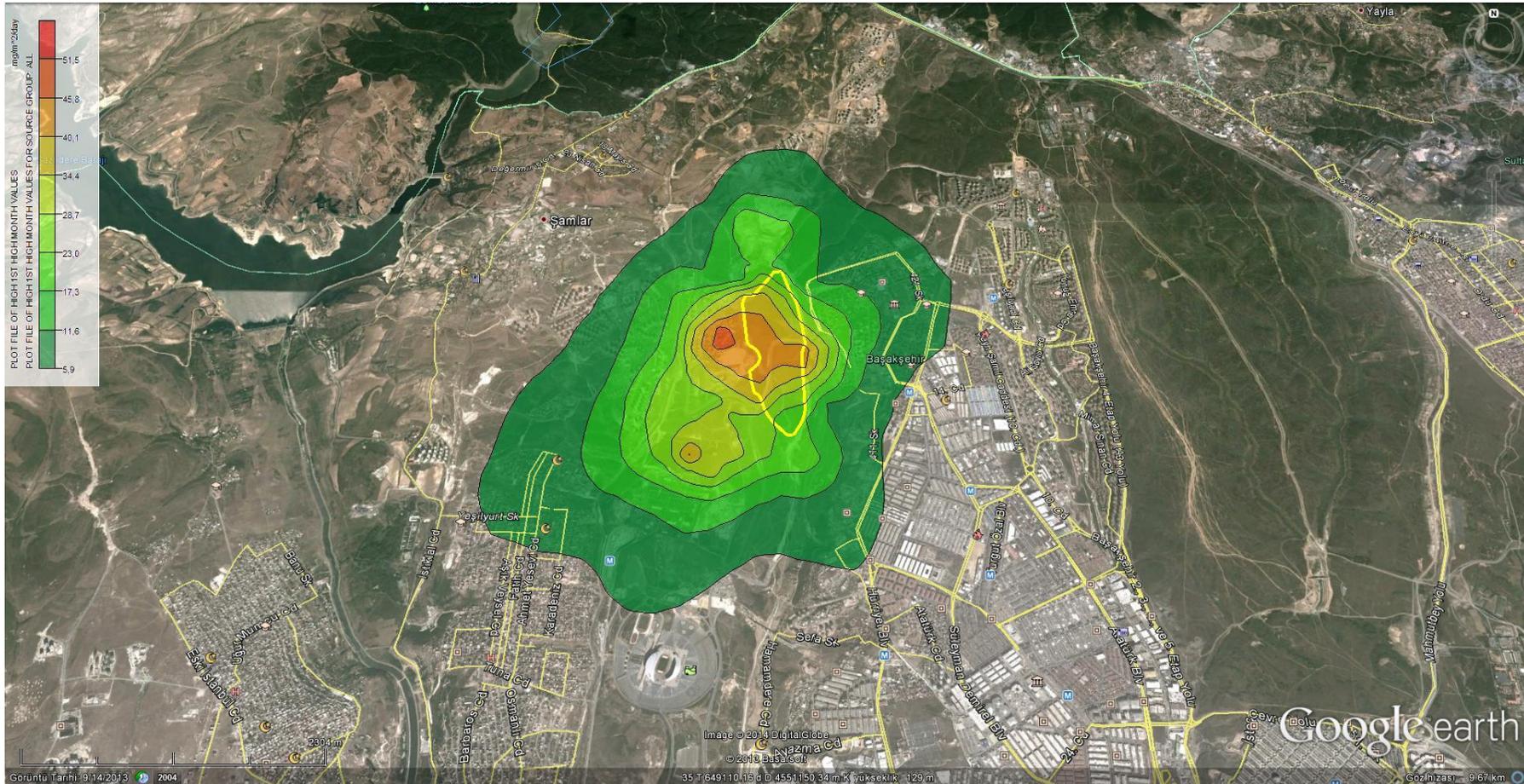


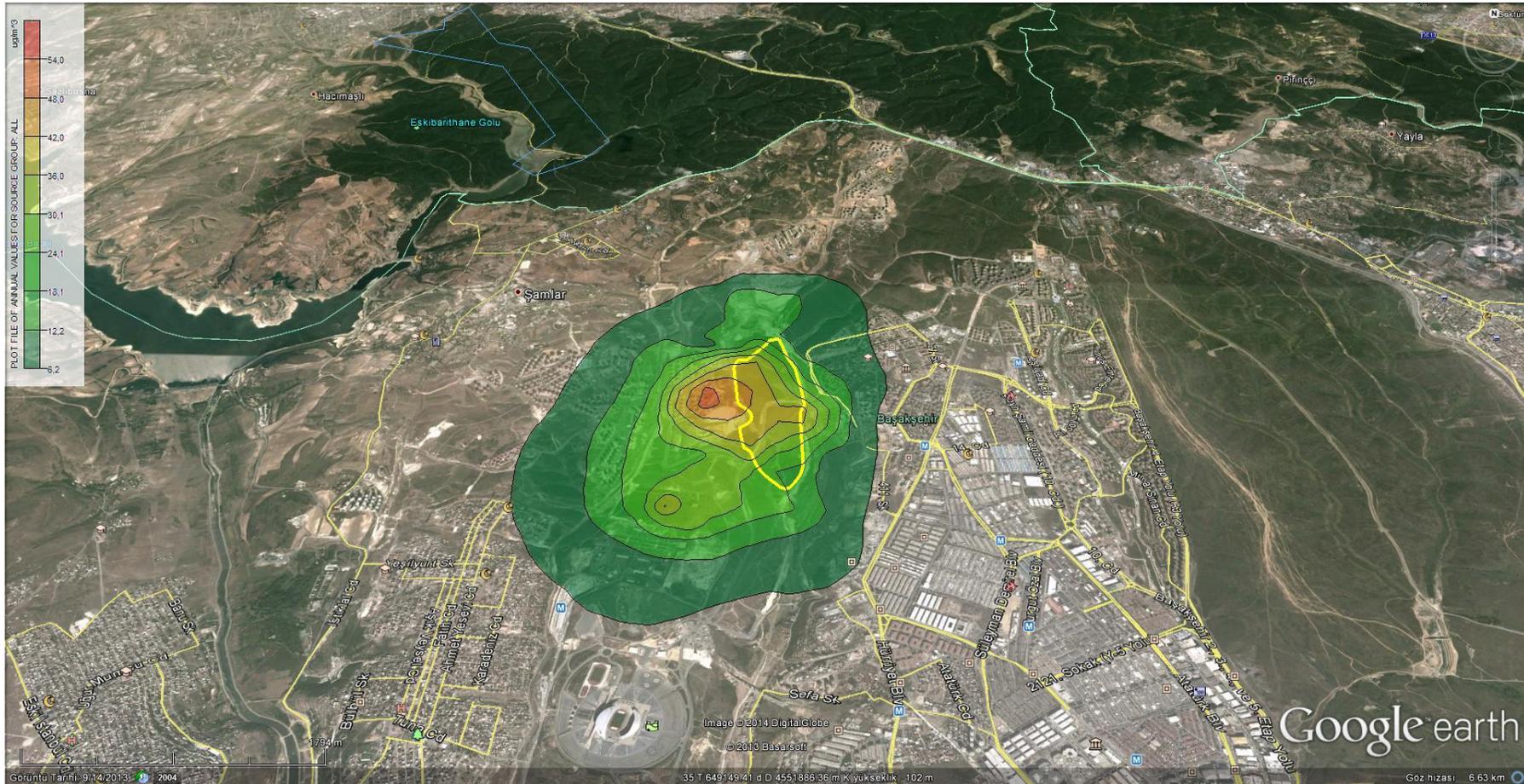
Figure 3. Daily Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for Uncontrolled Conditions



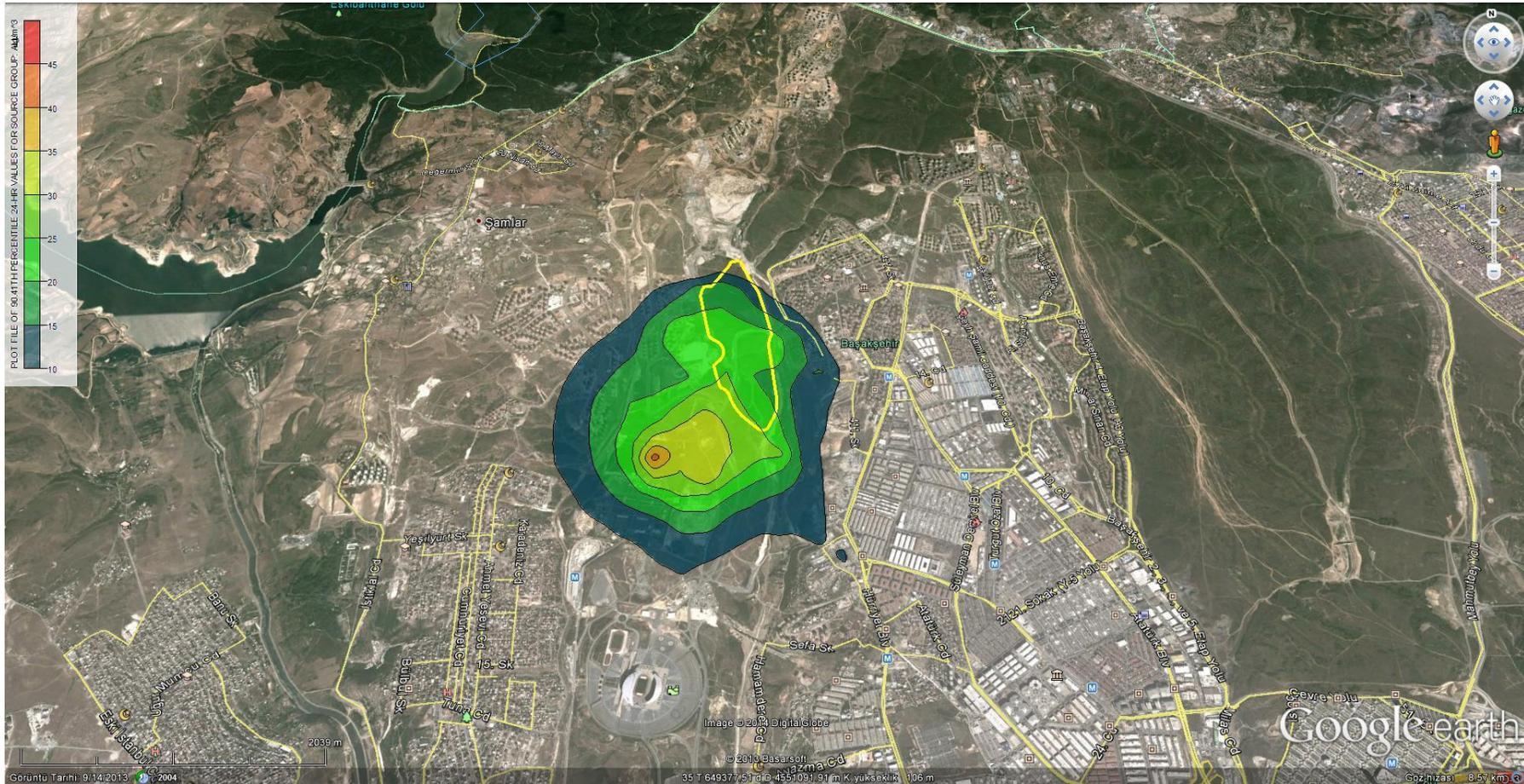
**Figure 4.** Yearly Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for Uncontrolled Conditions



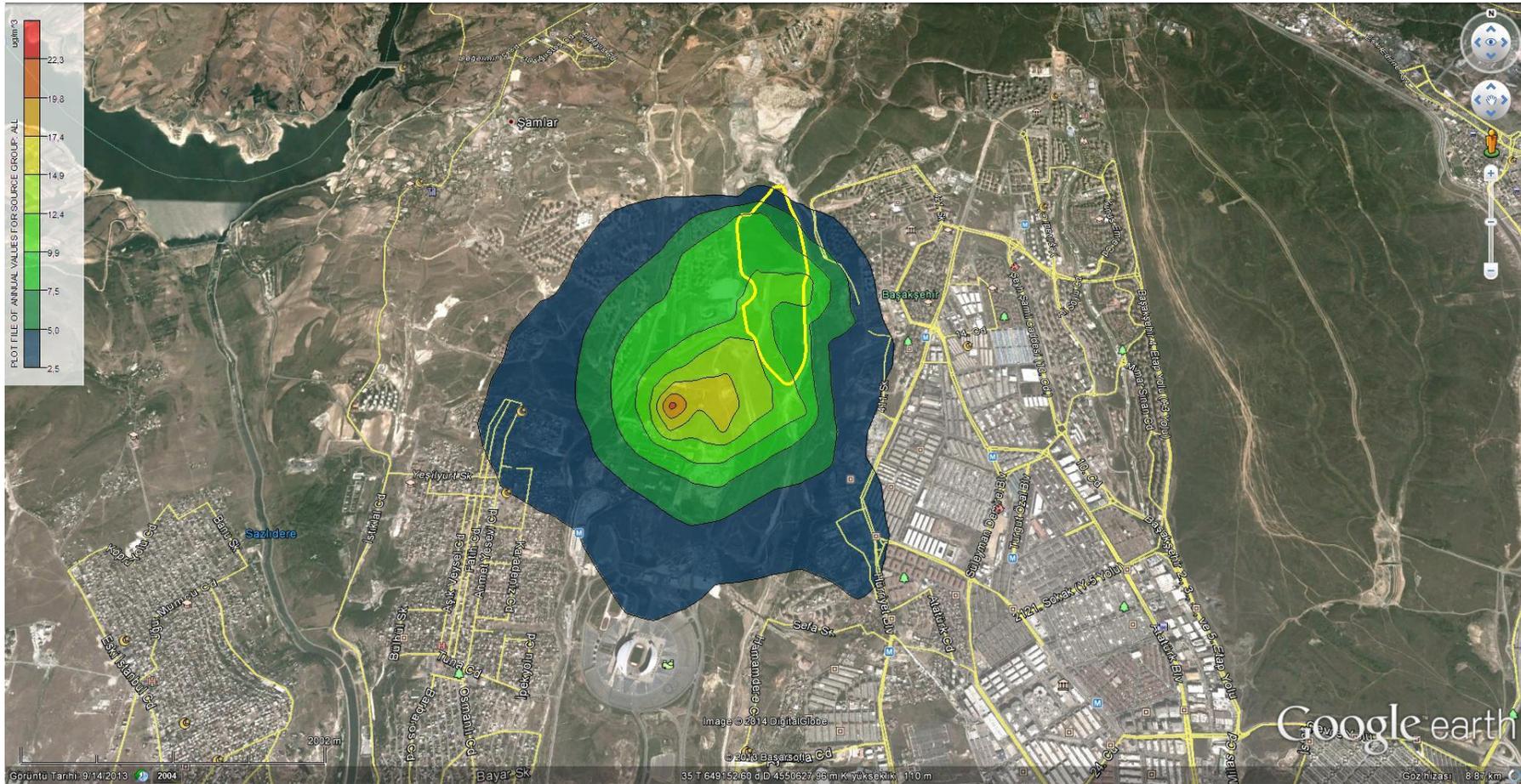
**Figure 5.** Monthly Average Maximum GLC Dispersion of PM Deposition That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for Uncontrolled Conditions



**Figure 6.** Yearly Average Maximum GLC Dispersion of PM Deposition That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for Uncontrolled Conditions



**Figure 7.** Daily Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 2 (Main Construction) Activities for Uncontrolled Conditions



**Figure 8.** Yearly Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 2 (Main Construction) Activities for Uncontrolled Conditions



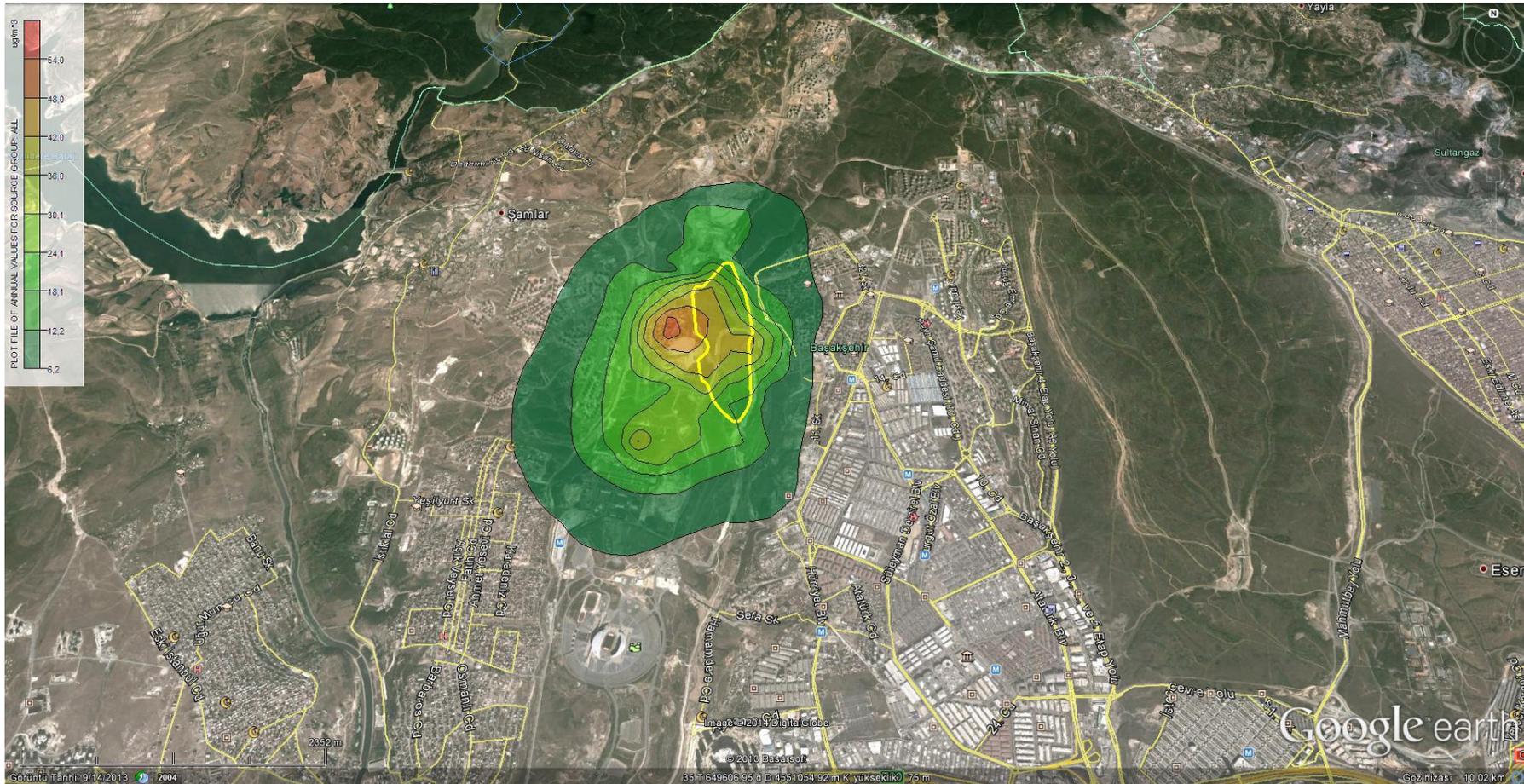
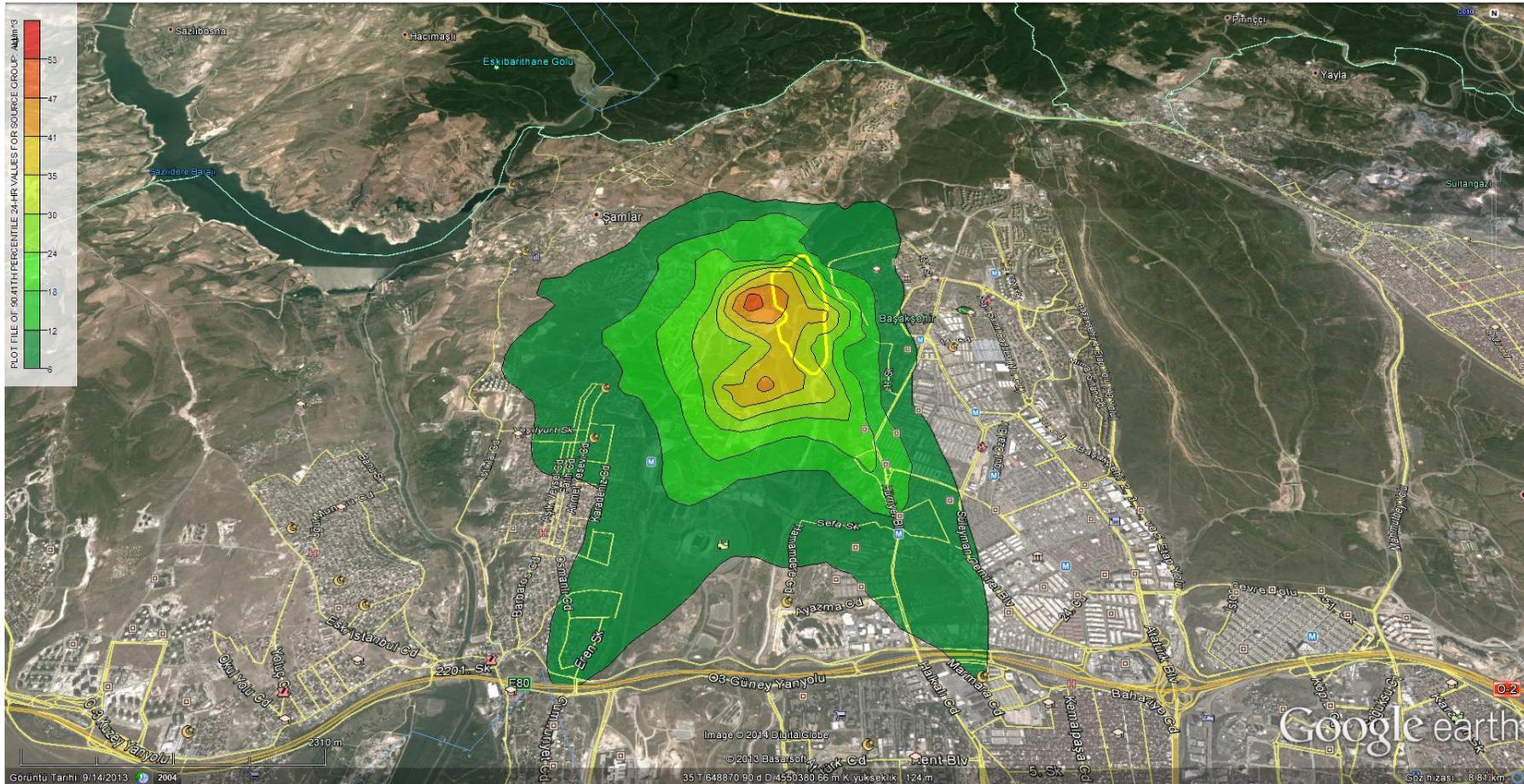
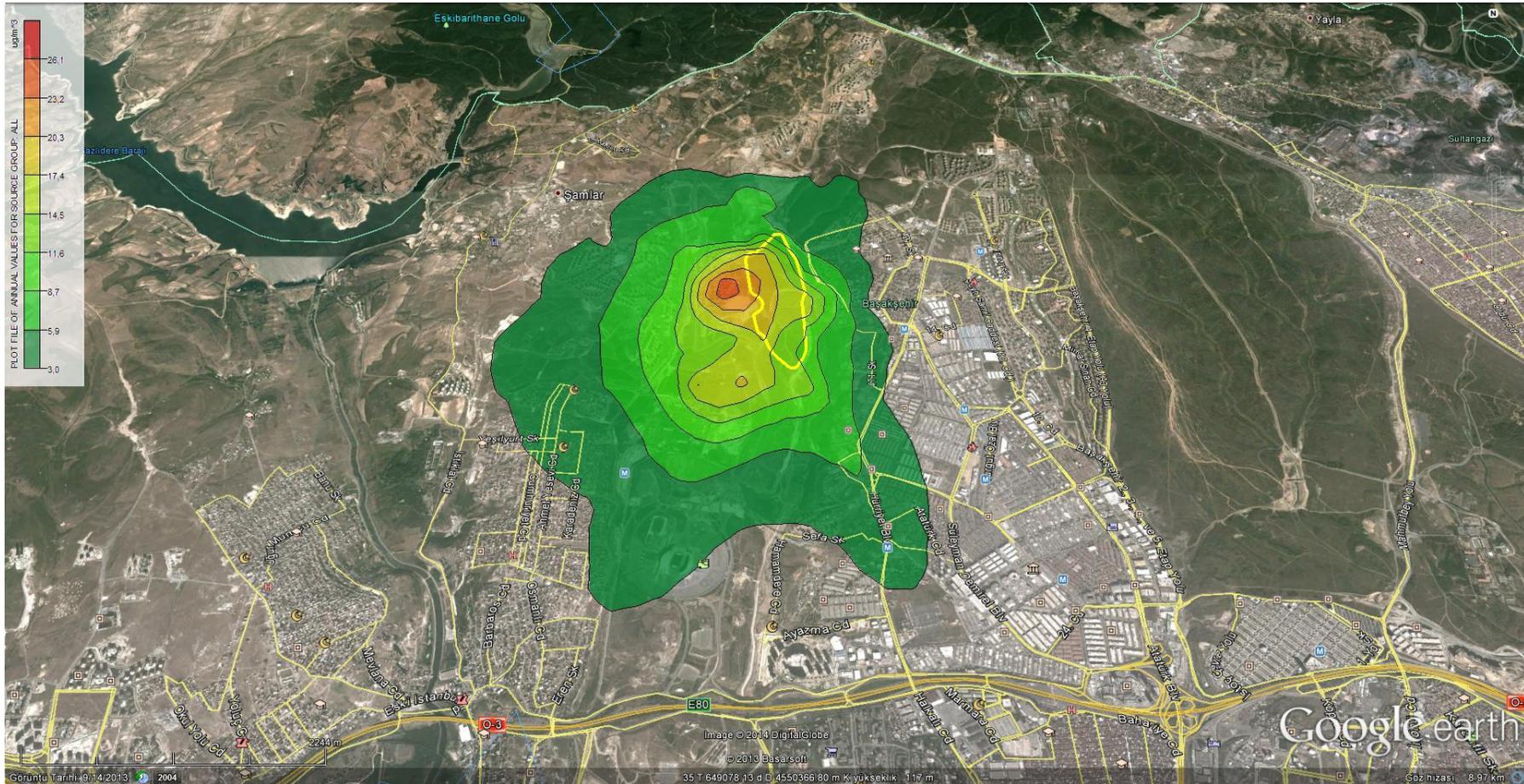


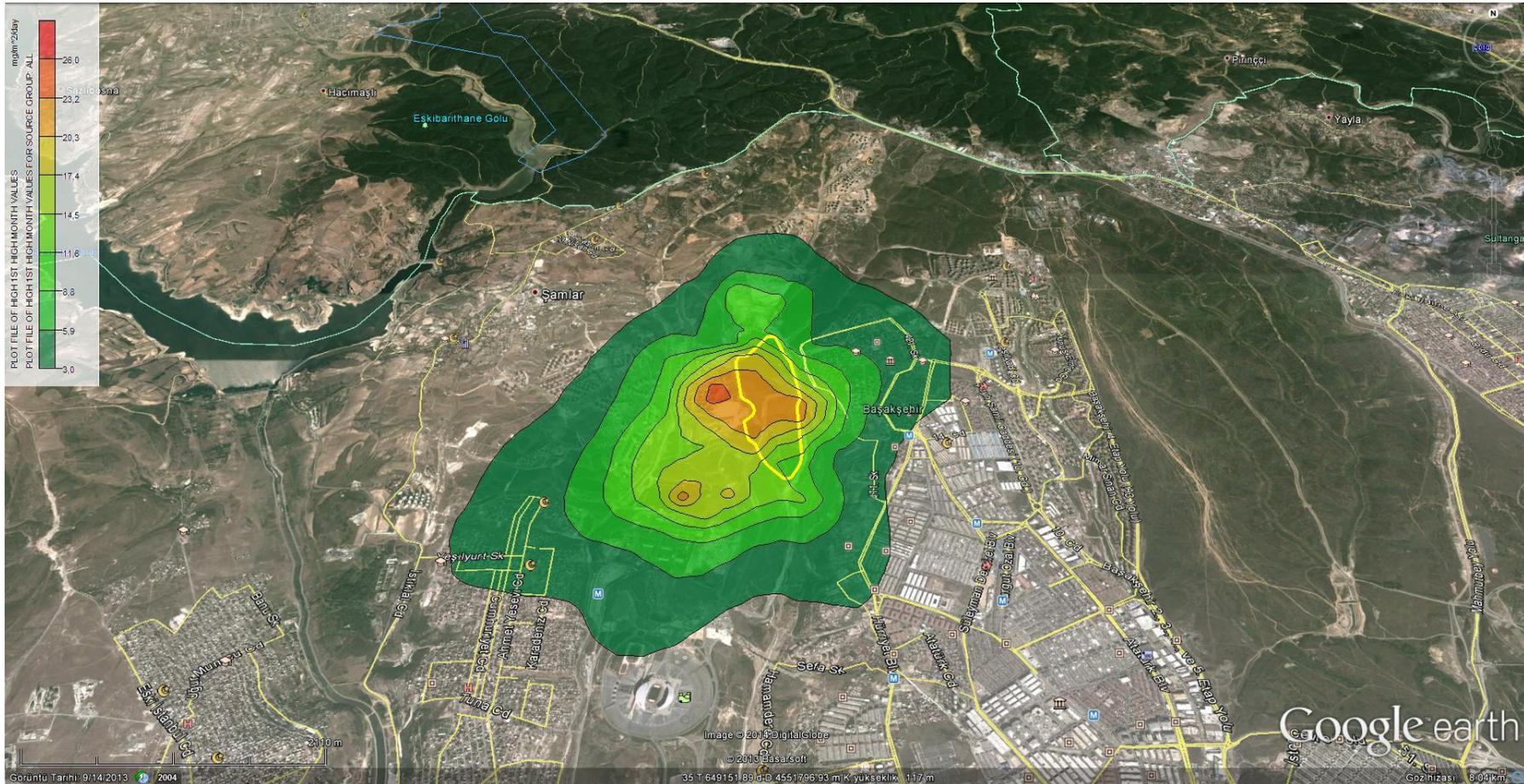
Figure 10. Yearly Average Maximum GLC Dispersion of PM Deposition That Will Arise from Phase 2 (Main Construction) Activities for Uncontrolled Conditions



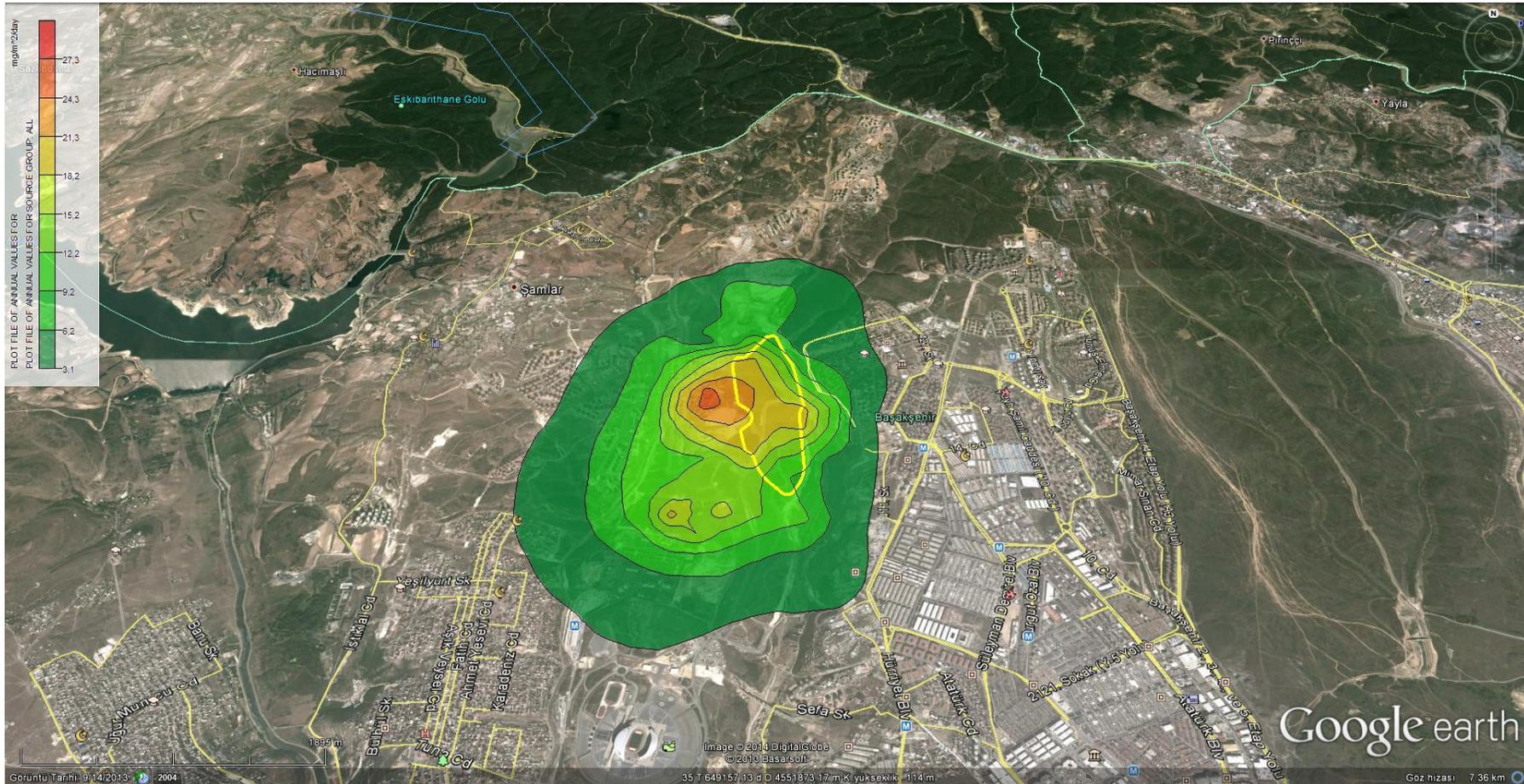
**Figure 11.** Daily Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for onrolled Conditions



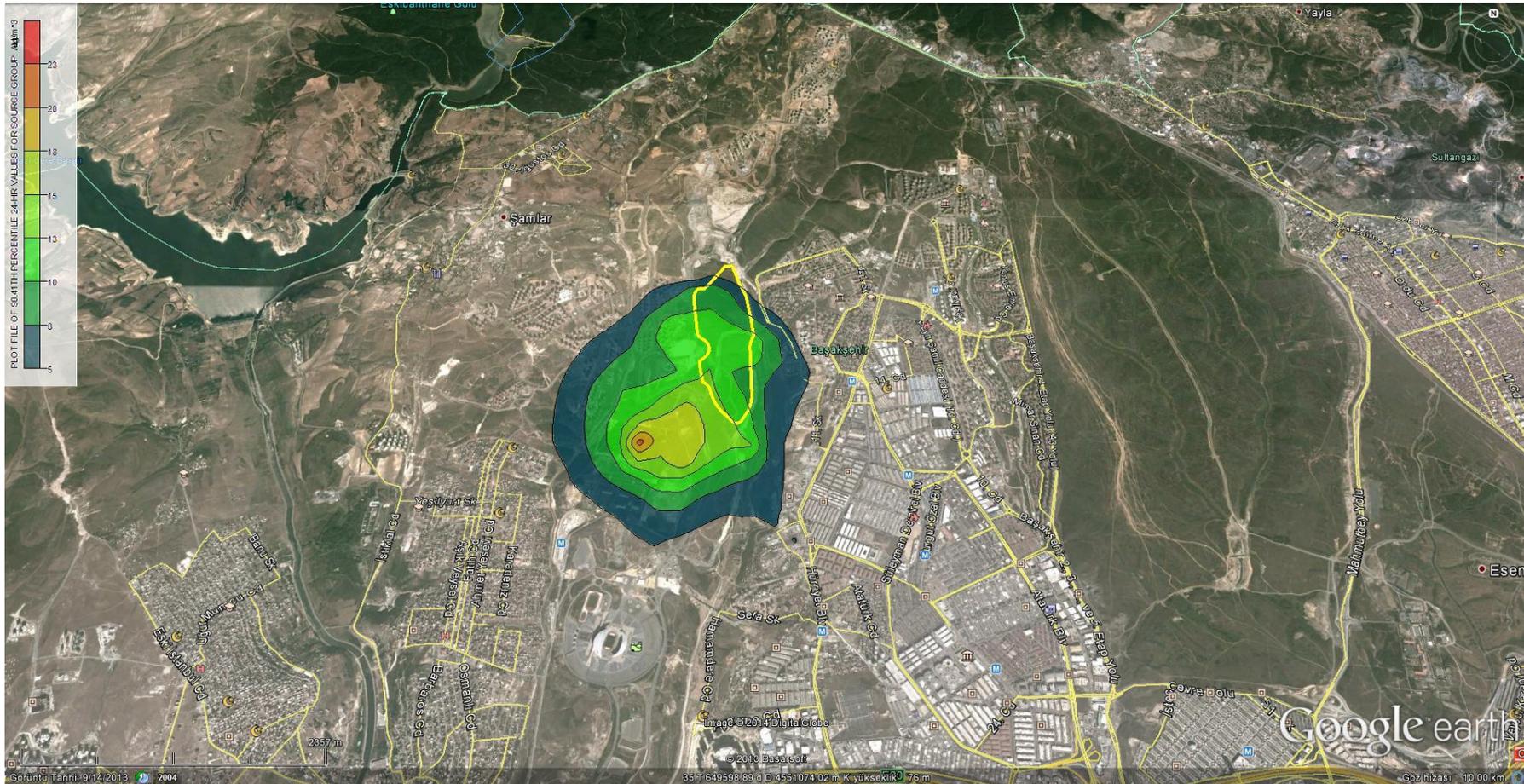
**Figure 12.** Yearly Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for Controlled Conditions



**Figure 13.** Monthly Average Maximum GLC Dispersion of PM Deposition That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for Controlled Conditions



**Figure 14.** Yearly Average Maximum GLC Dispersion of PM Deposition That Will Arise from Phase 1 (Earthworks and Main Construction) Activities for Controlled Conditions



**Figure 15.** Daily Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 2 (Main Construction) Activities for Controlled Conditions

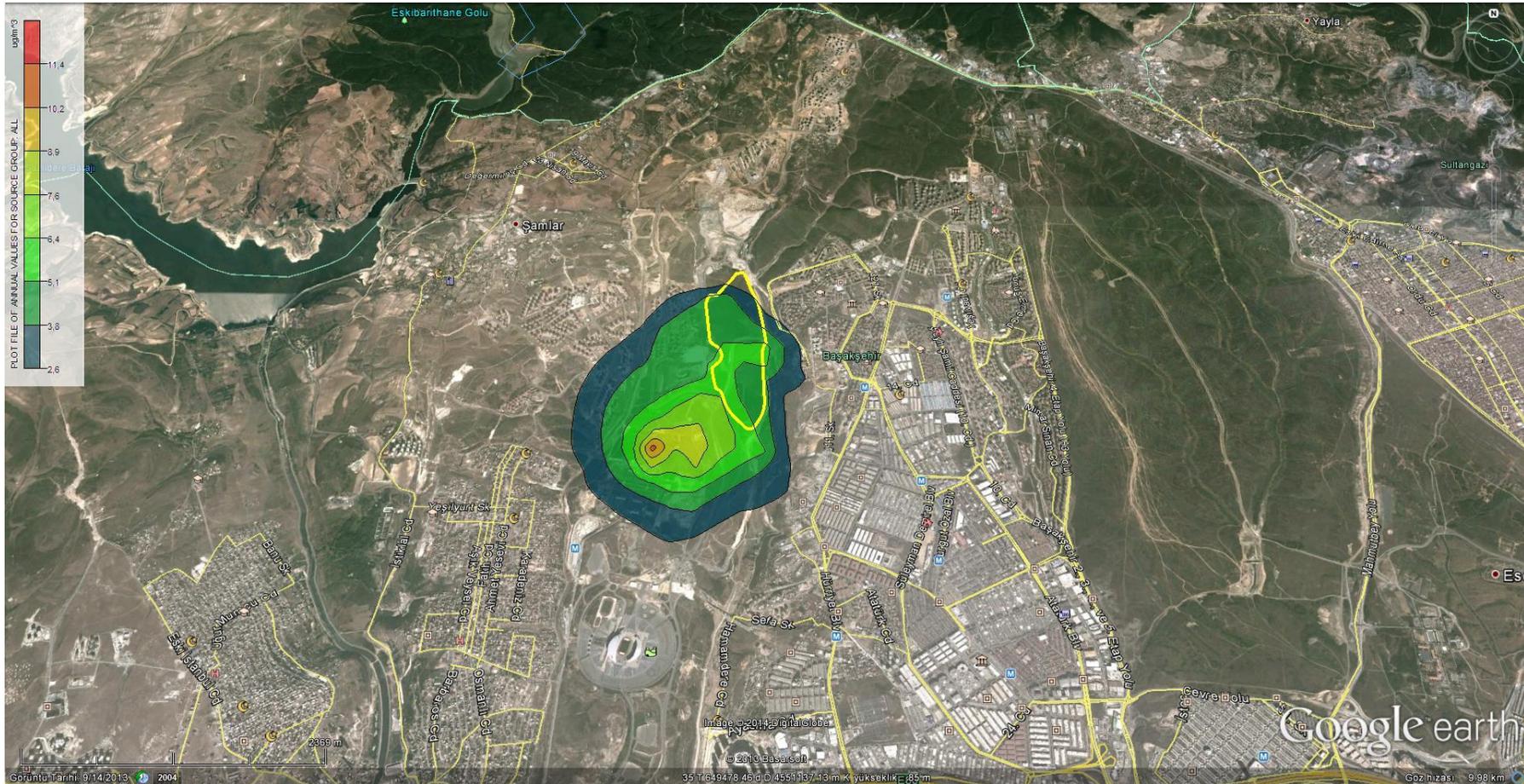
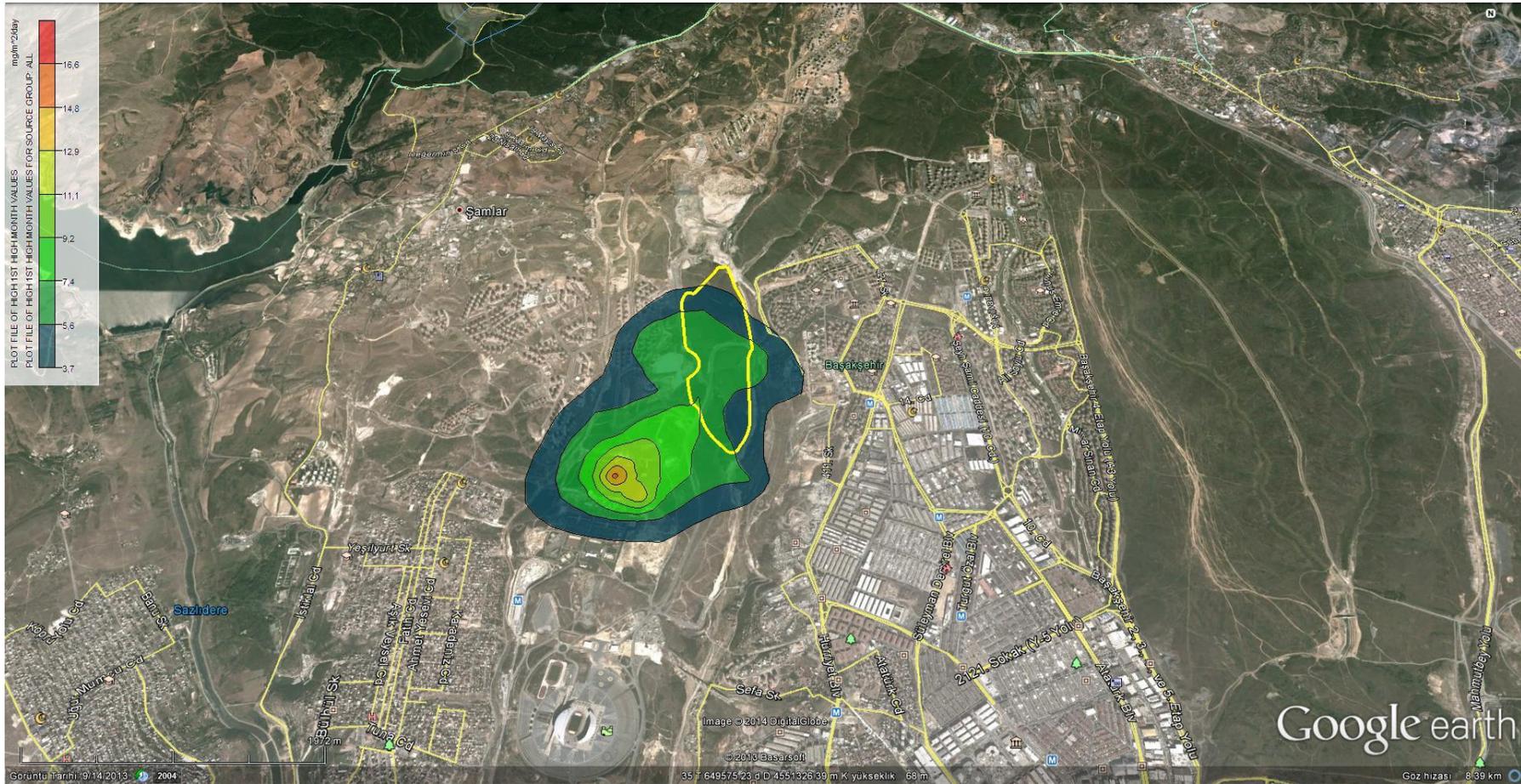


Figure 16. Yearly Average Maximum GLC Dispersion of PM<sub>10</sub> That Will Arise from Phase 2 (Main Construction) Activities for Controlled Conditions



**Figure 17.** Monthly Average Maximum GLC Dispersion of PM Deposition That Will Arise from Phase 2 (Main Construction) Activities for Controlled Conditions

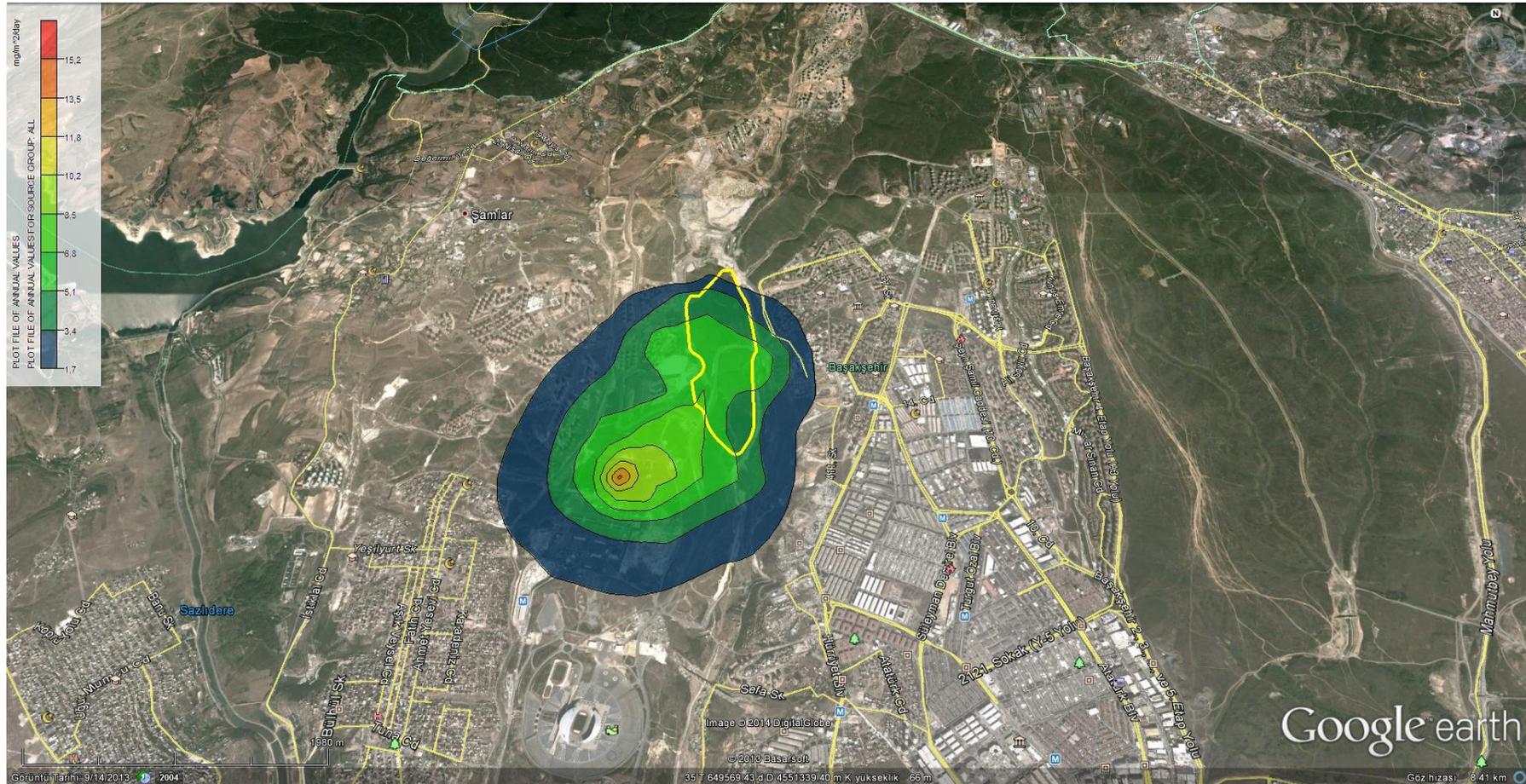


Figure 18. Yearly Average Maximum GLC Dispersion of PM Deposition That Will Arise from Phase 2 (Main Construction) Activities for Controlled Conditions

## 6.2. Operation Phase- Ground Level NO<sub>2</sub> Concentrations

Modeling studies are carried out for NO<sub>2</sub> parameter for operation activities. GLC's of NO<sub>2</sub>, determined from the modeling studies are listed in Table 19. GLC values estimated in the measurement points and the associated limit values are presented in Table 20. Pollutant dispersion is in north direction due to the effects of the prevailing winds and the topography.

**Table 19.** Operation Phase GLC Values Determined from the Modeling Studies

Parameter	Averaging Period	Values (µg/m <sup>3</sup> )	National Limit Values (µg/m <sup>3</sup> )		EU Limit Values (µg/m <sup>3</sup> )	WHO Limit Values (µg/m <sup>3</sup> )
			Year			
			2017	2024		
NO <sub>2</sub>	Hourly (99.71%)	18.07 (648852, 4551781)	270	200	200	200
	Annual	1.53 (649102, 4551531)	54	40	40	40

**Table 20.** NO<sub>2</sub> Air Pollution Contribution Values (APCV) of Operation Phase

Location	Background Concentration (µg/m <sup>3</sup> )	APCV (µg/m <sup>3</sup> )	Total Pollution Value (TPV) (µg/m <sup>3</sup> )	
	LTV	LTV	LTV	Contribution(%)
Monitoring Station	57	18.07	75.07	24
Baseline Measurement Location 1	11.62	0.26	11.88	2.19
Baseline Measurement Location 2	14.71	0.18	14.89	1.21

In accordance with Table 19, hourly and annual GLC values of NO<sub>2</sub> to be originated from the plant are 18.07 µg/m<sup>3</sup> and 1.53 µg/m<sup>3</sup>, respectively. These values are significantly lower than the associated limits to be complied by the year 2024 which are set forth by the RAMAQ and international limit values.

In accordance with the Table 20, contribution of the planned trigeneration plant to ambient air quality is maximum 24 %.

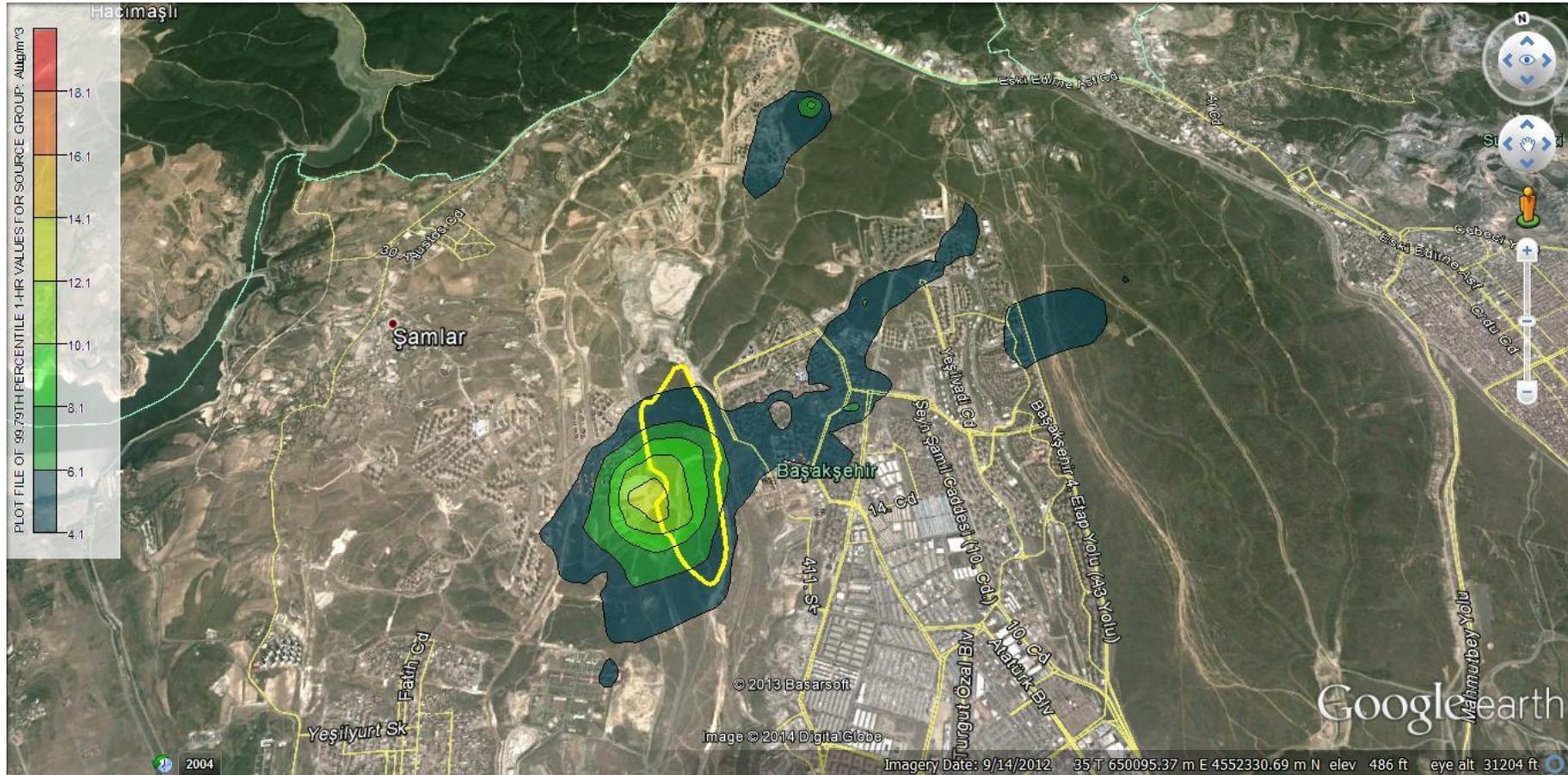


Figure 19. Hourly Average Maximum GLC Dispersion of NO<sub>2</sub>

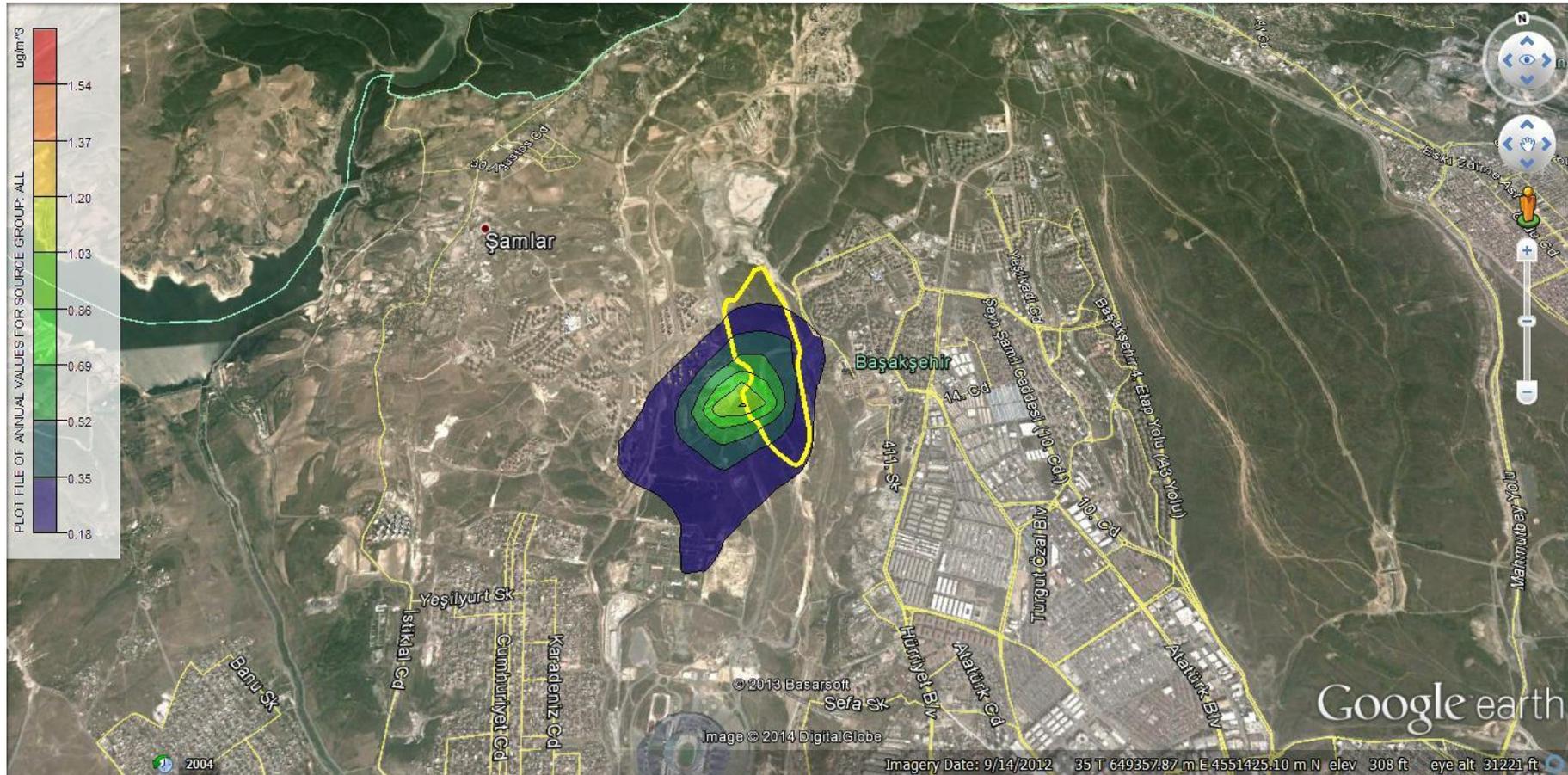


Figure 20. Annual Average Maximum GLC Dispersion of NO<sub>2</sub>

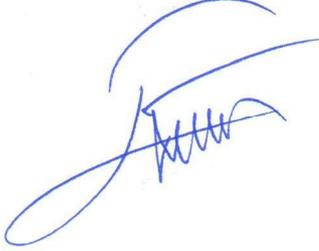
## 7. APPROVAL

The air quality modeling study was carried out with the aim of determining the air pollutants and their effects on ambient air quality which emit from Ikitelli Integrated Health Campus Project which is planned to establish in Istanbul Turkey. Results were assessed according to the Regulation on the Assessment and Management of Air Quality (RAMAQ), Regulation on the Control of Air Pollution Originating from Industry (RCAPOI), EU Council Directive 2008/50/EC and WHO limit values and this report was prepared.

**Modeled By**

Ersin ALA

Environmental Engineer



**Prepared By**

İsmail ULUSOY

Environmental Engineer



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## **ANNEX I**

### **Noise Supporting Information**

Annex I-1: Baseline Noise Measurement Report

Annex I-2: Detailed Grid Maps for Construction (Phase 1 and Phase 2)

## **ANNEX I-1**

### **Baseline Noise Measurement Report**



Test  
TS EN ISO/IEC 17025  
AB-0360-T



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476- D - 94

01-14

**Deney Raporu**  
Test Report

**Müşterinin adı/adresi**  
Customer Name/Address

ELC Group Consulting and Engineering Inc.  
(İSTANBUL İKİTELLİ INTEGRATED HEALTH CAMPUS  
PROJECT)

**İstek numarası**  
Order No.

-

**Numunenin adı ve tarifi**  
Name and identity of the test item

ÇEVRESEL GÜRÜLTÜ ÖLÇÜMLERİ  
Environmental Noise Measurements

**Numunenin kabul tarihi**  
The date of receipt of the test item

-

**Açıklamalar**  
Remarks

This report is prepared in 3 (three) copies.  
Bu Rapor 3(üç) nüsha olarak hazırlanmıştır

**Deneyin yapıldığı tarih**  
Date of Test

01.11.2013

**Raporun Sayfa Sayısı**  
Number of pages of the Report

17 (On yedi) Sayfa ve Ekler

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

*The test and/or measurement results, the uncertainties ( if applicable ) with confidence probability and test methods are given on the following pages which are part of this report.*

**Mühür**  
Seal

**Tarih**  
Date

**Deneyi Yapan**  
**Deney Sorumlusu**  
Person in charge of test

**Kontrol Eden**  
**Kalite Sistem Yöneticisi**  
Quality Control Manager

**Onaylayan**  
**Teknik Müdür**  
Technical Manager



21/01/2014

Ekim Şükrü BAKIRCI

F. Sinem BAKIRCI

Ekim Şükrü BAKIRCI

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir.*

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## A.INTRODUCTION

In this study, baseline noise levels in the İstanbul İkitelli Integrated Health Campus Project site and surroundings were measured. The primary noise source is the road traffic around the Project site. The project site is surrounded by residential, cultural and educational areas.

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## B.METHODOLOGY

Noise measurements were carried out with respect to ISO 1996-1, 1996-2, Svantek 949, Svantek 957 and Svantek 958 Class 1 Sound Level Meters were used for measurements. Measurements were conducted on 1<sup>st</sup> of November, 2013. Measurement locations are shown in Figure 1. Unattended noise measurements have been carried out for 24 hours were conducted. During the noise level measurement, height of the bi-directional microphone was kept at 1.5 meter off the ground. By using this methodology, baseline noise emission values is measured for three different time periods as depicted in Turkish Regulation on the Assessment and Management of Environmental Noise. Measurement results and logger graphics are presented in the Results Section.



**Figure 1. Measurement Locations**

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## C.MEASUREMENT EQUIPMENT

### Noise Monitoring Equipment

SVAN 949 which is used for monitoring is a Class 1 Sound Level Meter with options for 1/1 & 1/3 octave analysis.

- Type 1 sound or vibration (option) measurements in 20 kHz band
- Three parallel independent profiles of the meter mode with time history (simultaneous to frequency analysis)
- 8 MB or 48 MB (option) internal memory for logging more than one week (six weeks) of three 1 sec results (one result per profile)
- Measurement range 22 dBA RMS ÷ 140 dBA Peak in SLM mode
- Human Vibration measurements Type 1 accuracy (ISO 8041) including VDV and MTVV (option)
- 1/1 and 1/3 octave real time analysis with time history, Min & Max spectra's and statistical calculation (option)
- FFT real time analysis in 20 kHz band with spectra's logging, selectable number of lines up to 1920, several window types (option)
- RT 60 Reverberation Time (option)
- Tonality measurements (option)
- Loudness (option)
- Acoustic dose meter (option)
- RPM rotation speed measurements with laser tachometer (option)
- Enveloping (option)
- Advanced trigger function
- Markers
- Outdoor microphone kit SA 201A (option)
- Easy in use
- USB 1.1 interface (real time PC "front end" application supported)
- Integration time programmable up to 24 hours
- Standard four AA batteries (operational time more than 12 hours with alkaline batteries or more than 24 hours with optional SA 17A external battery pack)
- Hand held, light weight and robust case (only ca 600 grams including batteries)

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporla ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

The SVAN 958 is a four-channel instrument offering 20kHz-band sound & vibration analysis.

- Four channels, 20 kHz real time, simultaneous sound and vibration measurements
- FFT real time analysis up to 1600 lines in 20 kHz band
- 1/1 and 1/3 octave real time analysis
- Human Vibration measurements meeting ISO 8041:2005 including VDV and MTVV.
- Noise measurements Class 1, IEC 61672:2002
- Acoustic dose meter function
- Sound Intensity measurements
- Reverberation Time measurements RT 60
- FFT cross spectra's
- Advanced Data Logger with 32 MB non-volatile internal memory
- USB Memory Stick provides almost unlimited logging capability
- Time domain signal recording
- Advanced trigger and alarm functions
- USB 1.1 Client and USB Host, optional RS 232 and IrDA interfaces
- Integration time programmable up to 24 h
- Powered by 4 x AA standard or rechargeable batteries
- Easy in use, hand held, light weight and robust case

The Svan 957 is a Class 1 Sound Level Meter

- Noise measurements (SPL, LEQ, SEL, Lden, Ltm3, Ltm5 and statistics) with Type 1
- IEC 61672:2002 accuracy in the frequency range 10 Hz ÷ 20 kHz with ACO 7052H microphone
- Parallel IMPULSE, FAST and SLOW detectors for the measurements with A, C or Z filters
- Two measurement ranges 25 dB RMS(A) ÷ 123 dB PEAK (LOW) and 36 dB RMS(A) ÷ 140 dB PEAK (HIGH)
- 1/1 OCTAVE and 1/3 OCTAVE real time analysis (optional) - 15 filters with centre frequencies
- 1 Hz ÷ 16 kHz, Type 1 – IEC 1260 and 45 filters with centre frequencies 0.8 Hz ÷ 20 kHz, Type 1 –
- IEC 1260
- RT 60 analysis in 1/3 octave bands (option)

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

## D. RESULTS

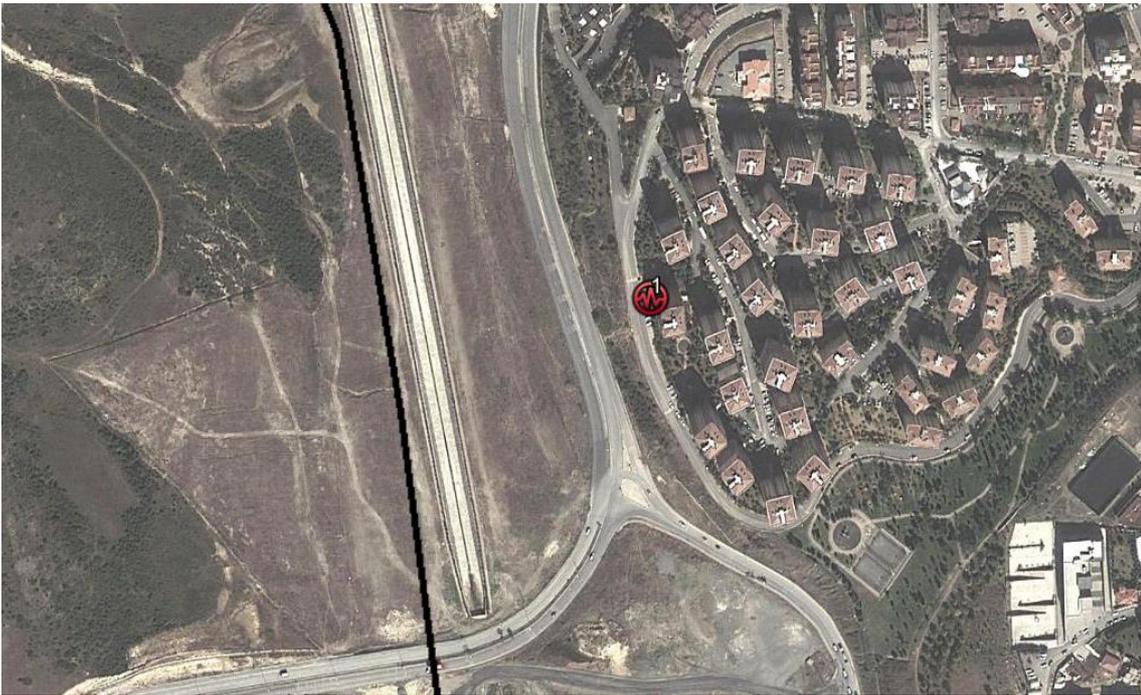
### 1.) Noise Measurement #1 (24:00:00, all units are dB)

- Information about conditions while measurement was taken;

Table 1. Information (Measurement 1)

Equipment			
Serial No	20702	Calibration Factor	6.2 dB
Type	Class 1	Model	SVAN 958
Measurement			
Measurement No	1	Date	01.11.2013
SLM No	FC 2	Distance to Project Area (m)	190
Data No	@R19	Height	30
Coordinates (E/N)	41,1055167633112 28,7822216749191	Humidity (%)	55
Start	14:56:00	Temperature (C <sup>0</sup> )	16
End	14:56:00	Wind Direction	NW
Total Time	23:59:59	Wind Speed (m/s)	4.5
Description	Residential area		
Background Sources	Traffic, Daily Human Activities		

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*



**Figure 2. Measurement Location 1**

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporla ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

➤ Results;

**Table 2. Results of Measurement 1**

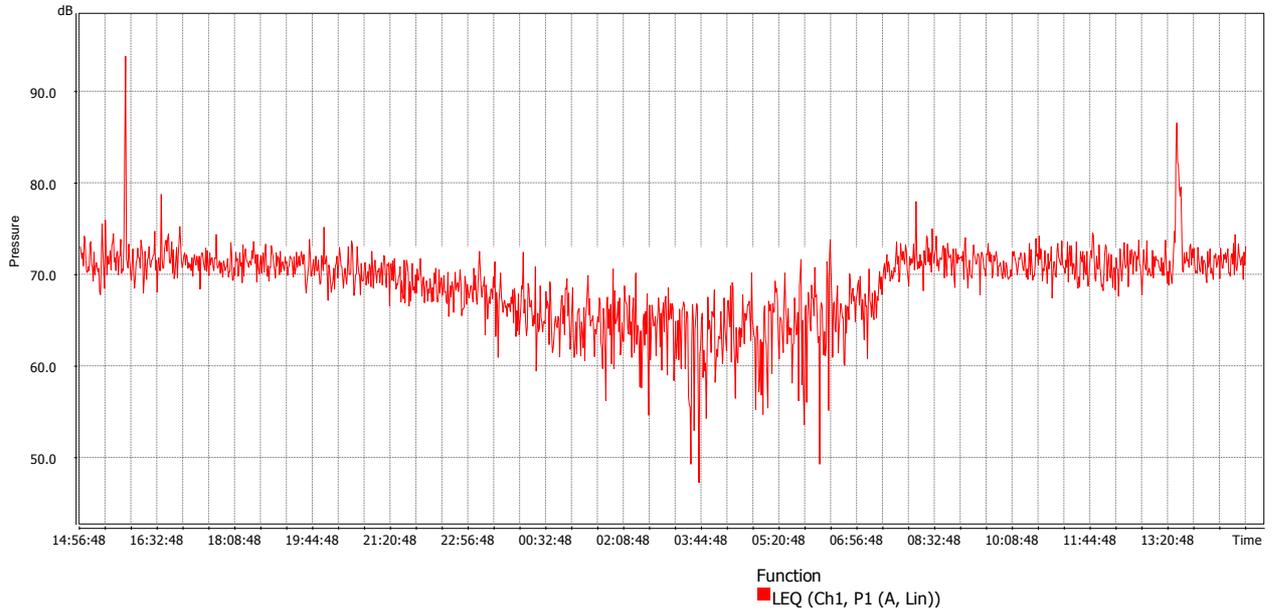
Day	Hour	Filter	Elapsed time	PEAK	MAX	MIN	SPL	LEQ	SEL	Lden	Ltm3	Ltm5
01.11.2013	14:56:48	A	24:00:00	125.8	112.9	42.9	74.3	71.1	120.5	74.7	75.9	77.6
01.11.2013	14:56:48	C	24:00:00	123.1	111.7	57.5	81.1	77.8	127.2	82.1	81.3	82.3
01.11.2013	14:56:48	Z	24:00:00	127.2	121.2	60.6	82.6	81.0	130.4	84.9	86.1	87.3

L10	L90
72.9 dBA	61.2 dBA

➤  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$  in A-weighted sound levels;

**Table 3. Sound Levels (Day, Evening, Night)**

$L_{day}$	$L_{evening}$	$L_{night}$
72.9	70.2	65.9



**Figure 3. Logger of Noise Measurement #1**

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Dene sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporla ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

## 2.) Noise Measurement #2(24:00:00, all units are dB)

- Information about conditions while measurement was taken;

Table 4. Information (Measurement 2)

Equipment			
Serial No	14563	Calibration Factor	3.2 dB
Type	Class 1	Model	SVAN 957
Measurement			
Measurement No	2	Date	01.11.2013
SLM No	FC 1	Distance to Project Area (m)	475
Data No	@R309	Height	25
Coordinates (E/N)	41,1005488474304 28,7846758961678	Humidity (%)	55
Start	14:29:00	Temperature (C <sup>0</sup> )	16
End	14:29:00	Wind Direction	NW
Total Time	24:00:00	Wind Speed (m/s)	4,5
Description	Residential area		
Background Sources	Traffic, Daily Human Activities		

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*



**Figure 4. Measurement Location 2**

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➤ Results;

Table 5. Results of Measurement 2

Day	Hour	Filter	Elapsed time	PEAK	MAX	MIN	SPL	LEQ	SEL	Lden	Ltm3	Ltm5
01.11.2013	14:29:44	A	24:00:00	112.8	96.7	39.1	55.8	58.4	107.8	61.8	63.3	64.6
01.11.2013	14:29:44	C	24:00:00	113.5	96.8	55.0	71.9	71.0	120.4	74.9	73.9	74.4
01.11.2013	14:29:44	Z	24:00:00	119.6	115.1	57.5	84.0	83.5	132.9	85.5	89.3	90.4

L10	L90
61,1 dBA	49,0 dBA

➤  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$  in A-weighted sound levels;

Table 6. Sound Levels (Day, Evening, Night)

$L_{day}$	$L_{evening}$	$L_{night}$
60.5	55.4	53.5

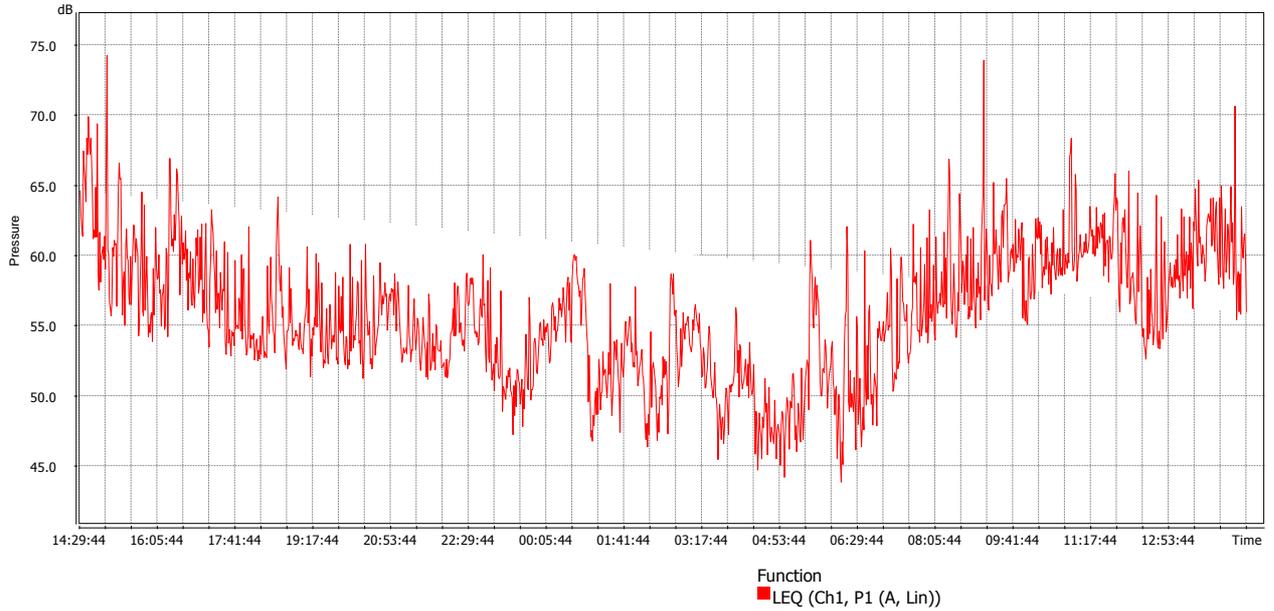


Figure 5. Logger of Noise Measurement #2

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporunda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

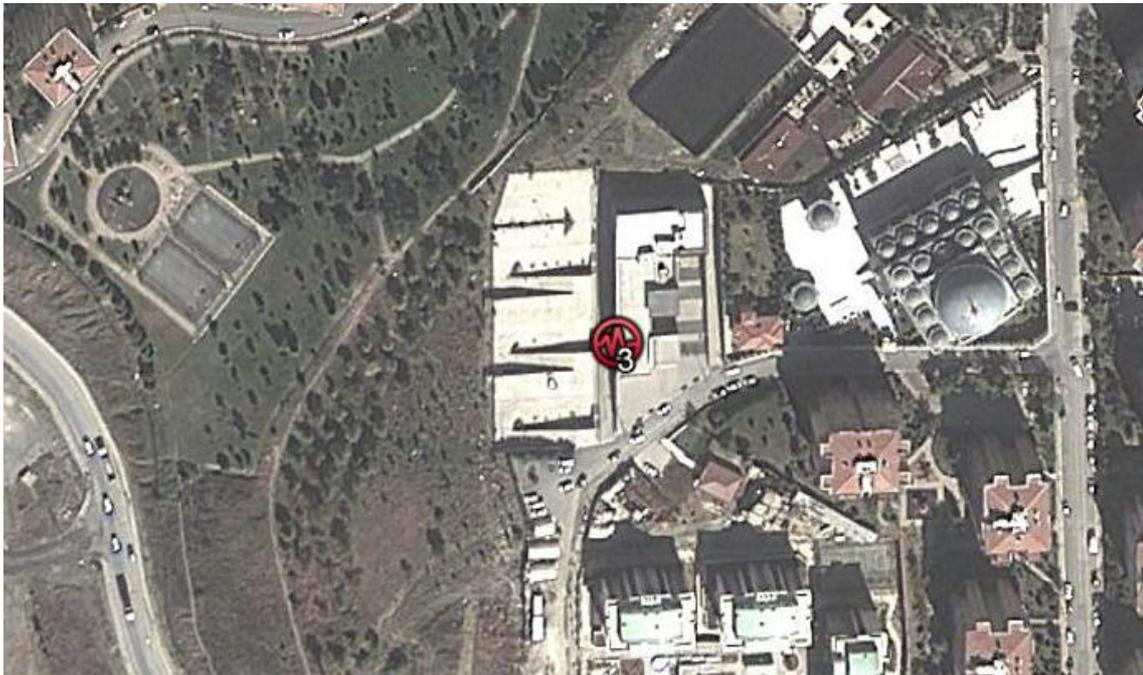
### 3.) Noise Measurement #3 (24:00:00, all units are dB)

- Information about conditions while measurement was taken;

Table 7. Information (Measurement 3)

Equipment			
Serial No	6061	Calibration Factor	6.6 dB
Type	Class 1	Model	SVAN 949
Measurement			
Measurement No	3	Date	01.11.2013
SLM No	FC 3	Distance to Project Area (m)	460
Data No	@RES646	Height	9
Coordinates (E/N)	41,1045951604418 28,7853705883026	Humidity (%)	55
Start	15:31:00	Temperature (C <sup>0</sup> )	16
End	15:31:00	Wind Direction	NW
Total Time	24:00:00	Wind Speed (m/s)	4,5
Description	Educational & Cultural area		
Background Sources	Daily Human Activities, Traffic		

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporla ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*



**Figure 6. Measurement Location 3**

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➤ Results;

**Table 8. Results of Measurement 3**

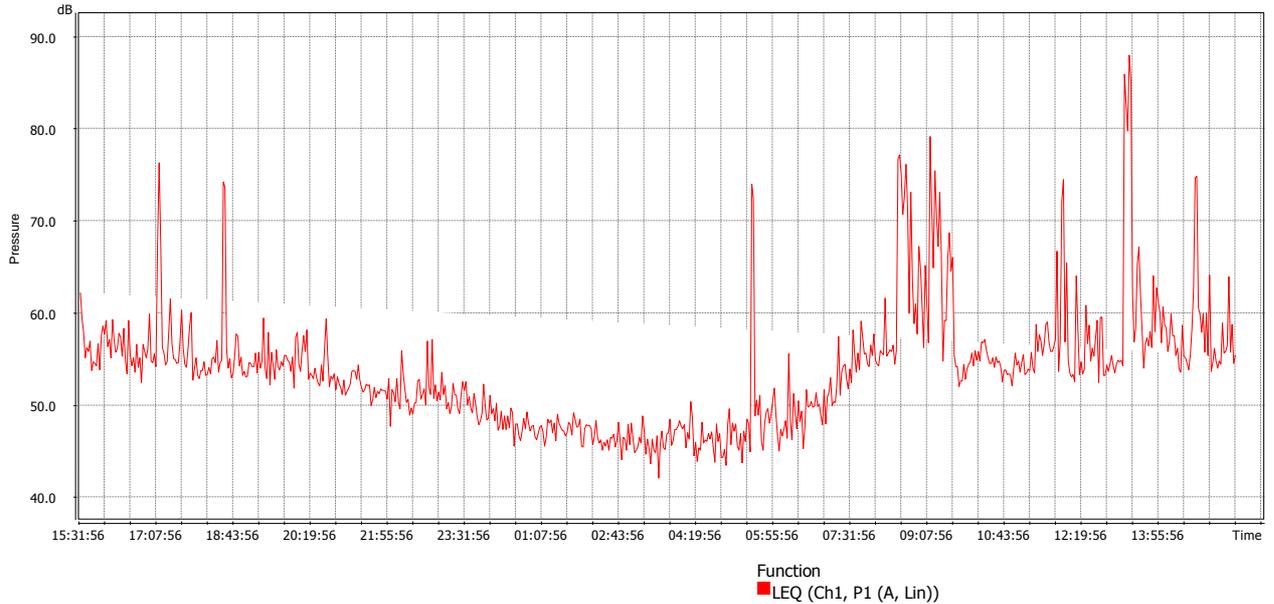
Day	Hour	Filter	Elapsed time	PEAK	MAX	MIN	SPL	LEQ	SEL	Lden	Ltm3	Ltm5
01.11.2013	15:31:56	A	24:00:00	126.7	107.5	37.7	57.8	65.5	114.9	66.4	72.2	73.0
01.11.2013	15:31:56	C	24:00:00	124.5	105.7	41.9	59.4	64.9	114.3	66.5	70.9	71.8
01.11.2013	15:31:56	Z	24:00:00	126.8	107.8	42.3	59.9	66.2	115.6	67.7	72.7	73.6

L10	L90
57.9 dBA	44.8 dBA

➤  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$  in A-weighted sound levels;

**Table 9. Sound Levels (Day, Evening, Night)**

$L_{day}$	$L_{evening}$	$L_{night}$
66.6	53.7	53.9



**Figure 7. Logger of Noise Measurement #3**

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

#### 4.) Noise Measurement #4 (24:00:00, all units are dB)

- Information about conditions while measurement was taken;

Table 10. Information (Measurement 4)

Equipment			
Serial No	12263	Calibration Factor	2.0 dB
Type	Class 1	Model	SVAN 949
Measurement			
Measurement No	4	Date	01.11.2013
SLM No	FC 4	Distance to Project Area (m)	400
Data No	@F8C2615	Height	7
Coordinates (E/N)	41,1020808973676 28,7839624285698	Humidity (%)	55
Start	15:58:00	Temperature (C <sup>0</sup> )	16
End	15:58:00	Wind Direction	NW
Total Time	24:00:00	Wind Speed (m/s)	4,5
Description	Residential & Commercial		
Background Sources	Daily Human Activities, Traffic		

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mührsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*



**Figure 8. Measurement Location 4**

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

➤ Results;

**Table 11. Results of Measurement 4**

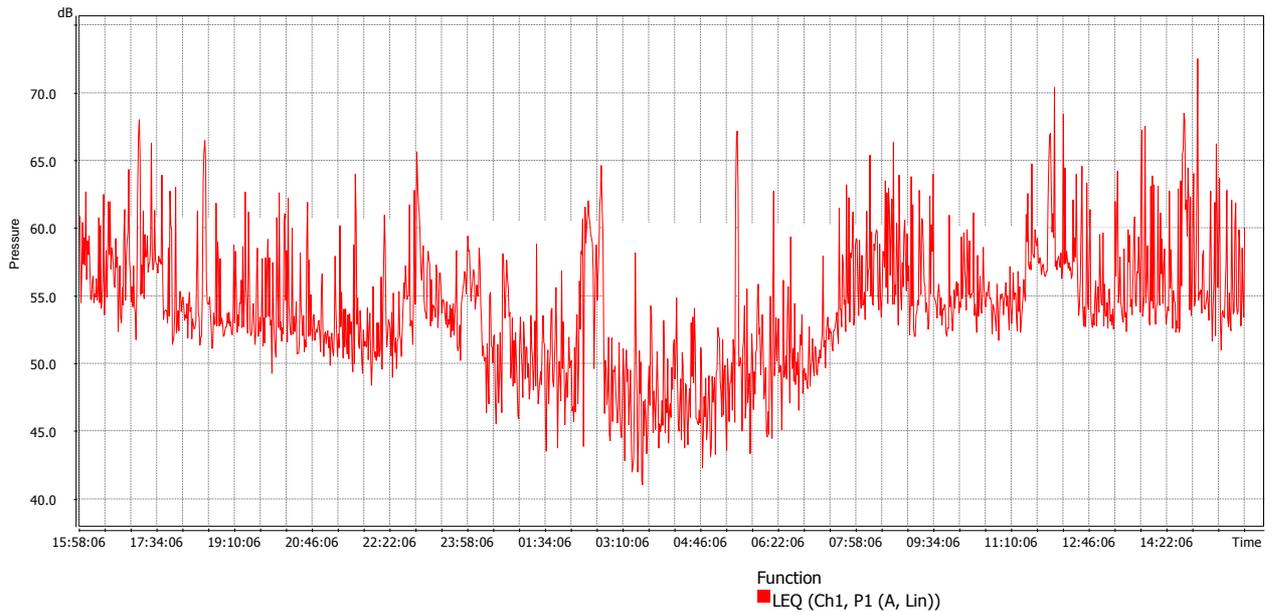
Day	Hour	Filter	Elapsed time	PEAK	MAX	MIN	SPL	LEQ	SEL	Lden	Ltm3	Ltm5
01.11.2013	15:58:12	A	24:00:00	99.2	84.8	35.4	71.9	56.8	106.2	61.1	59.9	60.6
01.11.2013	15:58:12	C	24:00:00	109.9	101.8	49.2	79.0	71.3	120.7	74.3	76.0	77.0
01.11.2013	15:58:12	Z	24:00:00	117.2	109.4	51.5	79.5	77.5	126.9	79.7	83.6	84.7

L10	L90
58.5 dBA	46.5 dBA

➤  $L_{day}$ ,  $L_{evening}$ ,  $L_{night}$  in A-weighted sound levels;

**Table 12. Sound Levels (Day, Evening, Night)**

$L_{day}$	$L_{evening}$	$L_{night}$
58.4	55.4	53.5



**Figure 9. Logger of Noise Measurement #4**

*Bu rapor, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. Deney sonuçları, yalnızca ölçüm sırasındaki proses koşullarıyla ilgilidir. Raporda ilgili ölçüm parametreleri ISO-17025 akreditasyonu kapsamındadır. Bu rapor Türkiye Cumhuriyeti Çevre ve Şehircilik Bakanlığı'na ait, çevre mevzuatına ilişkin resmi işlemlerde kullanılamaz. This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature and seal are not valid. Test results are only related with process condition during the measurement. This report is prepared under the accreditation to ISO-17025. This report shall not be used officially according to environmental legislations of Ministry of Environment and Urbanization of Republic of Turkey.*

# APPENDIX - 1

Akreditasyon Sertifikası Eki (Sayfa 1/3)

Akreditasyon Kapsamı

 Test TS EN ISO/IEC 17025 AB-0360-T	<b>FREKANS ÇEVRE ÖLÇÜM</b> <b>Mühendislik Danışmanlık Taahhüt İthalat İhracat Ve Tic. Ltd. Şti.</b>	
	Akreditasyon No: AB-0360-T Revizyon No: 00 Tarih: 16-Aralık-2010	
<b>Deney Laboratuvarının</b>		
Adres : Öveçler Mahallesi 1335. Sokak No: 3/1 Çankaya ANKARA / TÜRKİYE		Tel : 0 312 481 97 33 Faks : 0 312 481 97 93 E-Posta : bilgi@frekanscevre.com Website : www.frekanscevre.com

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standartlar, işletme içi metodlar)
ÇEVRESEL GÜRÜLTÜ / TİTREŞİM	AKUSTİK-ÇEVRE GÜRÜLTÜSÜNÜN TARİFLİ ÖLÇÜLMESİ VE DEĞERLENDİRİLMESİ	TS 9315 ISO 1996-1
	AKUSTİK-ÇEVRE GÜRÜLTÜSÜNÜN TANIMLANMASI VE ÖLÇÜLMESİ	TS ISO 1996-2
	BUILDING ACOUSTICS-ESTIMATION OF ACOUSTIC PERFORMANCE OF BUILDINGS FROM THE PERFORMANCE OF ELEMENTS-PART 4 TRANSMISSION OF INDOOR SOUND TO THE OUTSIDE	ISO 15712-4
	MADENCİLİK-HAVA ŞOKU VE YER TİTREŞİMİ ÖLÇÜMÜ	TS ISO 10354:1992
	MEKANİK TİTREŞİM VE ŞOK-BİNALARIN TİTREŞİMİ-TİTREŞİMİN ÖLÇÜLMESİ VE BİNALARA ETKİLERİNİN DEĞERLENDİRİLMESİ İÇİN KLAVUZ	TS ISO 4866-2006
SANAYİ TESİSLERİ MAKİNE VE EKİPMAN SES GÜCÜ TAYİNİ	AKUSTİK-ÇOKLU GÜRÜLTÜ KAYNAĞINA SAHİP SANAYİ TESİSLERİNDE ÇEVREDEKİ SES BASINÇ SEVİYELERİNİN TAYİNİ	TS ISO 8297
	AKUSTİK-SES BASINCI KULLANARAK GÜRÜLTÜ KAYNAKLARININ SES GÜÇ SEVİYELERİNİN TAYİNİ	TS 8958 EN ISO 3746



# APPENDIX - 1

## Akreditasyon Sertifikası Eki (Sayfa 2/3) Akreditasyon Kapsamı

 <p>TÜRKAK Türk Akreditasyon Kurumu TS EN ISO/IEC 17025 AB-0360-T</p>	<p><b>FREKANS ÇEVRE ÖLÇÜM</b> Mühendislik Danışmanlık Taahhüt İthalat İhracat Ve Tic. Ltd. Şti.</p> <p>Akreditasyon No: AB-0360-T Revizyon No: 00 Tarih: 16-Aralık-2010</p>
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Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standartlar, işletme içi metodlar)
( SANAYİ TESİSLERİ MAKİNE VE EKİPMAN SES GÜCÜ TAYİNİ Devam )	AKUSTİK-GÜRÜLTÜ KAYNAKLARININ SES GÜCÜ SEVİYELERİNİN SES BASINCI KULLANILARAK TAYİNİ	TS EN ISO 3744
GÜRÜLTÜ HARİTASI	AKUSTİK-SESİN DIŞARIDA YAYILIRKEN AZALMASI.BÖLÜM2:GENEL HESAPLAMA YÖNTEMİ	TS ISO 9613-2
	KARAYOLU GÜRÜLTÜSÜ İÇİN FRANSIZ HESAPLAMA YÖNTEMİ	NMPB - Routes - 96 / XPS 31- 133
	DEMİRYOLU GÜRÜLTÜSÜ İÇİN HOLLANDA ULUSAL HESAPLAMA YÖNTEMİ	Reken - Meervoorschrift Railverkeer slawaai
	HAVAALANI GÜRÜLTÜSÜ İÇİN Sivil Hava Limanları Etrafındaki Gürültü Konturlarını Hesaplamak İçin Standart Yöntem Hakkındaki Rapor	1997 tarihli ECAC. CEAC Doc 29
TİTREŞİM	MECHANICAL VIBRATION-EVALUATION OF MACHINE VIBRATION BY MEASUREMANT ON NON-ROTATING PARTS-MACHINE SETS IN HYDRAULIC POWER GENERATING AND POWER PLANTS	ISO 10816-5
KİŞİSEL GÜRÜLTÜ MARUZİYETİ	AKUSTİK-İŞYERİNDE MARUZ KALINAN GÜRÜLTÜNÜN TAYİNİ VE BU GÜRÜLTÜNÜN SEBEP OLDUĞU İŞİTME KAYBININ TAHMİNİ	TS 2607 ISO 1999



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Akreditasyon Sertifikası Eki (Sayfa 3/3)  
Akreditasyon Kapsamı

 <p>Test TS EN ISO IEC 17025 AB-0360-T</p>	<p><b>FREKANS ÇEVRE ÖLÇÜM</b> Mühendislik Danışmanlık Taahhüt İthalat İhracat Ve Tic. Ltd. Şti.</p> <p>Akreditasyon No: AB-0360-T Revizyon No: 00 Tarih: 16-Aralık-2010</p>
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Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standartlar, işletme içi metodlar)
( KİŞİSEL GÜRÜLTÜ MARUZİYETİ Devam )	AKUSTİK- HAVADAKİ AKUSTİKSEL GÜRÜLTÜLERİN ÖLÇÜLMESİ VE İNSAN ÜZERİNDEKİ ETKİLERİNİN DEĞERLENDİRİLMESİNE İLİŞKİN KILAVUZ	TS 2673

KAPSAM SONU

  
**Ali BOĞA**  
Yönetim Kurulu Başkanı



  
**Atakan BAŞTÜRK**  
Genel Sekreter



# APPENDIX - 1

 <b>AVL</b> Kalibrasyon Laboratuvarı	<b>TÜRKAK</b> TÜRK AKREDİTASYON KURUMU TURKISH ACCREDITATION AGENCY tarafından akredite edilmiştir.	 <b>TÜRKAK</b> Kalibrasyon TS EN ISO/IEC 17025 AB-0089-K	
<b>AVL AKUSTİK VİBRASYON</b> <b>KALİBRASYON LABORATUVARI</b> İvedik O.S.B. 1385. Sk. No: 10 OSTİM / ANKARA		AB-0089-K 2013-0267 04-2013	
<i>Kalibrasyon Sertifikası</i> Calibration Certificate			
<b>Cihazın Sahibi</b> Customer	: FREKANS ÇEVRE LAB. Aşağı Öveçler Mh.1328.Sk.ABC İş Merkezi 7/2 Çankaya / ANKARA		
<b>İstek Numarası</b> Order No.	: ISK-0267		
<b>Makine / Cihaz</b> Instrument / Device	: Ses Seviyesi Ölçüm Cihazı Sound Level Meter		
<b>İmalatçı</b> Manufacturer	: SVANTEK		
<b>Tip</b> Type	: SVAN 949		
<b>Seri Numarası</b> Serial number	: 6061		
<b>Kalibrasyon Tarihi</b> Date of calibration	: 18.04.2013		
<b>Sertifika Sayfa Sayısı</b> Number of pages of the certificate	: 6		
<p><b>Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standartlarına izlenebilirliği belgeler.</b> <i>This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).</i></p> <p><b>Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.</b> <i>The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognition of calibration certificates.</i></p> <p><b>Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.</b> <i>The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.</i></p>			
 <b>Mühür</b> TÜRKAK AB-0089-K	<b>Tarih</b> Date 18.04.2013	<b>Kalibrasyonu Yapan</b> Calibrated by Younes NEVAYE SHIRAZI	<b>Laboratuvar Müdürü</b> Head of the Calibration Laboratory Younes NEVAYE SHIRAZI

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.  
İmzasız ve mühürsüz sertifikalar geçersizdir.  
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faks: +90 312 394 15 53 tel: +90 312 394 15 50 web sitesi : [www.avl.com.tr](http://www.avl.com.tr) e-posta : [bilgi@avl.com.tr](mailto:bilgi@avl.com.tr)



# APPENDIX - 1

## AVL AKUSTİK VİBRASYON KALİBRASYON LABORATUVARI

AB-0089-K
2013-0267
04-2013

### 1. Cihaza Ait Bilgiler / Device to be Calibrated

**Cihazın Adı / Name of the instrument** : Ses Seviyesi Ölçüm Cihazı *Sound Level Meter*  
**İmalatçısı / Manufacturer** : SVANTEK  
**Seri No / Serial Number** : 6061  
**Tipi / Type** : SVAN 949

**2. Cihazın Laboratuvara Kabul Tarihi** : 18.04.2013

*Date of receipt of Device*

### 3. Kalibrasyon Metodu - Prosedürü / Calibration Method - Procedure

Kalibrasyon IEC 61672-3 Standardında tarif edilen testlere göre yapılmıştır. AVL PR.LBBR.501 Elektroakustik Ses Ölçerleri Periyodik Kalibrasyon prosedürü kullanılmıştır. Ölçümlerden ve testlerden önce ses seviyesi ölçüm cihazı 94 dB; 1000 Hz de kalibre edilmiştir.

*Calibration was made according to IEC 61672-3 Standard procedure PR.LBBR.501 was used in kalibration of the sound level meters. Sound level meter was calibrated to 94 dB at 1000 Hz before measurement.*

### 4. Çevresel Şartlar / Environmental Conditions

Ortam Sıcaklığı :  $22 \pm 3$  °C

*Tempreture*

Bağıl Nem :  $39,0 \pm 25$  %

*Relative humidity*

Ortam Basıncı :  $910 \pm 1$  hPa

*Ambient Pressure*

### 5. Ölçüm Belirsizliği / Measurement Uncertainty

Frekans Ağırlıklı Akustik Test : 31,5 ila 2 KHz :  $\pm 0,30$  dB    2 KHz ila 5 KHz :  $\pm 0,50$  dB

*Frekans Ağırlıklı Akustik Test*

Seviye doğrusallığı Test :  $\pm 0,10$  dB

*Level Linearity*

### 6. Kalibrasyonda Kullanılan Referans Cihazlar / Reference Equipments Used in Calibration

Açıklama <i>Description</i>	İmalatçı <i>Manufacturer</i>	Tip <i>Type</i>	Seri No <i>Serial No</i>	İzlenebilirlik <i>Traceability</i>
CS 18 Kalibrasyon Sistemi	Spektra	CS 18 VLF LF	201003	Spektra: D-K-15183-01-00: 270
CS 18 Kalibrasyon Sistemi	Spektra	CS 18 VLF MF	201003	Spektra: D-K-15183-01-00: 277
Akustik Kalibratör	Brüel & Kjaer	4231	2705957	Spektra: D-K-15183-01-00: 228
Mikrofon	Brüel & Kjaer	4192-MV203	2709959-2154	Spektra: D-K-15183-01-00: 230

SRT.LBBR.502



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## AVL AKUSTİK VİBRASYON KALİBRASYON LABORATUVARI

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### 7. Kalibrasyon Sonuçları / Calibration Results

#### 7.1 1000 Hz, 94 dB Kalibrasyon / Calibration at frequency point 1000 Hz, 94 dB

Kalibrasyondan önceki değer / Value before calibration : 94,7 dB  
Sapma / Deviation : 0,7 dB

#### 7.2 Frekans Ağırlıklı Akustik Test : C - Ağırlıklı / Acoustical signal tests of a C-frequency weighting

Frekans	Uygulanan SPL	Okunan Ses Seviyesi	Standart Sapma%	Tepki Farkı	C-Ağırlıklı Filtre Karakteristiği	Tepki Farkı Sapma	Tolerans
Frequency	Applied SPL	Measured Sound Level	Standard Deviation	Response Difference	C-Weighted Filter Characterization	Response Deviation	Tolerance
Hz	dB		%	dB			
63,00	75,03	75,10	0,037	0,07	-0,80	0,87	± 1,5
80,00	75,00	75,20	0,038	0,20	-0,50	0,70	± 1,5
100,00	75,04	75,40	0,150	0,36	-0,30	0,66	± 1,5
160,00	74,99	75,60	0,042	0,61	-0,10	0,71	± 1,5
200,00	75,00	75,70	0,042	0,70	0,00	0,70	± 1,5
250,00	74,92	75,60	0,116	0,68	0,00	0,68	± 1,4
315,00	74,98	75,60	0,016	0,62	0,00	0,62	± 1,4
400,00	75,02	75,50	0,423	0,48	0,00	0,48	± 1,4
500,00	75,00	75,30	0,036	0,30	0,00	0,30	± 1,4
630,00	75,03	75,20	0,108	0,17	0,00	0,17	± 1,4
800,00	75,07	75,00	0,269	-0,07	0,00	-0,07	± 1,4
1000,00	75,02	74,90	0,053	-0,12	0,00	-0,12	± 1,1
1250,00	75,02	74,70	0,009	-0,32	0,00	-0,32	± 1,4
1600,00	75,02	74,40	0,093	-0,62	-0,10	-0,52	± 1,6
2000,00	75,02	74,00	0,004	-1,02	-0,20	-0,82	± 1,6
2500,00	75,03	73,50	0,007	-1,53	-0,30	-1,23	± 1,6
3150,00	75,02	72,80	0,009	-2,22	-0,50	-1,72	± 1,6
4000,00	75,02	71,90	0,005	-3,12	-0,80	-2,32	± 1,6

Tablo 1: Frekans Ağırlıklı Akustik Test / Frequency Weightings Akustik Test

#### 7.3 1kHz de Frekans & Zaman Ağırlıklı Test / Frequency & Time Weighted Test at 1kHz

Frekans	Voltaj	Okunan Değer	Sapma
Frequency	Voltage	Data From SLM	Deviation
Hz	V	dB	dB
1000,00	0,042506	94,0	Ref.
1000,00	0,042465	94,0	0,0

Tablo 2: 1 kHz de Frekans & Zaman Ağırlıklı Test / Frequency & Time Weighted Test at

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## AVL AKUSTİK VİBRASYON KALİBRASYON LABORATUARI

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### 7.4 Frekans Ağırlıklı - Elektriksel Test / Frequency Weightings - Electrical Test

Frekans	Uygulanan Voltaj	Okunan Ses Seviyesi	Tepki Farkı	A-ağırlıklı Filtre Karakteristiği	Tepki Farkı Sapma	Tolerans
Frequency	Applied Voltage	Measured Sound Level	Response Difference	A-Weighted Filter Characterization	Response Deviation	Tolerance
Hz	Voltaj			dB		
1000	0,042489	94,00	(Ref. Değer)	-----	-----	-----
63	0,042474	67,90	-26,10	-26,20	0,10	±1,5
80	0,042654	71,70	-22,33	-22,50	0,17	±1,5
100	0,042443	74,90	-19,09	-19,10	0,01	±1,5
125	0,042485	77,90	-16,10	-16,10	0,00	±1,5
160	0,042661	80,80	-13,24	-13,40	0,16	±1,5
200	0,042437	83,20	-10,79	-10,90	0,11	±1,5
250	0,042484	85,40	-8,60	-8,60	0,00	±1,4
315	0,042547	87,40	-6,61	-6,60	-0,01	±1,4
400	0,042449	89,30	-4,69	-4,80	0,11	±1,4
500	0,042482	90,80	-3,20	-3,20	0,00	±1,4
630	0,042559	92,10	-1,91	-1,90	-0,01	±1,4
800	0,042423	93,20	-0,79	-0,80	0,01	±1,4
1000	0,042447	94,00	0,01	0,00	0,01	±1,1
1250	0,042571	94,60	0,58	0,60	-0,02	±1,4
1600	0,042454	95,00	1,01	1,00	0,01	±1,6
2000	0,042476	95,30	1,30	1,20	0,10	±1,6
2500	0,042481	95,30	1,30	1,30	0,00	±1,6
3150	0,042472	95,30	1,30	1,20	0,10	±1,6
4000	0,042481	95,10	1,10	1,00	0,10	±1,6
5000	0,042444	94,70	0,71	0,50	0,21	±2,1
6300	0,042431	94,10	0,11	-0,10	0,21	2,1; -2,6
8000	0,042369	93,00	-0,98	-1,10	0,12	2,1; -3,1
10000	0,042333	91,60	-2,37	-2,50	0,13	2,6; -3,6
12500	0,042281	89,80	-4,16	-4,30	0,14	3,0; -6,0
16000	0,042117	87,10	-6,82	-6,60	-0,22	3,5; -17,0
20000	0,041984	84,70	-9,20	-9,30	0,10	4,0; -∞

Tablo 3: Frekans Ağırlıklı Elektriksel Test / Frequency Weighted Electrical Test

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sayfa.4/6



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### 7.5 Seviye Doğrusallığı Testi / Level Linearity Test

Frekans Frequency	Uygulanan Voltaj Applied Voltage	Ref. Ses Seviyesi Ref. Sound Level	Okunan Ses Seviyesi Measured Sound Level	Sapma Deviation	Tolerans Tolerance
Hz	V	dB			
8000,00	0,047366	94,00	94,00	0,00	2,1; -3,1
8000,00	0,084220	99,00	99,00	0,00	2,1; -3,1
8000,00	0,149790	104,00	104,00	0,00	2,1; -3,1
8000,00	0,266380	109,00	109,00	0,00	2,1; -3,1
8000,00	0,473780	114,00	114,00	0,00	2,1; -3,1
8000,00	0,842460	119,00	119,00	0,00	2,1; -3,1
8000,00	0,945370	120,00	120,00	0,00	2,1; -3,1
8000,00	1,060600	121,00	121,00	0,00	2,1; -3,1
8000,00	1,190100	122,00	122,00	0,00	2,1; -3,1
8000,00	1,335300	123,00	123,00	0,00	2,1; -3,1
8000,00	1,498100	124,00	124,00	0,00	2,1; -3,1
8000,00	0,047368	94,00	94,00	0,00	2,1; -3,1
8000,00	0,026637	89,00	89,00	0,00	2,1; -3,1
8000,00	0,014977	84,00	84,00	0,00	2,1; -3,1
8000,00	0,008423	79,00	79,00	0,00	2,1; -3,1
8000,00	0,004732	74,00	74,00	0,00	2,1; -3,1
8000,00	0,002662	69,00	69,00	0,00	2,1; -3,1
8000,00	0,001496	64,00	64,10	0,10	2,1; -3,1
8000,00	0,000843	59,00	59,10	0,10	2,1; -3,1
8000,00	0,000472	54,00	54,30	0,30	2,1; -3,1
8000,00	0,000265	49,00	49,40	0,40	2,1; -3,1
8000,00	0,000146	44,00	44,80	0,80	2,1; -3,1
8000,00	0,000034	39,00	40,10	1,10	2,1; -3,1
8000,00	0,000088	38,00	39,30	1,30	2,1; -3,1
8000,00	0,000064	37,00	38,30	1,30	2,1; -3,1
8000,00	0,000059	36,00	37,70	1,70	2,1; -3,1
8000,00	0,000067	35,00	37,00	2,00	2,1; -3,1
8000,00	0,000049	34,00	35,90	1,90	2,1; -3,1

Tablo 4: 8000 Hz Seviye Doğrusallığı Testi / Level linearity Test

### 7.6 Seviye Aralıklarında Seviye Doğrusallığı / Level Linearity including the level range control

Seviye Aralığı Level Range	Frekans Frequency	Okunan Ses Seviyesi Measured Sound Level	Sapma Deviation	Tolerans tolerance
dB	Hz	dB		
20-130	1000,00	94,00	0,00	±1,1

Tablo 5: 1 kHz 94 dB'de Seviye Aralıklarında Seviye Kontrolü / Level Control at Level Ranges

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## 8. Uygunluk Beyanı / Statement of Compliance

Ölçüm sonuçları ve ölçüm belirsizliği yukarıda verilmiştir. Kullanıcı bunları dikkate alarak uygunluğuna karar vermelidir. Beyan edilen genişletilmiş belirsizlik değeri standart belirsizliğin normal dağılımı için; yaklaşık % 95 güvenilirlik seviyesini sağlayan  $k=2$  kapsam faktörü ile çarpımının sonucudur. Standart ölçüm belirsizliği GUM ve EA-4/02 dokümanlarına uygun olarak belirlenmiştir. Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı bir bölümüdür.

*The measurement results and measurement uncertainty were given. The user have to consider the results and decide compliance of the device. The reported expanded uncertainty of measurement is stated as the standart uncertainty of multitude by coverage factor  $k=2$ , which for a normal distribution corresponds to coverage of approximately 95%. The standart measurement uncertainty is defined according to the GUM and EA-4/02 documents. Measurement results, the expanded measurement uncertainty of measurement and calibration methods, is an integral part of the this certificate.*

## 9. Açıklama / Remarks

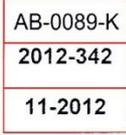
Bu sertifikada bulunan sonuçlar cihazın kalibrasyon tarihindeki durumu kapsar ve uzun dönem kararlılığı hakkında bir öngörü içermez.

*The result reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument*

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	<b>TÜRKAK</b> <b>TÜRK AKREDİTASYON KURUMU</b> TURKISH ACCREDITATION AGENCY tarafından akredite edilmiştir.		
	<b>AVL AKUSTİK VİBRASYON</b> <b>KALİBRASYON LABORATUVARI</b> İvedik O.S.B. 1385. Sk. No: 10 OSTİM / ANKARA		
	<i>Kalibrasyon Sertifikası</i> Calibration Certificate		
<b>Cihazın Sahibi</b> <i>Customer</i>	: <b>Frekans Çevre Ölçüm Mühendislik Danışmanlık Tic. İhr. Ltd Şti.</b> Öveçler Mah. 1343. Sok. No: 3 / 1 Çankaya / ANKARA		
<b>İstek Numarası</b> <i>Order No.</i>	: ISK-342		
<b>Makine / Cihaz</b> <i>Instrument / Device</i>	: Ses Seviyesi Ölçüm Cihazı Sound Level Meter		
<b>İmalatçı</b> <i>Manufacturer</i>	: SVANTEK		
<b>Tip</b> <i>Type</i>	: SVAN 949		
<b>Seri Numarası</b> <i>Serial number</i>	: 12263		
<b>Kalibrasyon Tarihi</b> <i>Date of calibration</i>	: 01.11.2012		
<b>Sertifika Sayfa Sayısı</b> <i>Number of pages of the certificate</i>	: 6		
<p><b>Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standartlarına izlenebilirliği belgeler.</b> <i>This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).</i></p> <p><b>Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.</b> <i>The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognition of calibration certificates.</i></p> <p><b>Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.</b> <i>The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.</i></p>			
<b>Mühür</b> <i>Seal</i>	<b>Tarih</b> <i>Date</i>	<b>Kalibrasyonu Yapan</b> <i>Calibrated by</i>	<b>Laboratuvar Müdürü</b> <i>Head of the Calibration Laboratory</i>
	01.11.2012	 Younes NEVAYE SHIRAZI	 Younes NEVAYE SHIRAZI

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.

İmzasız ve mühürsüz sertifikalar geçersizdir.

*This certificate shall not be reproduced other than in full except with the permission of the laboratory. Calibration certificates without signature and seal are not valid.*

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## AVL AKUSTİK VİBRASYON KALİBRASYON LABORATUARI

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### 1. Cihaza Ait Bilgiler / Device to be Calibrated

**Cihazın Adı / Name of the instrument** : Ses Seviyesi Ölçüm Cihazı *Sound Level Meter*  
**İmalatçısı / Manufacturer** : SVANTEK  
**Seri No / Serial Number** : 12263  
**Tipi / Type** : SVAN 949

**2. Cihazın Laboratuvara Kabul Tarihi** : 31.10.2012

*Date of receipt of Device*

### 3. Kalibrasyon Metodu - Prosedürü / Calibration Method - Procedure

Kalibrasyon IEC 61672-3 Standardında tarif edilen testlere göre yapılmıştır. AVL PR.LBBR.501 Elektroakustik Ses Ölçerleri Periyodik Kalibrasyon prosedürü kullanılmıştır. Ölçümlerden ve testlerden önce ses seviyesi ölçüm cihazı 94 dB; 1000 Hz de kalibre edilmiştir.

*Calibration was made according to IEC 61672-3 Standard . procedure PR.LBBR.501 was used in kalibration of the sound level meters.  
Sound level meter was calibrated to 94 dB at 1000 Hz before measurement.*

### 4. Çevresel Şartlar / Environmental Conditions

**Ortam Sıcaklığı** : 20,8 ± 3 °C  
*Temperature*  
**Bağıl Nem** : 51,0 ± 25 %  
*Relative humidity*  
**Ortam Basıncı** : 910,0 ± 1 hPa  
*Ambient Pressure*

### 5. Ölçüm Belirsizliği / Measurement Uncertainty

**Frekans Ağırlıklı Akustik Test** : 31,5 ila 2 KHz : ± 0,30 dB    2 KHz ila 5 KHz : ± 0,50 dB  
*Frekans Ağırlıklı Akustik Test* :  
**Seviye doğrusallığı Test** : ± 0,10  
*Level Linearity* :  
**Toneburst Tepkisi** : ± 0,10  
*Toneburst response* :  
**Peak C** : ± 0,10  
*Peak C* :  
**Aşırı Yük Testi** : ± 0,10  
*Overload Indication*

### 6. Kalibrasyonda Kullanılan Referans Cihazlar / Reference Equipments Used in Calibration

Açıklama <i>Description</i>	İmalatçı <i>Manufacturer</i>	Tip <i>Type</i>	Seri No <i>Serial No.</i>	İzlenebilirlik <i>Traceability</i>
CS 18 Kalibrasyon Sistemi	Spektra	CS 18 VLF LF	201003	Spektra: D-K-15183-01-00: 270
CS 18 Kalibrasyon Sistemi	Spektra	CS 18 VLF MF	201003	Spektra: D-K-15183-01-00: 277
Akustik Kalibratör	Brüel & Kjaer	4231	2705957	Spektra: D-K-15183-01-00: 228
Mikrofon	Brüel & Kjaer	4192-MV203	2709959-2154	Spektra: D-K-15183-01-00: 230

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### 7. Kalibrasyon Sonuçları / Calibration Results

#### 7.1 1000 Hz, 94 dB Kalibrasyon / Calibration at frequency point 1000 Hz, 94 dB

Kalibrasyondan önceki değer / Value before calibration : 94,0 dB  
Sapma / Deviation : 0,0 dB

#### 7.2 Frekans Ağırlıklı Akustik Test : C - Ağırlıklı / Acoustical signal tests of a C-frequency weighting

Frekans Frequency	Uygulanan SPL Applied SPL	Okunan Ses Seviyesi Measured Sound Level	Standart Sapma% Standard Deviation	Tepki Farkı Response Difference	C-Ağırlıklı Filtre Karakteristiği C-Weighted Filter Characterization	Tepki Farkı Sapma Response Deviation	Tolerans Tolerance
Hz	dB		%	dB			
63,00	75,02	74,30	0,535	-0,72	-0,80	0,08	± 1,5
80,00	74,94	74,60	0,196	-0,34	-0,50	0,16	± 1,5
100,00	75,04	74,80	0,104	-0,24	-0,30	0,06	± 1,5
160,00	74,98	74,90	0,071	-0,08	-0,10	0,02	± 1,5
200,00	74,74	74,70	0,070	-0,04	0,00	-0,04	± 1,5
250,00	75,00	75,10	0,585	0,10	0,00	0,10	± 1,4
315,00	74,97	75,10	0,067	0,13	0,00	0,13	± 1,4
400,00	75,01	75,10	0,045	0,09	0,00	0,09	± 1,4
500,00	74,98	75,10	0,038	0,12	0,00	0,12	± 1,4
630,00	75,02	75,20	0,175	0,18	0,00	0,18	± 1,4
800,00	74,99	75,20	0,050	0,21	0,00	0,21	± 1,4
1000,00	75,03	75,00	0,015	-0,03	0,00	-0,03	± 1,1
1250,00	75,02	75,30	0,022	0,28	0,00	0,28	± 1,4
1600,00	75,04	75,30	0,049	0,26	-0,10	0,36	± 1,6
2000,00	75,02	75,30	0,045	0,28	-0,20	0,48	± 1,6
2500,00	75,03	75,20	0,026	0,17	-0,30	0,47	± 1,6
3150,00	75,02	75,00	0,011	-0,02	-0,50	0,48	± 1,6
4000,00	75,01	74,70	0,024	-0,31	-0,80	0,49	± 1,6
5000,00	75,01	74,20	0,003	-0,81	-1,30	0,49	± 2,1

Tablo 1: Frekans Ağırlıklı Akustik Test / Frequency Weightings Akustik Test

#### 7.3 1kHz de Frekans & Zaman Ağırlıklı Test / Frequency & Time Weighted Test at 1kHz

Frekans Frequency	Voltaj Voltage	Okunan Değer Data From SLM	Sapma Deviation
Hz	V	dB	dB
1000,00	0,04146	94,0	Ref.
1000,00	0,04146	94,0	0,0

Tablo 2: 1 kHz de Frekans & Zaman Ağırlıklı Test / Frequency & Time Weighted Test at

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### 7.4 Frekans Ağırlıklı - Elektriksel Test / Frequency Weightings - Electrical Test

Frekans	Uygulanan Voltaj	Okunan Ses Seviyesi	Tepki Farkı	A-ağırlıklı Filtre Karakteristiği	Tepki Farkı Sapma	Tolerans
Frequency	Applied Voltage	Measured Sound Level	Response Difference	A-Weighted Filter Characterization	Response Deviation	Tolerance
Hz	Voltaj	dB				
1000	0,041493	94,00	(Ref. Değer)	----	----	----
63	0,041486	67,90	-26,10	-26,20	0,10	±1,5
80	0,041652	71,70	-22,33	-22,50	0,17	±1,5
100	0,041427	74,90	-19,09	-19,10	0,01	±1,5
125	0,041492	77,90	-16,10	-16,10	0,00	±1,5
160	0,041642	80,80	-13,23	-13,40	0,17	±1,5
200	0,041435	83,20	-10,79	-10,90	0,11	±1,5
250	0,041488	85,40	-8,60	-8,60	0,00	±1,4
315	0,041554	87,40	-6,61	-6,60	-0,01	±1,4
400	0,041416	89,30	-4,68	-4,80	0,12	±1,4
500	0,041499	90,80	-3,20	-3,20	0,00	±1,4
630	0,041553	92,10	-1,91	-1,90	-0,01	±1,4
800	0,041465	93,20	-0,79	-0,80	0,01	±1,4
1000	0,041514	94,00	0,00	0,00	0,00	±1,1
1250	0,041486	94,60	0,60	0,60	0,00	±1,4
1600	0,041478	95,00	1,00	1,00	0,00	±1,6
2000	0,041483	95,30	1,30	1,20	0,10	±1,6
2500	0,041467	95,30	1,31	1,30	0,01	±1,6
3150	0,041474	95,30	1,30	1,20	0,10	±1,6
4000	0,041455	95,10	1,11	1,00	0,11	±1,6
5000	0,041444	94,70	0,71	0,50	0,21	±2,1
6300	0,041423	94,00	0,01	-0,10	0,11	2,1.; -2,6
8000	0,041445	93,00	-0,99	-1,10	0,11	2,1.; -3,1
10000	0,041341	91,60	-2,37	-2,50	0,13	2,6.; -3,6
12500	0,041259	89,70	-4,25	-4,30	0,05	3,0.; -6,0
16000	0,041156	87,10	-6,83	-6,60	-0,23	3,5.; -17,0
20000	0,041028	84,70	-9,20	-9,30	0,10	4,0.; -∞

Tablo 3: Frekans Ağırlıklı Elektriksel Test / Frequency Weighted Electrical Test

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### 7.5 Seviye Doğrusallığı Testi / Level Linearity Test

Frekans	Uygulanan Voltaj	Ref. Ses Seviyesi	Okunan Ses Seviyesi	Sapma	Tolerans
Frequency	Applied Voltage	Ref. Sound Level	Measured Sound Level	Deviation	Tolerance
Hz	V	dB			
8000,00	0,041384	94,00	94,00	0,00	2,1; -3,1
8000,00	0,073581	99,00	99,00	0,00	2,1; -3,1
8000,00	0,130860	104,00	104,00	0,00	2,1; -3,1
8000,00	0,232810	109,00	109,00	0,00	2,1; -3,1
8000,00	0,413900	114,00	114,00	0,00	2,1; -3,1
8000,00	0,736030	119,00	119,00	0,00	2,1; -3,1
8000,00	1,308800	124,00	124,00	0,00	2,1; -3,1
8000,00	2,327800	129,00	129,00	0,00	2,1; -3,1
8000,00	4,138900	134,00	134,00	0,00	2,1; -3,1
8000,00	4,643600	135,00	135,00	0,00	2,1; -3,1
8000,00	5,209900	136,00	136,00	0,00	2,1; -3,1
8000,00	5,845600	137,00	137,00	0,00	2,1; -3,1
8000,00	6,570900	138,00	138,10	0,10	2,1; -3,1
8000,00	7,371100	139,00	139,10	0,10	2,1; -3,1
8000,00	0,041382	94,00	94,00	0,00	2,1; -3,1
8000,00	0,023268	89,00	89,00	0,00	2,1; -3,1
8000,00	0,013085	84,00	84,00	0,00	2,1; -3,1
8000,00	0,007345	79,00	79,00	0,00	2,1; -3,1
8000,00	0,004135	74,00	74,00	0,00	2,1; -3,1
8000,00	0,002324	69,00	69,10	0,10	2,1; -3,1
8000,00	0,001307	64,00	64,10	0,10	2,1; -3,1
8000,00	0,000731	59,00	59,20	0,20	2,1; -3,1
8000,00	0,000411	54,00	54,20	0,20	2,1; -3,1
8000,00	0,000231	49,00	49,40	0,40	2,1; -3,1

Tablo 4: 8000 Hz Seviye Doğrusallığı Testi / Level linearity Test

### 7.6 Seviye Aralıklarında Seviye Doğrusallığı / Level Linearity including the level range control

Seviye Aralığı	Frekans	Okunan Ses Seviyesi	Sapma	Tolerans
Level Range	Frequency	Measured Sound Level	Deviation	tolerance
dB	Hz	dB		
40-140	1000,00	94,00	0,00	±1,1

Tablo 5: 1 kHz 94 dB'de Seviye Aralıklarında Seviye Kontrolü / Level Control at Level Ranges

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## 8. Uygunluk Beyanı / Statement of Compliance

Ölçüm sonuçları ve ölçüm belirsizliği yukarıda verilmiştir. Kullanıcı bunları dikkate alarak uygunluğuna karar vermelidir. Beyan edilen genişletilmiş belirsizlik değeri standart belirsizliğin normal dağılımı için; yaklaşık % 95 güvenirlilik seviyesini sağlayan k=2 kapsam faktörü ile çarpımının sonucudur. Standart ölçüm belirsizliği GUM ve EA-4/02 dokümanlarına uygun olarak belirlenmiştir. Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı bir bölümüdür.

*The measurement results and measurement uncertainty were given. The user have to consider the results and decide compliance of the device. The reported expanded uncertainty of measurement is stated as the standart uncertainty of multitude by coverage factor k=2, which for a normal distribution corresponds to covarage of approximately 95%. The standart measurement uncertainty is defined according to the GUM and EA-4/02 documents. Measurement results, the expanded measurement uncertainty of measurement and calibration methods, is an integral part of the this certificate.*

## 9. Açıklama / Remarks

Bu sertifikada bulunan sonuçlar cihazın kalibrasyon tarihindeki durumu kapsar ve uzun dönem kararlılığı hakkında bir öngörü içermez.

*The result reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument*

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	<p><b>TÜRKAK</b> TÜRK AKREDİTASYON KURUMU TURKISH ACCREDITATION AGENCY tarafından akredite edilmiştir.</p> <p><b>AVL AKUSTİK VİBRASYON</b> KALİBRASYON LABORATUVARI</p> <p>İvedik O.S.B. 1385. Sk. No: 10 OSTİM / ANKARA</p> <p><i>Kalibrasyon Sertifikası</i> Calibration Certificate</p>	 <p>Kalibrasyon TS EN ISO/IEC 17025 AB-0089-K</p> <p>AB-0089-K 2013-0266 04-2013</p>	
<b>Cihazın Sahibi</b> Customer	: FREKANS ÇEVRE LAB. Aşağı Öveçler Mh.1328.Sk.ABC İş Merkezi 7/2 Çankaya / ANKARA		
<b>İstek Numarası</b> Order No.	: ISK-0266		
<b>Makine / Cihaz</b> Instrument / Device	: Ses Seviyesi Ölçüm Cihazı Sound Level Meter		
<b>İmalatçı</b> Manufacturer	: SVANTEK		
<b>Tip</b> Type	: SVAN 957		
<b>Seri Numarası</b> Serial number	: 14563		
<b>Kalibrasyon Tarihi</b> Date of calibration	: 17.04.2013		
<b>Sertifika Sayfa Sayısı</b> Number of pages of the certificate	: 6		
<p><b>Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standartlarına izlenebilirliği belgeler.</b> <i>This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).</i></p> <p><b>Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.</b> <i>The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognition of calibration certificates.</i></p> <p><b>Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.</b> <i>The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.</i></p>			
	<b>Tarih</b> Date 17.04.2013	<b>Kalibrasyonu Yapan</b> Calibrated by Younes NEVAYE SHIRAZI	<b>Laboratuvar Müdürü</b> Head of the Calibration Laboratory Younes NEVAYE SHIRAZI

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.  
İmzasız ve mühürsüz sertifikalar geçersizdir.  
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## AVL AKUSTİK VİBRASYON KALİBRASYON LABORATUARI

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### 1. Cihaza Ait Bilgiler / Device to be Calibrated

**Cihazın Adı / Name of the instrument** : Ses Seviyesi Ölçüm Cihazı *Sound Level Meter*  
**İmalatçısı / Manufacturer** : SVANTEK  
**Seri No / Serial Number** : 14563  
**Tipi / Type** : SVAN 957

**2. Cihazın Laboratuvara Kabul Tarihi** : 17.04.2013

*Date of receipt of Device*

### 3. Kalibrasyon Metodu - Prosedürü / Calibration Method - Procedure

Kalibrasyon IEC 61672-3 Standardında tarif edilen testlere göre yapılmıştır. AVL PR.LBBR.501 Elektroakustik Ses Ölçerleri Peryodik Kalibrasyon prosedürü kullanılmıştır. Ölçümlerden ve testlerden önce ses seviyesi ölçüm cihazı 94 dB; 1000 Hz de kalibre edilmiştir.

*Calibration was made according to IEC 61672-3 Standard, procedure PR.LBBR.501 was used in kalibration of the sound level meters. Sound level meter was calibrated to 94 dB at 1000 Hz before measurement.*

### 4. Çevresel Şartlar / Environmental Conditions

**Ortam Sıcaklığı** : 22,4 ± 3 °C  
*Temperature*  
**Bağıl Nem** : 38,0 ± 25 %  
*Relative humidity*  
**Ortam Basıncı** : 910 ± 1 hPa  
*Ambient Pressure*

### 5. Ölçüm Belirsizliği / Measurement Uncertainty

**Frekans Ağırlıklı Akustik Test** : 31,5 ila 2 KHz : ± 0,30 dB 2 KHz ila 5 KHz : ± 0,50 dB  
*Frekans Ağırlıklı Akustik Test*  
**Seviye doğrusalığı Test** : ± 0,10 dB  
*Level Linearity*

### 6. Kalibrasyonda Kullanılan Referans Cihazlar / Reference Equipments Used in Calibration

Açıklama <i>Description</i>	İmalatçı <i>Manufacturer</i>	Tip <i>Type</i>	Seri No <i>Serial No.</i>	İzlenebilirlik <i>Traceability</i>
CS 18 Kalibrasyon Sistemi	Spektra	CS 18 VLF LF	201003	Spektra: D-K-15183-01-00: 270
CS 18 Kalibrasyon Sistemi	Spektra	CS 18 VLF MF	201003	Spektra: D-K-15183-01-00: 277
Akustik Kalibratör	Brüel & Kjaer	4231	2705957	Spektra: D-K-15183-01-00: 228
Mikrofon	Brüel & Kjaer	4192-MV203	2709959-2154	Spektra: D-K-15183-01-00: 230

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### 7. Kalibrasyon Sonuçları / Calibration Results

#### 7.1 1000 Hz, 94 dB Kalibrasyon / Calibration at frequency point 1000 Hz, 94 dB

Kalibrasyondan önceki değer / Value before calibration : 94,7 dB  
Sapma / Deviation : 0,7 dB

#### 7.2 Frekans Ağırlıklı Akustik Test : C - Ağırlıklı / Acoustical signal tests of a C-frequency weighting

Frekans Frequency	Uygulanan SPL Applied SPL	Okunan Ses Seviyesi Measured Sound Level	Standart Sapma% Standard Deviation	Tepki Farkı Response Difference	C-Ağırlıklı Filtre Karakteristiği C-Weighted Filter Characterization	Tepki Farkı Sapma Response Deviation	Tolerans Tolerance
Hz	dB		%		dB		
63,00	75,04	74,90	0,045	-0,14	-0,80	0,66	± 1,5
80,00	74,98	75,20	0,037	0,22	-0,50	0,72	± 1,5
100,00	75,03	75,40	0,029	0,37	-0,30	0,67	± 1,5
160,00	74,99	75,50	0,077	0,51	-0,10	0,61	± 1,5
200,00	75,02	75,60	0,061	0,58	0,00	0,58	± 1,5
250,00	75,00	75,50	0,053	0,50	0,00	0,50	± 1,4
315,00	74,99	75,50	0,027	0,51	0,00	0,51	± 1,4
400,00	75,00	75,40	0,022	0,40	0,00	0,40	± 1,4
500,00	74,99	75,30	0,017	0,31	0,00	0,31	± 1,4
630,00	75,00	75,20	0,065	0,20	0,00	0,20	± 1,4
800,00	75,04	75,00	0,087	-0,04	0,00	-0,04	± 1,4
1000,00	75,03	74,90	0,011	-0,13	0,00	-0,13	± 1,1
1250,00	75,03	74,60	0,022	-0,43	0,00	-0,43	± 1,4
1600,00	75,03	74,30	0,012	-0,73	-0,10	-0,63	± 1,6
2000,00	75,02	73,90	0,008	-1,12	-0,20	-0,92	± 1,6
2500,00	75,03	73,40	0,008	-1,63	-0,30	-1,33	± 1,6
3150,00	75,02	72,90	0,016	-2,12	-0,50	-1,62	± 1,6
4000,00	75,01	72,40	0,010	-2,61	-0,80	-1,81	± 1,6

Tablo 1: Frekans Ağırlıklı Akustik Test / Frequency Weightings Akustik Test

#### 7.3 1kHz de Frekans & Zaman Ağırlıklı Test / Frequency & Time Weighted Test at 1kHz

Frekans Frequency	Voltaj Voltage	Okunan Değer Data From SLM	Sapma Deviation
Hz	V	dB	dB
1000,00	0,031461	94,0	Ref.
1000,00	0,031474	94,0	0,0

Tablo 2: 1 kHz de Frekans & Zaman Ağırlıklı Test / Frequency & Time Weighted Test at

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### 7.4 Frekans Ağırlıklı - Elektriksel Test / Frequency Weights - Electrical Test

Frekans	Uygulanan Voltaj	Okunan Ses Seviyesi	Tepki Farkı	A-ağırlıklı Filtre Karakteristiği	Tepki Farkı Sapma	Tolerans
Frequency	Applied Voltage	Measured Sound Level	Response Difference	A-Weighted Filter Characterization	Response Deviation	Tolerance
1000	0,031498	94,00	(Ref. Değer)	-----	-----	-----
63	0,031483	67,80	-26,20	-26,20	0,00	±1,5
80	0,031614	71,70	-22,33	-22,50	0,17	±1,5
100	0,031458	74,90	-19,09	-19,10	0,01	±1,5
125	0,031488	77,90	-16,10	-16,10	0,00	±1,5
160	0,031622	80,80	-13,23	-13,40	0,17	±1,5
200	0,031463	83,20	-10,79	-10,90	0,11	±1,5
250	0,031497	85,40	-8,60	-8,60	0,00	±1,4
315	0,031574	87,40	-6,62	-6,60	-0,02	±1,4
400	0,031482	89,20	-4,80	-4,80	0,00	±1,4
500	0,031506	90,80	-3,20	-3,20	0,00	±1,4
630	0,031534	92,10	-1,91	-1,90	-0,01	±1,4
800	0,031475	93,30	-0,69	-0,80	0,11	±1,4
1000	0,031493	94,00	0,00	0,00	0,00	±1,1
1250	0,031500	94,60	0,60	0,60	0,00	±1,4
1600	0,031480	95,10	1,11	1,00	0,11	±1,6
2000	0,031473	95,30	1,31	1,20	0,11	±1,6
2500	0,031475	95,40	1,41	1,30	0,11	±1,6
3150	0,031488	95,30	1,30	1,20	0,10	±1,6
4000	0,031469	95,10	1,11	1,00	0,11	±1,6
5000	0,031463	94,70	0,71	0,50	0,21	±2,1
6300	0,031447	94,10	0,11	-0,10	0,21	2,1; -2,6
8000	0,031412	93,00	-0,98	-1,10	0,12	2,1; -3,1
10000	0,031376	91,70	-2,27	-2,50	0,23	2,6; -3,6
12500	0,031308	89,80	-4,15	-4,30	0,15	3,0; -6,0
16000	0,031180	87,10	-6,81	-6,60	-0,21	3,5; -17,0
20000	0,031090	84,70	-9,19	-9,30	0,11	4,0; -∞

Tablo 3: Frekans Ağırlıklı Elektriksel Test / Frequency Weighted Electrical Test

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### 7.5 Seviye Doğrusallığı Testi / Level Linearity Test

Frekans	Uygulanan Voltaj	Ref. Ses Seviyesi	Okunan Ses Seviyesi	Sapma	Tolerans
Frequency	Applied Voltage	Ref. Sound Level	Measured Sound Level	Deviation	Tolerance
Hz	V	dB			
8000,00	0,035200	94,00	94,00	0,00	2,1; -3,1
8000,00	0,062596	99,00	99,00	0,00	2,1; -3,1
8000,00	0,111320	104,00	104,00	0,00	2,1; -3,1
8000,00	0,197950	109,00	109,00	0,00	2,1; -3,1
8000,00	0,352080	114,00	114,00	0,00	2,1; -3,1
8000,00	0,626090	119,00	119,00	0,00	2,1; -3,1
8000,00	0,702440	120,00	120,00	0,00	2,1; -3,1
8000,00	0,788210	121,00	121,00	0,00	2,1; -3,1
8000,00	0,884440	122,00	122,00	0,00	2,1; -3,1
8000,00	0,992330	123,00	123,00	0,00	2,1; -3,1
8000,00	1,113400	124,00	124,00	0,00	2,1; -3,1
8000,00	0,035202	94,00	94,00	0,00	2,1; -3,1
8000,00	0,019792	89,00	89,00	0,00	2,1; -3,1
8000,00	0,011131	84,00	84,00	0,00	2,1; -3,1
8000,00	0,006255	79,00	79,00	0,00	2,1; -3,1
8000,00	0,003516	74,00	74,00	0,00	2,1; -3,1
8000,00	0,001976	69,00	69,00	0,00	2,1; -3,1
8000,00	0,001111	64,00	64,00	0,00	2,1; -3,1
8000,00	0,000622	59,00	59,00	0,00	2,1; -3,1
8000,00	0,000347	54,00	54,00	0,00	2,1; -3,1
8000,00	0,000196	49,00	49,00	0,00	2,1; -3,1
8000,00	0,000121	44,00	44,10	0,10	2,1; -3,1
8000,00	0,000061	39,00	39,10	0,10	2,1; -3,1
8000,00	0,000033	34,00	34,30	0,30	2,1; -3,1
8000,00	0,000029	33,00	33,30	0,30	2,1; -3,1
8000,00	0,000029	32,00	32,40	0,40	2,1; -3,1
8000,00	0,000020	31,00	31,40	0,40	2,1; -3,1
8000,00	0,000022	30,00	30,60	0,60	2,1; -3,1
8000,00	0,000019	29,00	29,80	0,80	2,1; -3,1

Tablo 4: 8000 Hz Seviye Doğrusallığı Testi / Level linearity Test

### 7.6 Seviye Aralıklarında Seviye Doğrusallığı / Level Linearity including the level range control

Seviye Aralığı	Frekans	Okunan Ses Seviyesi	Sapma	Tolerans
Level Range	Frequency	Measured Sound Level	Deviation	Tolerance
dB	Hz	dB		
20-130	1000,00	94,00	0,00	±1.1

Tablo 5: 1 kHz 94 dB'de Seviye Aralıklarında Seviye Kontrolü / Level Control at Level Ranges

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## 8. Uygunluk Beyanı / Statement of Compliance

Ölçüm sonuçları ve ölçüm belirsizliği yukarıda verilmiştir. Kullanıcı bunları dikkate alarak uygunluğuna karar vermelidir. Beyan edilen genişletilmiş belirsizlik değeri standart belirsizliğin normal dağılımı için; yaklaşık % 95 güvenilirlik seviyesini sağlayan  $k=2$  kapsam faktörü ile çarpımının sonucudur. Standart ölçüm belirsizliği GUM ve EA-4/02 dokümanlarına uygun olarak belirlenmiştir. Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı bir bölümüdür.

*The measurement results and measurement uncertainty were given. The user have to consider the results and decide compliance of the device. The reported expanded uncertainty of measurement is stated as the standart uncertainty of multitude by coverage factor  $k=2$ , which for a normal distribution corresponds to coverage of approximately 95%. The standart measurement uncertainty is defined according to the GUM and EA-4/02 documents. Measurement results, the expanded measurement uncertainty of measurement and calibration methods, is an integral part of the this certificate.*

## 9. Açıklama / Remarks

Bu sertifikada bulunan sonuçlar cihazın kalibrasyon tarihindeki durumu kapsar ve uzun dönem kararlılığı hakkında bir öngörü içermez.

*The result reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument*

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<b>TÜRKAK</b> <b>TÜRK AKREDİTASYON KURUMU</b> <i>TURKISH ACCREDITATION AGENCY</i> <i>tarafından akredite edilmiş</i>			
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<b>Kalibrasyon Sertifikası</b> <i>Calibration Certificate</i>			
 Kalibrasyon TS EN ISO/IEC 17025 AB-0078-K			
AB-0078-K			
91/2012			
02-12			
<b>Cihazın Sahibi/ adresi</b> <i>Customer / address</i>	: <b>Frekans Çevre Ölçüm Ltd. Şti.</b> Öveçler 4.Cad. 1335. Sok. Ihlamur Apt. 3/1 Öveçler / ANKARA		
<b>Talep Numarası</b> <i>Order Number</i>	: <b>54/2012</b>		
<b>Makine/Cihaz</b> <i>Instrument/Device</i>	: <b>Ses Seviyesi Ölçer</b>		
<b>İmalatçı</b> <i>Manufacturer</i>	: <b>SVANTEK</b>		
<b>Tip</b> <i>Type</i>	: <b>SVAN 958</b>		
<b>Seri Numarası</b> <i>Serial Number</i>	: <b>20702</b>		
<b>Kalibrasyon Tarihi</b> <i>Date of Calibration</i>	: <b>25.02.2012</b>		
<b>Sertifikanın Sayfa Sayısı</b> <i>Number of pages of the Certificate</i>	: <b>5</b>		
<b>Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standartlarına izlenebilirliği belgeler.</b> <i>This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).</i>			
<b>Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.</b> <i>The Turkish Accreditation Agency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation(EA) and of the International Laboratory Accreditation(ILAC) for the Mutual recognition of calibration certificates.</i>			
<b>Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.</b> <i>The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.</i>			
<b>Mühür</b> <i>Seal</i>	<b>Tarih</b> <i>Date</i>	<b>Kalibrasyonu Yapan</b> <i>Calibrated by</i>	<b>Laboratuvar Müdürü V.</b> <i>Head of Calibration Laboratory</i>
	28.02.2012	 Onur YILDIRIM	 Murat KUŞLU
Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz sertifikalar geçersizdir. <i>This certificate shall not be reproduced other than in full except with the permission of the laboratory. Calibration certificates without signature and seal are not valid.</i>			Sayfa 1/5 FRS10.02 rev00/02.08.2010



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91/2012

02-12

## 1. Test Edilen Cihaz

Adı	Üretici	Model / Tip	Seri No	Ölçme aralığı veya Tanımlama
Ses Düzeyi Ölçer (Aşağıdaki Mikrofon ve Ön Yükselteç ile)	SVANTEK	SVAN 958	20702	Sınıf : 1 Frekans Ağırlığı : A, C, Lin Zaman Ağırlığı : F:Hızlı, S:Yavaş
Ön Yükselteç	SVANTEK	SV 12L	25695	
Mikrofon	SVANTEK	SV 22	4012356	

2. Kalibrasyonun Yapıldığı Yer : Protos Kalibrasyon Laboratuvarı

3. Cihazın Laboratuvara Kabul Tarihi : 24.02.2012

## 4. Kalibrasyonda Kullanılan Referans Cihazlar :

Adı	Üretici	Model / Tip	Seri No	İzlenebilirlik
Çok Fonksiyonlu Akustik Kalibratör	B&K	4226	2692346	TÜBİTAK UME, G2AK0203-30.11.2011

5. Kalibrasyon Prosedürü : PR504.08 SLM Kalibrasyon Prosedürü  
Ses düzeyi ölçerin (SLM) A-Ağırlıklı, C-Ağırlıklı ve Lin filtrelerinin 31,5 Hz-16 kHz frekans aralığında tepkileri, doğrusallığı, F:Fast ve S:Slow zaman ağırlıklarının tepkileri, Crest Faktörü CF=3 ve bir saatlik çalışmada kararlılığı kontrol edildi.

Kalibrasyon sırasında referans cihaz tarafından üretilen ses basınç düzeyi değerleri ortam şartlarına göre düzeltilerek dikkate alınmıştır.

## 6. Çevre Şartları

Sıcaklık: (23 ± 1) °C

Bağıl Nem: %(36±5,0)

Basınç: (996±1,0)mbar



Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.

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02-12

## 7. Kalibrasyon Sonuçları

Tablo 1. SLM A-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	A-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-39,4	54,6	55,2	0,6	± 2,0
63	94,0	-26,2	67,8	68,4	0,6	± 1,5
125	94,0	-16,1	77,9	78,4	0,5	± 1,5
250	94,0	-8,6	85,4	85,8	0,4	± 1,4
500	94,0	-3,2	90,8	91,1	0,3	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	1,2	95,2	94,5	-0,7	± 1,6
4000	94,0	1,0	95,0	93,6	-1,4	± 1,6
8000	93,9	-1,1	92,8	90,4	-2,4	+2,0;-3,1
12500	94,1	-4,3	89,8	86,2	-3,6	+3,0;-6,0
16000	94,1	-6,6	87,5	80,9	-6,6	+3,5;-17,0

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

Tablo 2. SLM C-ağırlıklı filtrenin frekans tepkileri sonuçları

Frekans (Hz)	Nominal SPL (dB)	C-ağırlıklı filtrenin karakteristiği (dB)	Hesaplanan SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	-3,0	91,0	91,6	0,6	± 2,0
63	94,0	-0,8	93,2	93,8	0,6	± 1,5
125	94,0	-0,2	93,8	94,4	0,6	± 1,5
250	94,0	0,0	94,0	94,5	0,5	± 1,4
500	94,0	0,0	94,0	94,4	0,4	± 1,4
1000	94,0	0,0	94,0	94,0	0,0	± 1,1
2000	94,0	-0,2	93,8	93,1	-0,7	± 1,6
4000	94,0	-0,8	93,2	91,8	-1,4	± 1,6
8000	93,9	-3,0	90,9	88,5	-2,4	+2,0;-3,1
12500	94,1	-6,2	87,9	84,3	-3,6	+3,0;-6,0
16000	94,1	-8,5	85,6	78,8	-6,8	+3,5;-17,0

Tablodaki değerler SLM C-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

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# APPENDIX - 1



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**Tablo 3. SLM Lin filtresinin frekans tepkileri sonuçları**

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
31.5	94,0	94,6	0,6	± 2,0
63	94,0	94,6	0,6	± 1,5
125	94,0	94,5	0,5	± 1,5
250	94,0	94,5	0,5	± 1,4
500	94,0	94,4	0,4	± 1,4
1000	94,0	94,0	0,0	± 1,1
2000	94,0	93,3	-0,7	± 1,6
4000	94,0	92,6	-1,4	± 1,6
8000	93,9	91,4	-2,5	+2,0;-3,1
12500	94,1	90,6	-3,5	+3,0;-6,0
16000	94,1	87,4	-6,7	+3,5;-17,0

Tablodaki değerler SLM Lin -ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

**Tablo 4. SLM 1 kHz'deki doğrusallık kontrolü sonuçları**

Frekans (Hz)	Uygulanan		Ölçülen		Tepki Farkı (dB)	Tolerans (dB)
	SPL (dB)	Seviye Artışı (dB)	SPL (dB)	Seviye Artışı (dB)		
1000	94,0	0,0	94,0	0,0	0,0	±0,6
	104,0	10,0	104,0	10,0	0,0	
	114,0	20,0	114,0	20,0	0,0	

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

**Tablo 5. SLM Zaman Ağırlıklı filtrelerinin Hızlı (Fast) ve Yavaş (Slow) Kontrolü Sonuçları**

Frekans (Hz)	Hızlı				Yavaş			
	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
1000	105,0	105,0	0,0	±0,8	101,9	102,0	0,1	±0,8
2000	105,0	105,0	0,0		101,9	102,0	0,1	
4000	105,0	105,0	0,0		101,9	102,0	0,1	

Tablodaki değerler SLM A-ağırlıklı filtre modunda iken elde edilmiştir.

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# APPENDIX - 1



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**Tablo 6. SLM "Crest Factor CF=3" Kontrolü Sonuçları**

Frekans (Hz)	Nominal SPL (dB)	Ölçülen SPL (dB)	Tepki Farkı (dB)	Tolerans (dB)
2000	94,0	94,2	0,2	±0,5
	104,0	104,2	0,2	

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

**Tablo 7. SLM Bir saatlik çalışmasında okunan değerdeki en büyük sapma sonuçları**

Nominal SPL (dB)	Ölçülen SPL (dB)	En büyük sapma * (dB)	Tolerans (dB)
94,0	94,0	0,0	± 0,3

\*En büyük sapma, ölçülen değerdeki bir saatlik okuma süresi boyunca ki değişimdir.

Tablodaki değerler SLM A-ağırlıklı filtre ve Fast modunda iken elde edilmiştir.

## 8. Ölçüm Belirsizliği

Ses düzeyi ölçerinin kalibrasyonundaki belirsizlik 0,2 dB'dir.

Beyan edilen genişletilmiş ölçüm belirsizliği, standart belirsizliğin k=2 olarak alınan genişletme katsayısı ile çarpımı sonucunda bulunan değerdir ve %95 oranında güvenilirlik sağlamaktadır.

## 9. Görüşler, Açıklamalar ve Uygunluk Beyanı

Ölçüm sonuçları IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için verilen toleranslarla karşılaştırılmıştır. Cihazın ölçülen özelliklerinin IEC 61672-1 standartında 1.Sınıf Ses Düzeyi Ölçerler için belirtilen şartlara uygun olduğu tespit edilmiştir.

Kalibrasyon sonuçları sadece kalibrasyonu yapılan ses düzeyi ölçer cihazına aittir. Cihazın performansı için gerekli çevre şartlarında kullanımından ve uygun aralıklarla kalibrasyonunun sağlanmasından kullanıcı sorumludur.



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## **ANNEX I-2**

### **Detailed Grid Maps for Construction (Phase 1 and Phase 2)**

**DETAILED GRID MAPS for Baseline Noise Measurement Locations during Construction - PHASE 1:  
LAND PREPARATION & EARTHWORKS & MAIN CONSTRUCTION**

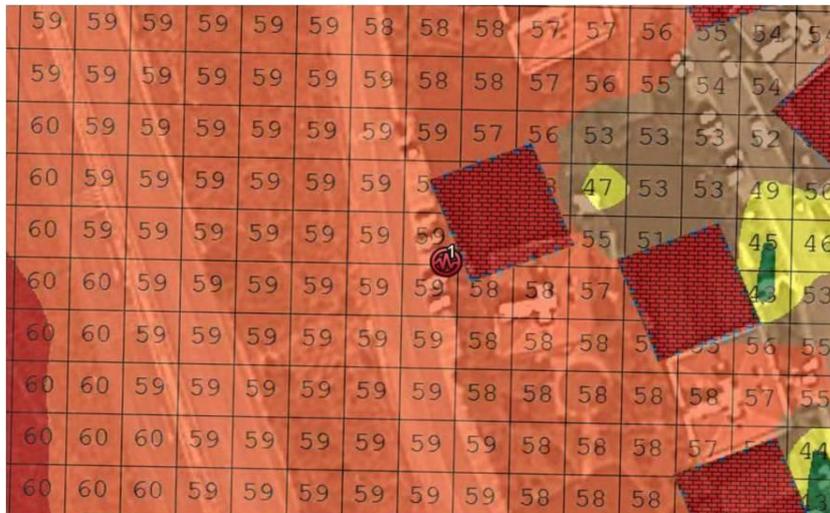


Figure I2-1: Measurement location 1, Phase 1



Figure I2-2: Measurement location 2, Phase 1

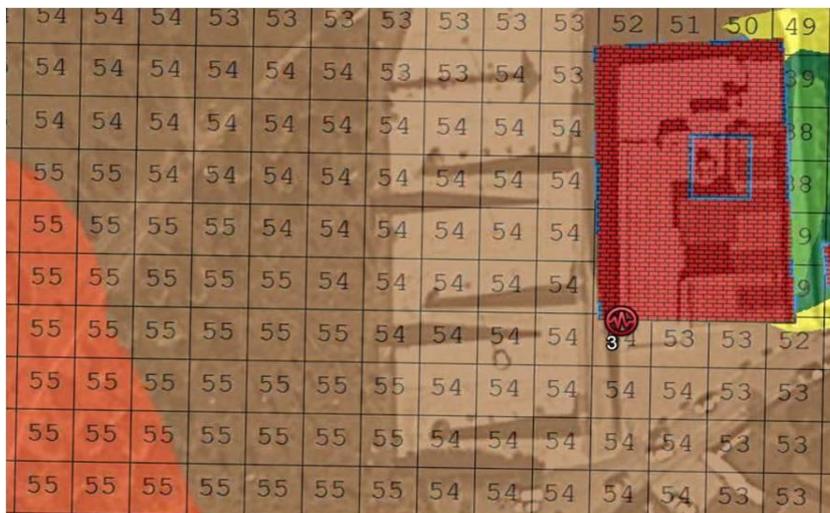


Figure I2-3: Measurement location 3, Phase 1

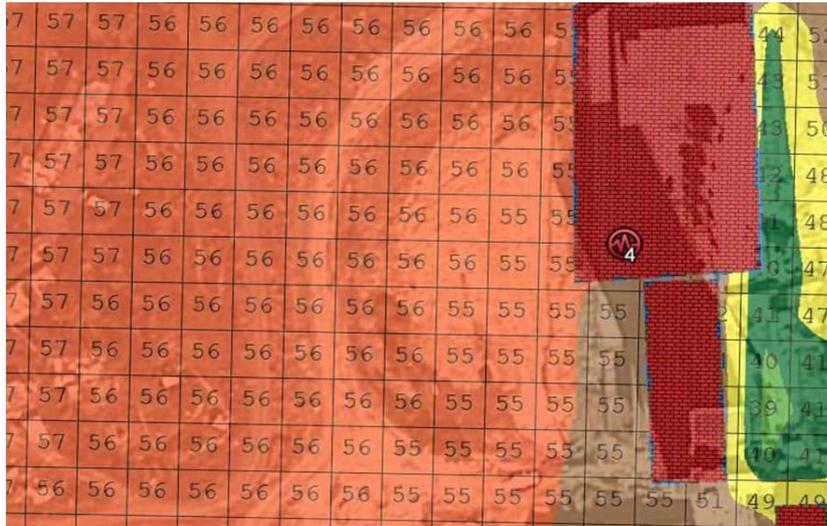


Figure I2-4: Measurement location 4, Phase 1

**DETAILED GRID MAPS for Baseline Noise Measurement Locations during Construction - PHASE 2: MAIN CONSTRUCTION**

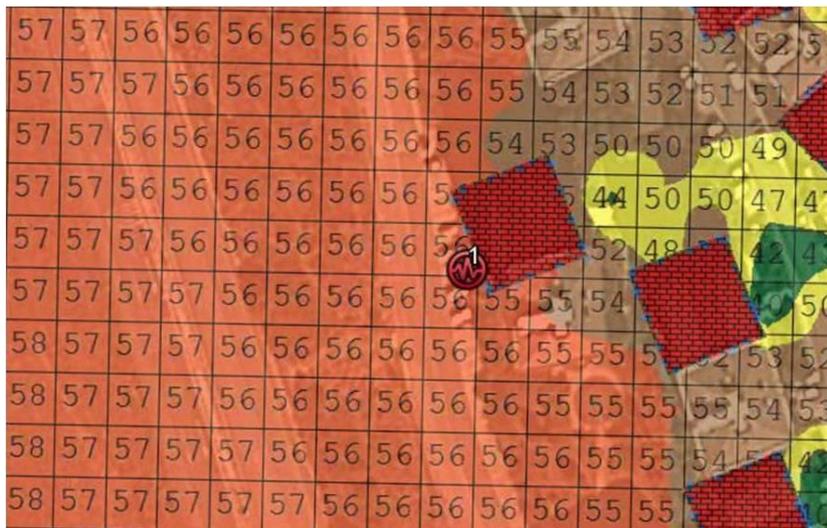


Figure I2-5: Measurement location 1, Phase 2

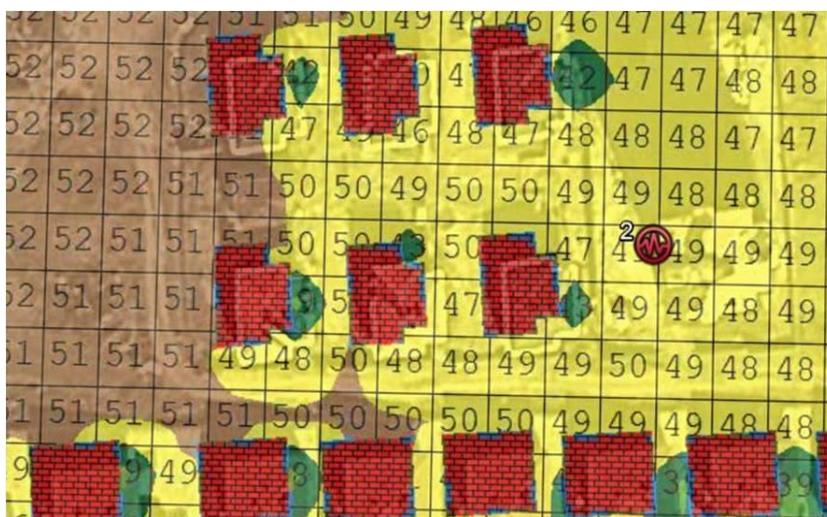


Figure I2-6: Measurement Location 2, Phase 2

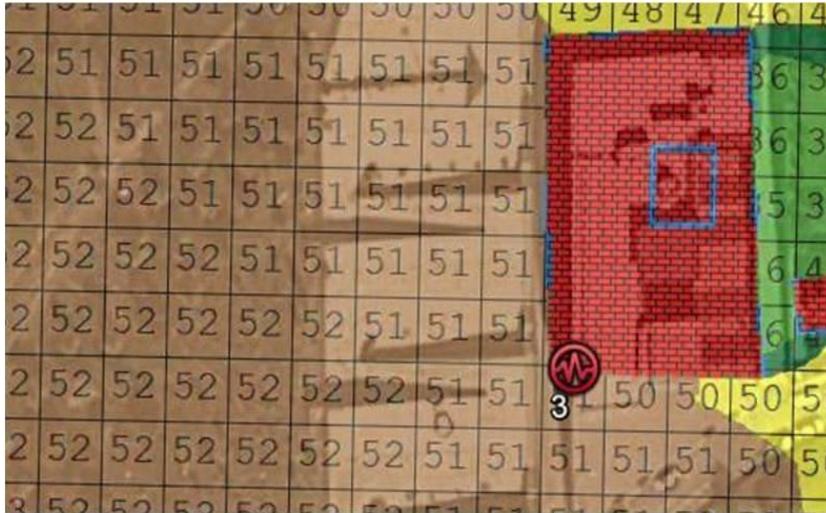


Figure I2-7: Measurement Location 3, Phase 2

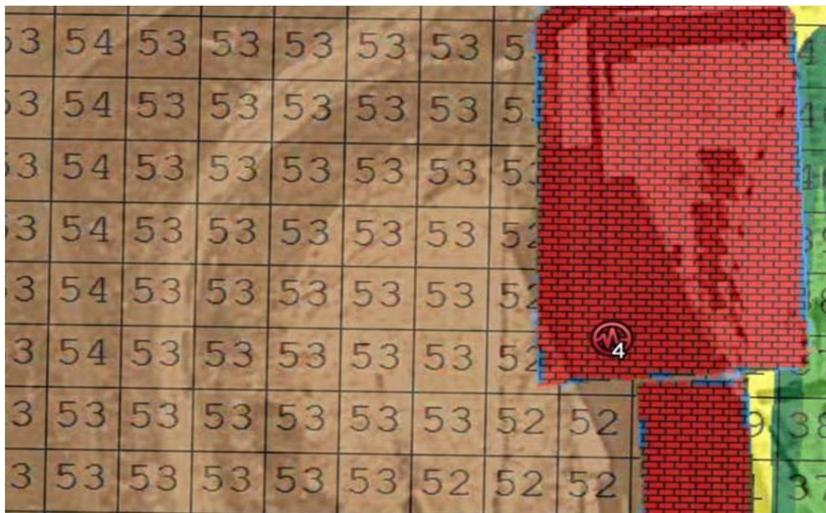


Figure I2-8: Measurement Location 4, Phase 2

## **ANNEX J**

### **Traffic Assessment Supporting Information**

**IHIC**  
İSTANBUL İKİTELLİ  
ULUSLARARASI SAĞLIK HİZMETLERİ  
YATIRIM VE İŞLETME A.Ş.

**ISTANBUL İKİTELLİ INTEGRATED HEALTH CAMPUS  
TRAFFIC STUDY  
FINAL SUBMISSION**

**JANUARY 2014**

**BOĞAZIÇI PROJE MÜHENDİSLİK  
PLANLAMA VE İNŞ. SAN. TİC. LTD. ŞTİ.**



Project Title

**ISTANBUL İKİTELLİ INTEGRATED HEALTH CAMPUS  
TRANSPORTATION - TRAFFIC ANALYSIS AND  
PROPOSED TRAFFIC DESIGN PROJECT  
TRAFFIC ANALYSIS AND PROPOSED TRAFFIC STUDY  
– Final Submission –**

Employer



**IHC İSTANBUL İKİTELLİ  
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	2) Özkan HAYTA	Civil Engineer	Asst.Project Manager	
	3) Murat BAŞÇI	Y. Şehir Plancısı	Expert Staff	
	4) Esin KASIMOĞLU	Şehir Plancısı	Expert Staff	

**Studies:**

- Existing Situation Analysis
- Draft Project Study
- Traffic Demand Supply
- Evaluation
- Proposed Traffic Design Project
- Final Traffic Simulation

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## 1. INTRODUCTION

### 1.1. Aim of Study

Transportation studies of "Istanbul İkitelli Integrated Health Campus Project", conducted by IHIC İkitelli International Healthcare Investment and Management Company, is prepared by Bogazici Project Engineering Planning Sti. Regulating existing transportation infrastructure, traffic demand calculations, designing accessible circulation and entrances of parking areas and other necessary analysis will be done within this study.

Istanbul İkitelli Integrated Health Campus Project consists a hospital having 2682 beds and aiming to serve whole city of Istanbul (Hospital facility includes a general hospital, orthopedic and neurological sciences hospital, cardiovascular diseases hospital, maternity hospital, children's hospital, oncology hospital, psychiatric hospital, rehabilitation hospital, a clinical hotel, social and commercial zones as well.

As a part of transportation-traffic studies, traffic surveys and observations of the Istanbul İkitelli Integrated Health Campus Project, have been made according to site visit on 14 November 2013. To evaluate existing situation study, existing transportation infrastructure of the project area is examined and traffic counts have been made at 2 intersections. Existing, planned projects and related data is collected. Then all the data is evaluated to identify the problems and to develop proposals for transportation infrastructure. Also, proposed transportation plan and its explanation notes will be within the scope of this report.

### 1.2. Method and Scope of Study

Aim of this study is to analyze strong and weak features of architectural design, in terms of transportation network, accessibility, parking places and capacity and preparing transportation network proposal as well.

Initially, existing situation analysis will be given, then traffic demand calculation related with the data will be explained. Finally, proposed plan designed in line with general evaluation and suggestions will be explained.

## 2. EXISTING SITUATION

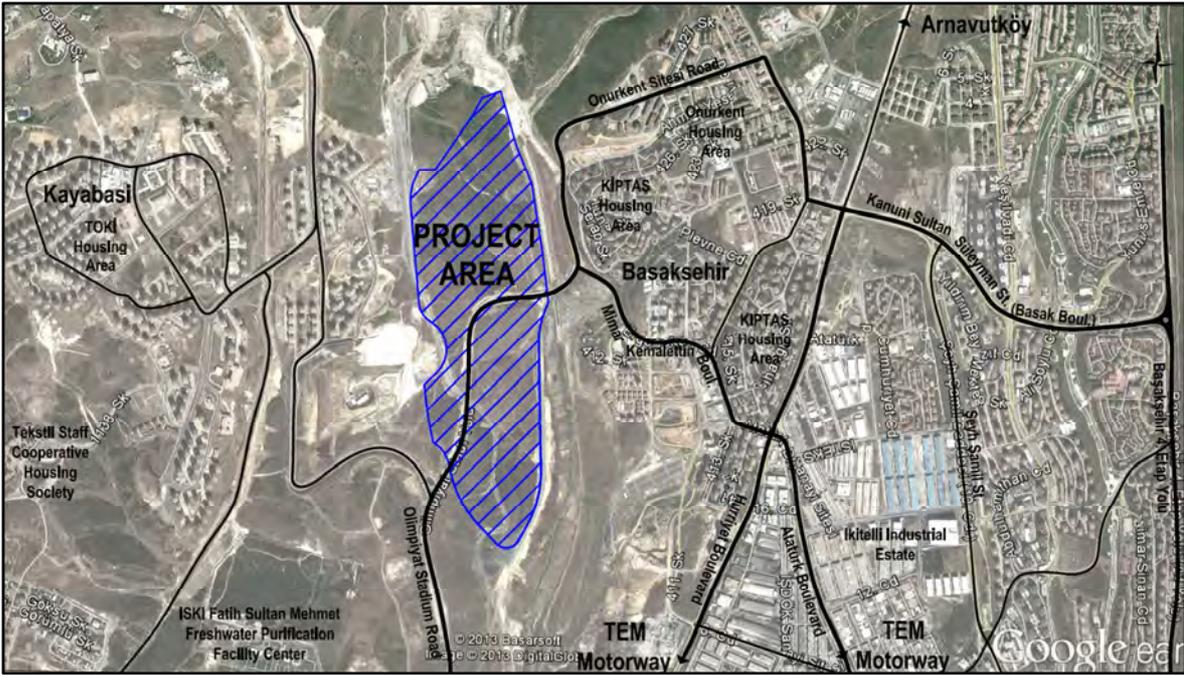
In this section, location, accessibility, functional zones within and surrounding the project area will be explained.

### 2.1. Project Area and the Urban Transportation System

Istanbul İkitelli Integrated Health Campus is located on “Olimpiyat Boulevard” which exists within Basaksehir District at European side of the city. It is on the north of TEM (E-80) Highway which lies in east-west direction. Ataturk Olimpiyat Stadium and İSKİ Fatih Sultan Mehmet Fresh Water Purification Centre are located on South of project area. Menekşe stream and its flood prevention zone restricts the area on east. Also beyond the stream on east, residential areas and industrial zones are present. Finally residential areas surrounding the area on West and North. (See.Figure 1 and Figure 2).



**Figure 1. Location of Project Area**



**Figure 2. Project Area**

Project area is vacant in present. (See Photo 1, Photo 2, Photo 3)

Analysis of existing situation depends on data collected from surveys and observations and data provided by employer.



**Photo 1. Scene from East of Project Area (Scene from Onurkent Settlement)**



**Photo 2. Scene from East of Project Area (Scene from Onurkent Settlement)**



**Photo 3. Project Area (Taken from center of Construction Area viewing east (Onurkent) direction.)**

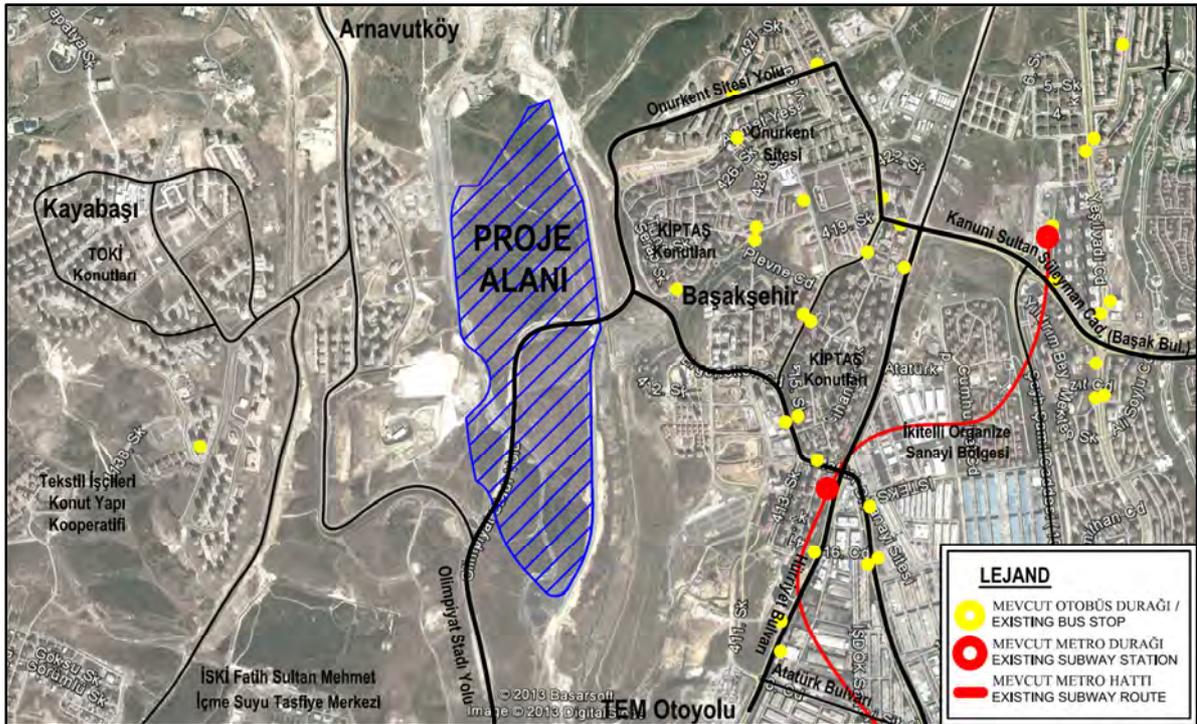
## 2.2. Access by Public Transit

Istanbul is a city which is expanding in a linear fashion from the center in both East and West directions. The city has grown around the two main roads, D100 (formerly named as E-5) and TEM (E-80). Several new developments around TEM (E-80) has lead to an increased density of housing capacity and rapid expansion in the east and West directions.

The project area has strong private transportation connections to the east and West directions due to the close proximity of TEM (E-80) but the public transportation system is weak because the area is still under development.

Public transportation from the city center to the area adjacent to project area is provided by Başakşehir bus lines and Başakşehir M3 metro line as shown in Figure 3.

The above mentioned bus and metro systems are being developed in order to improve the accessibility by public transportation to the project area. The current metro line M3 is planned to be extended to the 3rd airport metro line by 2019 (See Figure 4 and Figure 5)



**Figure 3. Bus Stops Around Project Area**

To improve public transit access to the project area, current bus and metro systems mentioned above will be developed in the present. Existing Metro M3 Line and proposed

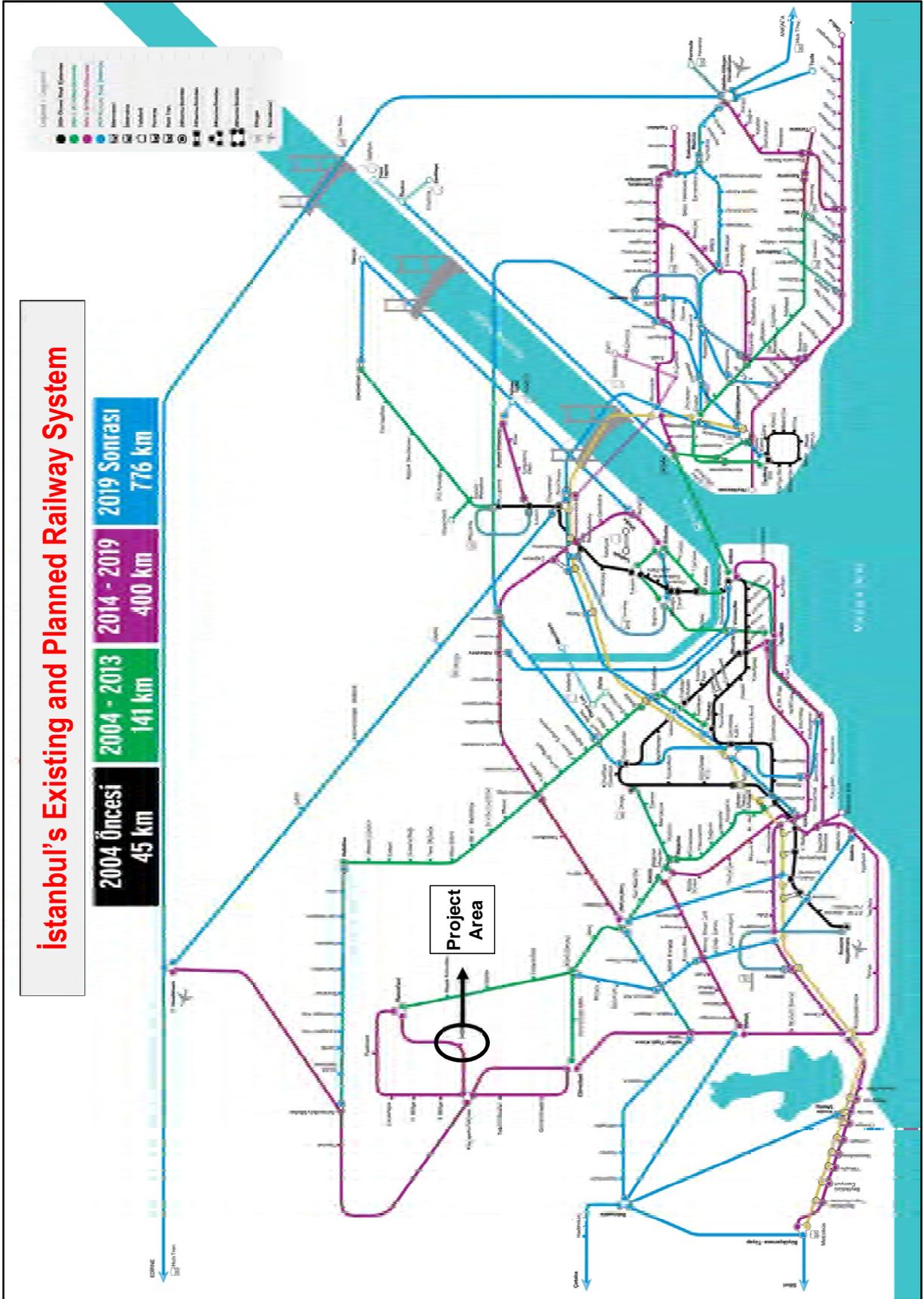
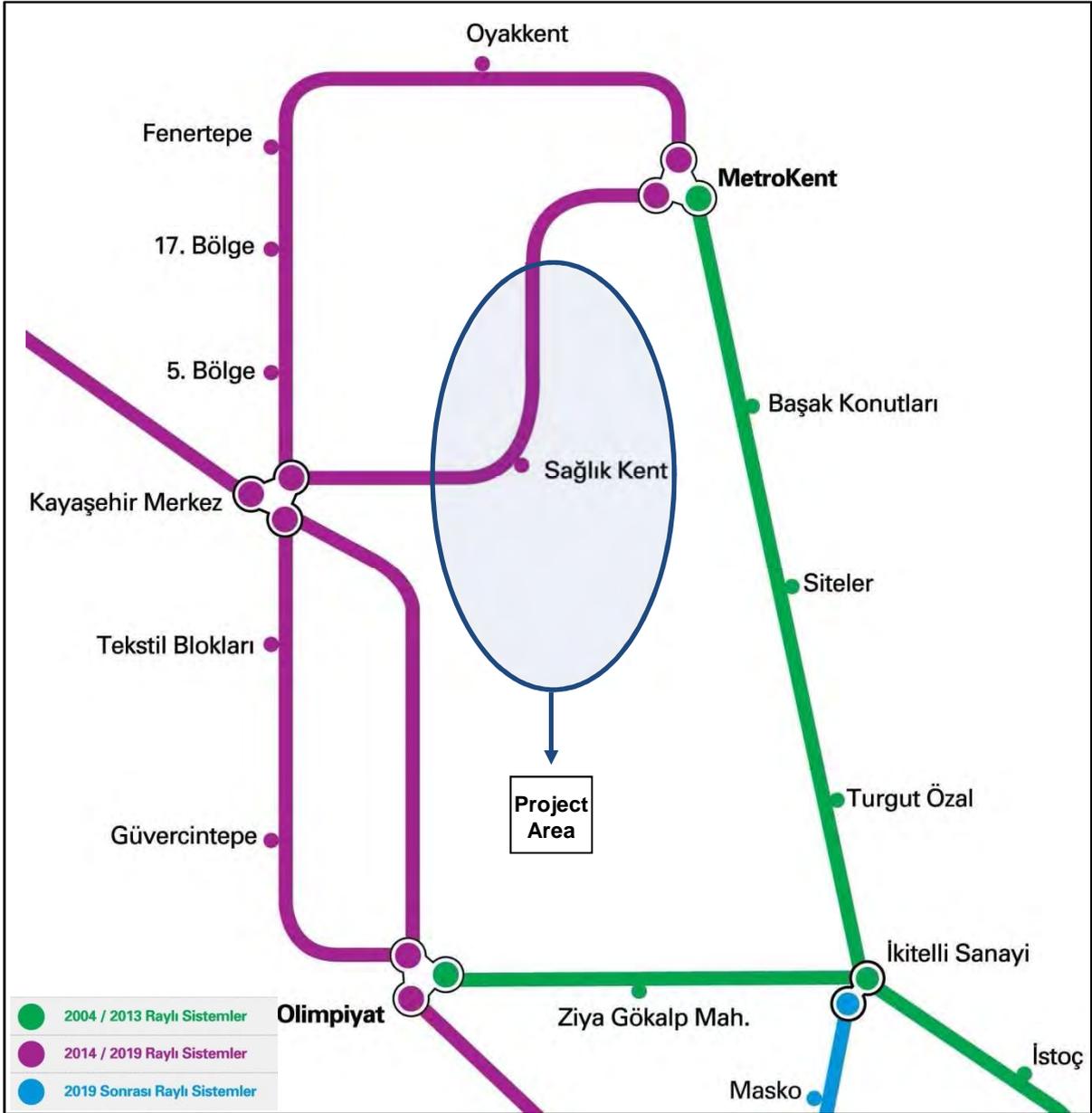


Figure 4. İstanbul Existing and Planned Railway System



**Figure 5. İstanbul Existing and Planned Railway System – Sağlık Kent Station**

### 3. EXISTING TRANSPORTATION INFRASTRUCTURE

In this section, existing transportation connections and related intersections will be analyzed and access to the project area will be evaluated.

#### 3.1. Existing Transportation Infrastructure

Access to project area from the Ankara direction, can be made by taking the exit from Mahmutbey West Intersection of TEM (E-80) Motorway and connecting to Olimpiyat Boulevard. As a second alternative, access is possible by taking the exit from Mahmutbey West Intersection and connecting Olimpiyat Boulevard through Ataturk Boulevard. Access from Tekirdag direction can also be made by taking the Mahmutbey West Intersection exit of TEM (E-80) Motorway and connecting to Ataturk Boulevard.

Olimpiyat Boulevard is a 22 m wide, 2x2 dual carriageway, passes through the project area. On the east, this road connects to Mimar Kemalettin and Ataturk Boulevards through Basaksehir Intersection and on the southwest, the boulevard connects to TEM (E-80) Motorway through Kayasehir Intersection (See Photo 4).

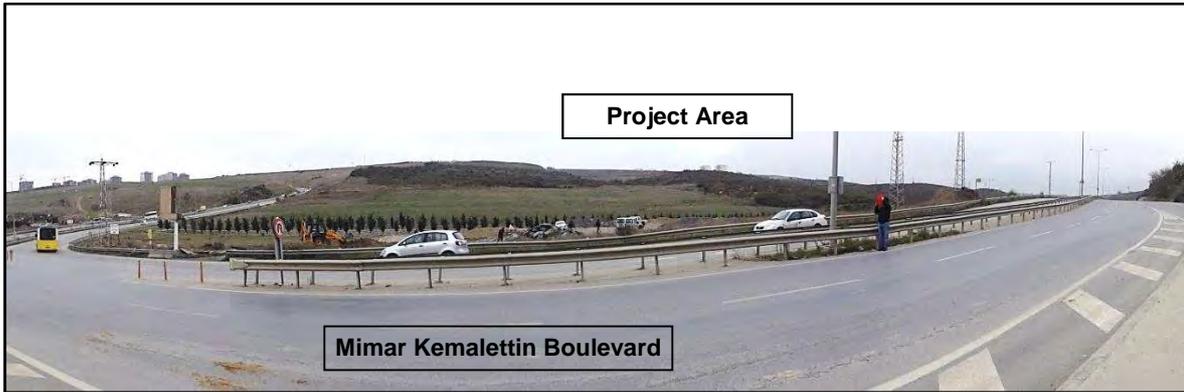


**Photo 4. Olimpiyat Boulevard (Passes Through the Project Area)**

Mimar Kemalettin Boulevard is a continuation of Ergenekon Street, that is a 12 m wide, road. After Basaksehir Intersection, it becomes 2x2 dual carriageway and continues to Onurkent direction. (See Photo 5 and Photo 6).



**Photo 5. Mimar Kemalettin Boulevard - Olimpiyat Boulevard Connection**



**Photo 6. Mimar Kemalettin Boulevard and Project Area**

### 3.2. Existing Intersections

The Olimpiyat Boulevard connection to The Basaksehir and Kayasehir settlements, is provided by using Kayasehir and Basaksehir Intersections (See Figure 6).

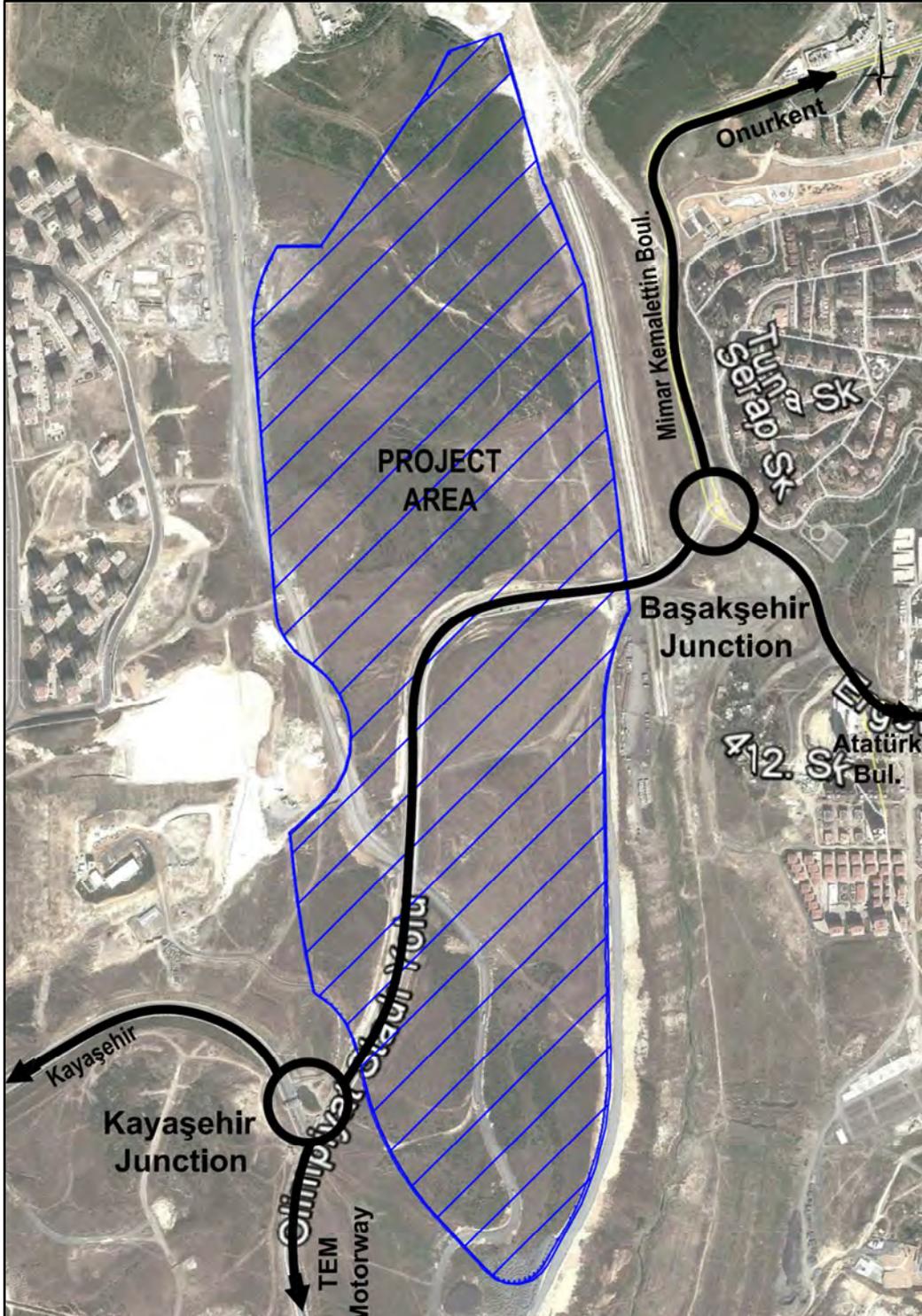


Figure 6. Olimpiyat Boulevard and Intersections Close to Project Area

Traffic counts for these intersections have been taken on 22.11.2013.

After deciphering the traffic counts and video records taken, peak hours for morning, midday and evening periods for each intersection are decided regarding below systematic;

- For each 3 counting period in the day, flow counts are deciphered by 15 minutes intervals,
- 4 of the consecutive quarters, which gives the highest results in sum, is defined as the peak hour for that counting period.

After identifying the peak hour, firstly flow measures are converted to per car unit by using the coefficients defined for each type of vehicle. (see Table 1)

**Table 1. Coefficients of Per Car Unit Conversion**

Type of Vehicle	Coefficient
Car / Taxicab	1
Pickup/ Panelvan / SUV	1,5
Minibus (both used for Public Transportation and Personnel Service)	1,5
Bus (both public and Privatized Public Transport Vehicles)	2,5
Trucks / TIR / Engineering Vehicles	3
Excavation Trucks	3

Then converted flow measures is split by arms of the intersection.

Finally, each result for arms are split by destinations.

A matrice showing the flow measures amongst arms is created and shown in tables

In these matrices, rows represent the flows produced from each arm of intersection and columns represent the flows attracted by each arm of intersection.

Also figures showing the numbers assigned to arms of intersection are given.

### 3.2.1. *Basaksehir Intersection*

Olimpiyat Boulevard and Mimar Kemalettin Boulevard creates Basaksehir intersection at 150 mt distance on east of the project area. This is an uncontrolled, 3 armed intersection that connects the line from Olimpiyat Boulevard to Atatürk Boulevard through Mimar Kemalettin Boulevard (See Figure 6 and Photo 7).



**Photo 7. Basaksehir Intersection**

According to the result of Başakşehir Intersection traffic counts, morning peak hour have been identified between 07:30 and 08:30. A.M. (See Table 2)

- Total traffic volume of the intersection is 2,524 per car unit (PCU).
- In the morning peak hour, arm 1 is the most widely used arm having a produced volume of 1,874 PCU. 69% of the vehicles (1,300 PCU) produced by arm 1, is attracted by arm 2.
- Arm 2, having 1,316 PCU attracted in total, also has the highest attracted flow measures, amongst arms of the intersection. 99% of these vehicles (1,300 PCU) come from arm 1.
- Arm 3 has the lowest flow measures both for attraction and production. Whilst the attracted volume by this arm is 586 PCU, produced volume is 244 PCU.

According to the midday count results, peak hour is identified between 12:30 and 13:30. P.M. (See Table 2)

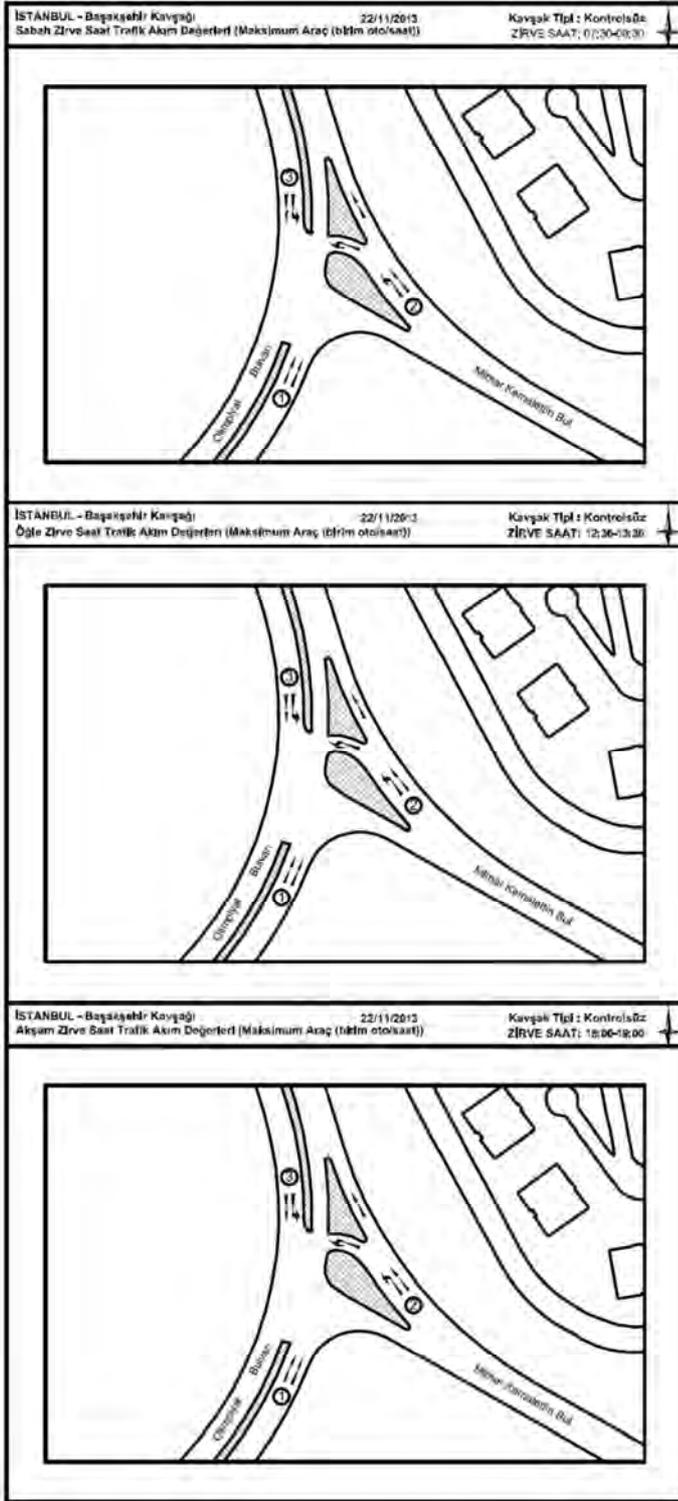
- Total traffic volume of the intersection is 1,221 PCU.
- In the midday peak hour, arm 1 is the most widely used intersection arm having a produced volume of 620 PCU.

- Also in terms of the attracted volume, arm 1 has the highest value, which is 578 PCU, as well.
- Similar to morning peak hour results, arm 3 is also having the lowest values of produced and attracted flow in midday peak hour. (Prod: 194 PCU, Attr: 210 PCU)

According to the evening count results, peak hour is identified between 18:00 and 19:00. P.M. (See Table 2)

- Total traffic volume of the intersection is 2,068 PCU.
- In the evening peak hour, arm 2 is the most widely used arm having a produced volume of 984 PCU. 98% of these vehicles (966 PCU) produced by arm 2, is attracted by arm 1.
- Arm 1, having 1,420 PCU attracted in total, also has the highest attracted flow measures, amongst arms of the intersection. 68% of these vehicles (966 PCU) come from arm 2.
- Arm 3 has the lowest flow measures both for attraction and production. Whilst the attracted volume by this arm is 250 PCU, produced volume is 466 PCU.

**Table 2. Basaksehir Intersection Flow Count Results (PCU)**



**MORNING PEAK HOUR (07:30 - 08:30)**

Flow Number	1	2	3	Total Prod Value.(PCU)
1	-	1300	574	1874
2	394	-	12	406
3	228	16	-	244
<b>Total Attr Value (PCU)</b>	<b>622</b>	<b>1316</b>	<b>586</b>	<b>2524</b>

**MIDDAY PEAK HOUR (12:30 - 13:30)**

Flow Number	1	2	3	Total Prod Value.(PCU)
1	-	427	193	620
2	390	-	17	407
3	188	6	-	194
<b>Total Attr Value (PCU)</b>	<b>578</b>	<b>433</b>	<b>210</b>	<b>1221</b>

**EVENİNG PEAK HOUR (18:00 - 19:00)**

Flow Number	1	2	3	Total Prod Value.(PCU)
1	-	386	232	618
2	966	-	18	984
3	454	12	-	466
<b>Total Attr Value (PCU)</b>	<b>1420</b>	<b>398</b>	<b>250</b>	<b>2068</b>

### 3.2.2. Kayasehir Intersection

Olimpiyat Boulevard and Kayasehir Street creates Kayasehir intersection at 100 mt distance on west of the project area. This is an uncontrolled, 3 armed intersection that connects the line from Olimpiyat Boulevard to Kayasehir Street (See Figure 6 and Photo 8)



**Photo 8. Kayasehir Intersection**

According to the result of Kayasehir Intersection traffic counts, morning peak hour have been identified between 07:30 and 08:30. A.M.

- Total traffic volume of the intersection is 3,142 per car unit (PCU).
- In the morning peak hour, arm 3 is the most widely used arm having a produced volume of 2,088 PCU. 78% of the vehicles (1,621 PCU) produced by arm 3, is attracted by arm 1.
- Arm 1, having 1,799 PCU attracted in total, also has the highest attracted flow measures, amongst arms of the intersection. 90% of these vehicles (1,621 PCU) come from arm 3.
- Arm 2 has the lowest flow measures both for attraction and production. Whilst the attracted volume by this arm is 609 PCU, produced volume is 401 PCU.

According to the midday count results, peak hour is identified between 12:30 and 13:30. P.M.

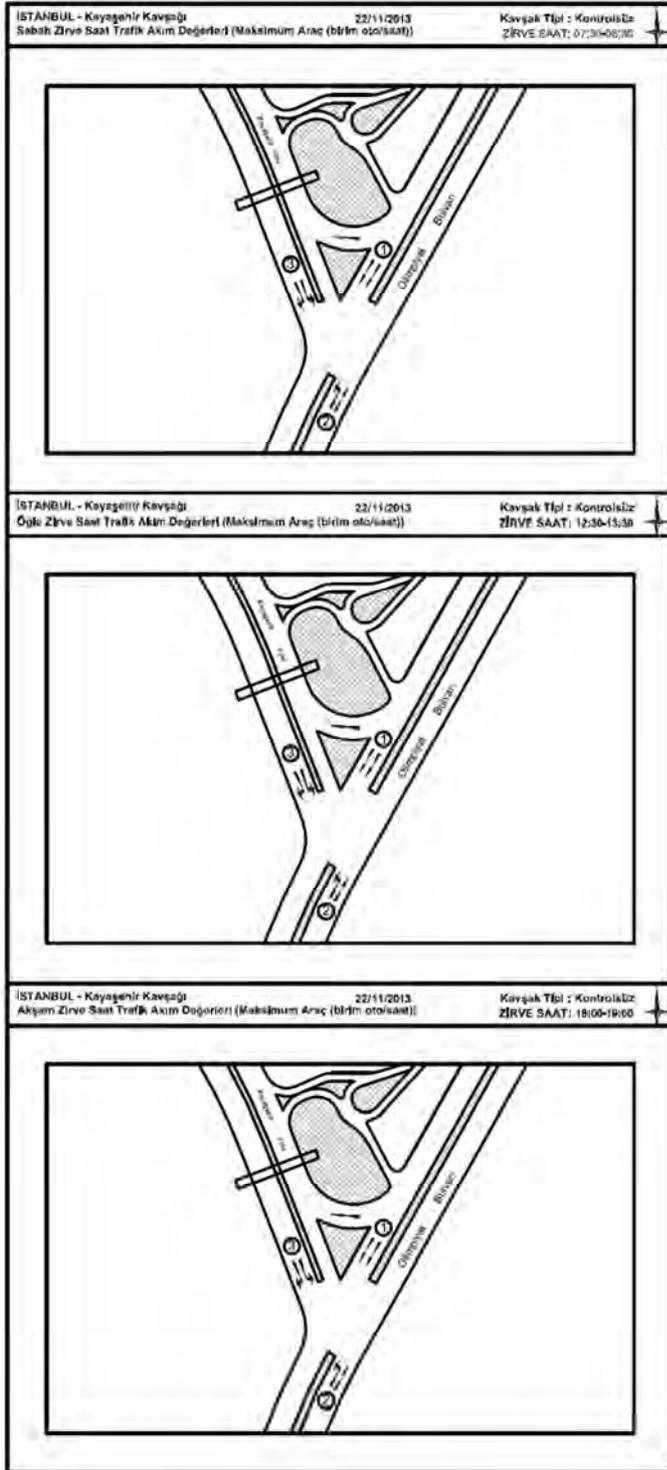
- Total traffic volume of the intersection is 1,540 PCU.

- In the midday peak hour, arm 3 is the most widely used intersection arm having a produced volume of 699 PCU. 75% of the vehicles (527 PCU) produced by arm 3, is attracted by arm 1.
- Arm 1, having 632 PCU attracted in total, also has the highest attracted flow measures, amongst arms of the intersection. 83% of these vehicles (527 PCU) come from arm 3.
- Similar to morning peak hour results, arm 3 is also having the lowest values of produced and attracted flow in midday peak hour. (Prod: 194 PCU, Attr: 210 PCU)
- Arm 2 has the lowest flow measures both for attraction and production. Whilst the attracted volume by this arm is 285 PCU, produced volume is 253 PCU.

According to the evening count results, peak hour is identified between 18:00 and 19:00. P.M.

- Total traffic volume of the intersection is 2,622 PCU.
- In the evening peak hour, arm 1 is the most widely used arm having a produced volume of 1,445 PCU. 92% of these vehicles (1,329 PCU) produced by arm 1 is attracted by arm 3.
- Arm 3, having 1,657 PCU attracted in total, also has the highest attracted flow measures, amongst arms of the intersection. 80% of these vehicles (1,329 PCU) come from arm 1.
- Arm 3 has the lowest flow measures both for attraction and production. Whilst the attracted volume by this arm is 342 PCU, produced volume is 378 PCU.

**Table 3. Kayasehir İntersection Flow Count Results (PCU)**



**MORNING PEAK HOUR (07:30 - 08:30)**

Flow Number	1	2	3	Total Prod Value.(PCU)
1	-	142	511	653
2	178	-	223	401
3	1621	467	-	2088
<b>Total Attr Value (PCU)</b>	<b>1799</b>	<b>609</b>	<b>734</b>	<b>3142</b>

**MIDDAY PEAK HOUR (12:30 - 13:30)**

Flow Number	1	2	3	Total Prod Value.(PCU)
1	-	113	475	588
2	105	-	148	253
3	527	172	-	699
<b>Total Attr Value (PCU)</b>	<b>632</b>	<b>285</b>	<b>623</b>	<b>1540</b>

**EVENING PEAK HOUR (18:00 - 19:00)**

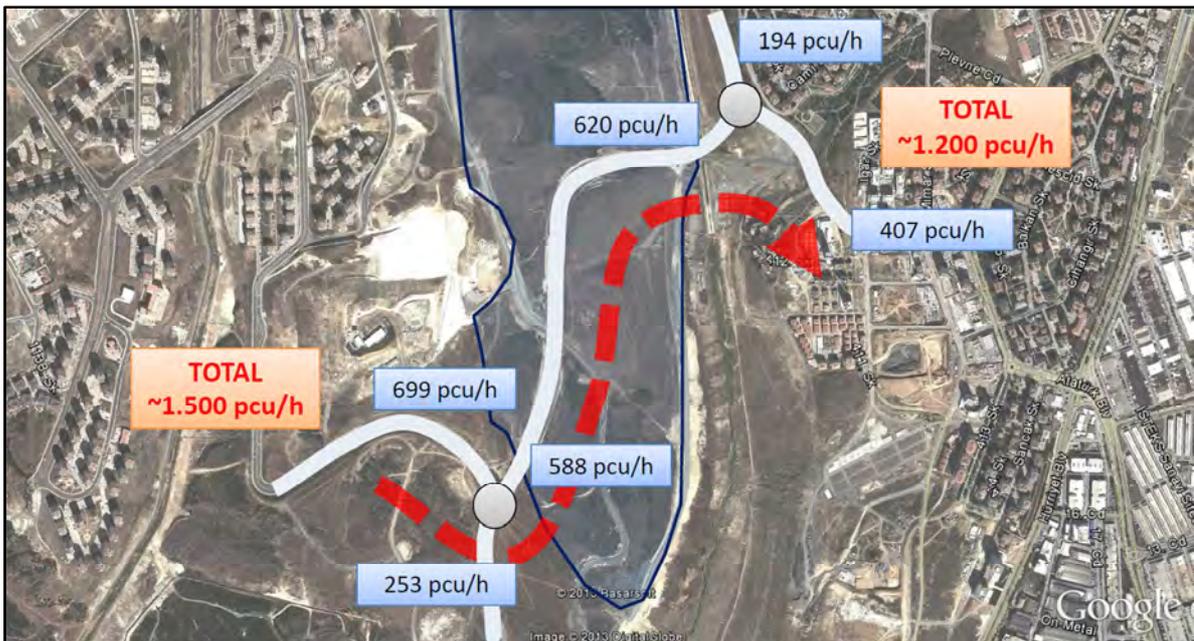
Flow Number	1	2	3	Total Prod Value.(PCU)
1	-	116	1329	1445
2	50	-	328	378
3	573	226	-	799
<b>Total Attr Value (PCU)</b>	<b>623</b>	<b>342</b>	<b>1657</b>	<b>2622</b>

It's seen that both of the intersections have the highest values in the morning peak hour. In the morning and midday, main flow direction is from Kayasehir (West) to Basaksehir. (East)

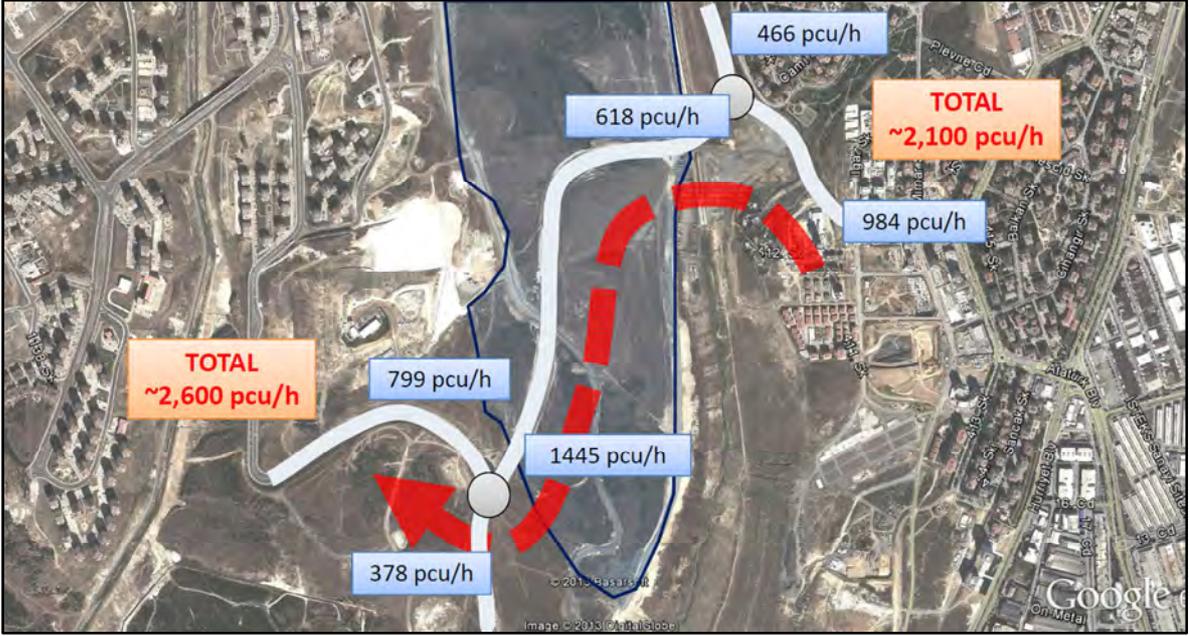
On the other hand, in the evening period, main flow direction is from Basaksehir (east) to Kayasehir (West) (See Figure 7, Figure 8, Figure 9). The values shown in figures, only represents the number of vehicles produced by arms. (PCU)



**Figure 7. Morning Peak Hour - Split Of Trips In Terms Of Directions**



**Figure 8. Midday Peak Hour - Split Of Trips In Terms Of Directions**



**Figure 9. Evening Peak Hour - Split Of Trips In Terms Of Directions**

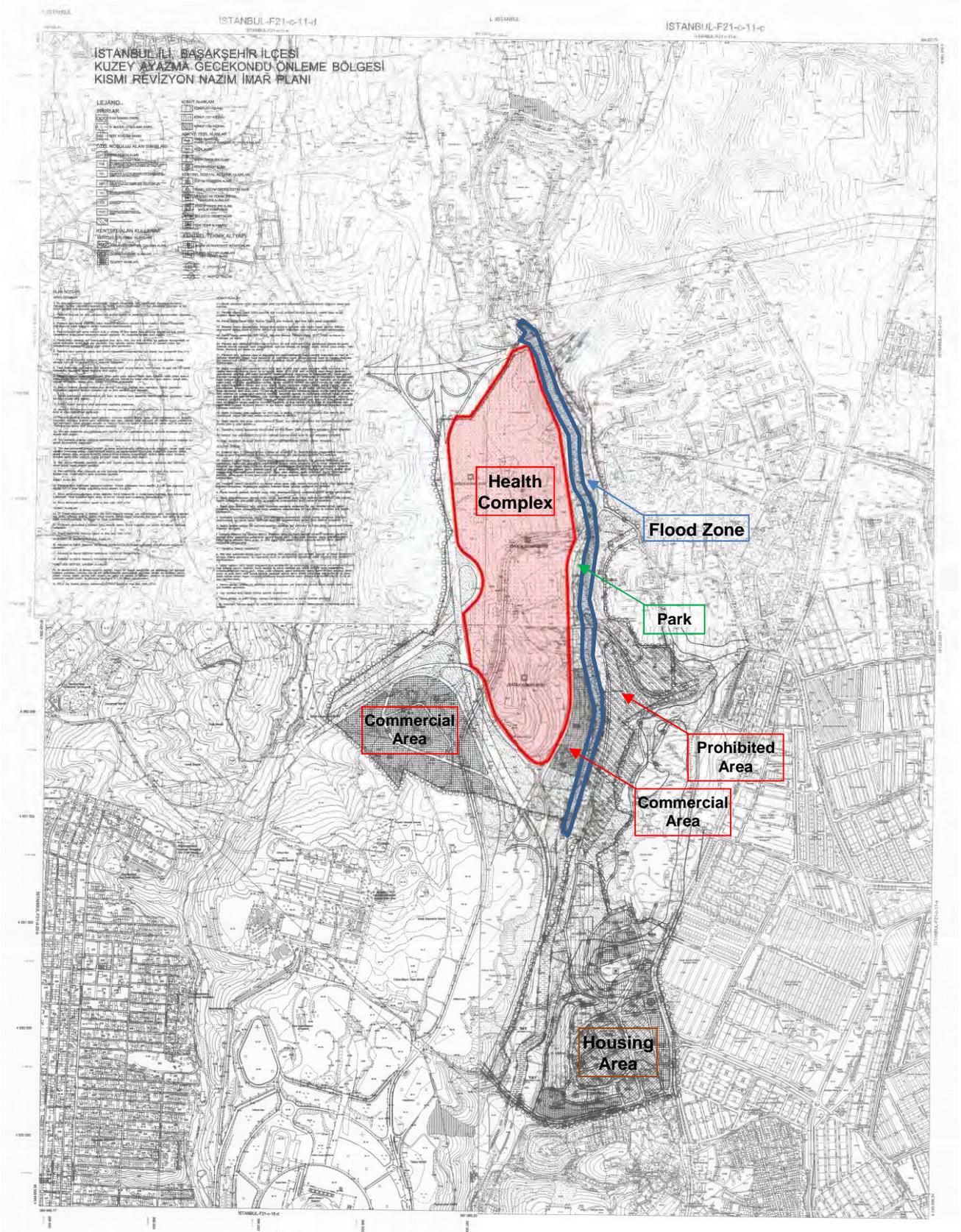
## 4. GENERAL OVERVIEW of SURROUNDING NETWORK

In this section, zoning plans (1/5.000) and implementation plans (1/1.000), proposed transit system, planned intersections and the North Marmara Motorway Project will be evaluated.

### 4.1. Zoning Plan

Project area is defined as "Health Facility Area - Health Complex" according to 1/5.000 scaled Partial Revision Zoning Plan of North Ayazma Slum Prevention Region.

Zoning plan shows that there are residential, commercial, green areas, sports fields, intersections, stream bed and floodplain creek in the environment (see Figure 10).



**Figure 10. 1/5.000 Zoning Plan**

In the 1 /1.000 Implementation Plan (see Figure 11) and 1/5.000 Zoning Plan; the project area's function is defined as "Health Facility Area - Health Complex". Construction conditions defined by these plans are; F.A.R. is "1.50" and H max is "unlimited".

According to the zoning plan, roads having 40 m. and 26 m. width are planned on the north and west of the project area, and these roads are connected with intersections (see Figure 11). Clover intersections are planned on South and North of the area, trumpet intersection is planned on west of the area, besides T-intersections and a roundabout intersection is planned on east of the area.

Als, project area is surrounded by Menekse Stream and its flood prevention area on northeast and an connection road to intersection, having 17m width on southwest.

Existing 10 m. wide road passing through the project area have been removed on the valid zoning plan. According to the plan, 17 m road on south and 26 m road on east. İs providing access to project are. Therefore, instead of existing roads and two intersections a new network of intersection and roads is suggested by the zoning plan. (See Figure 11)

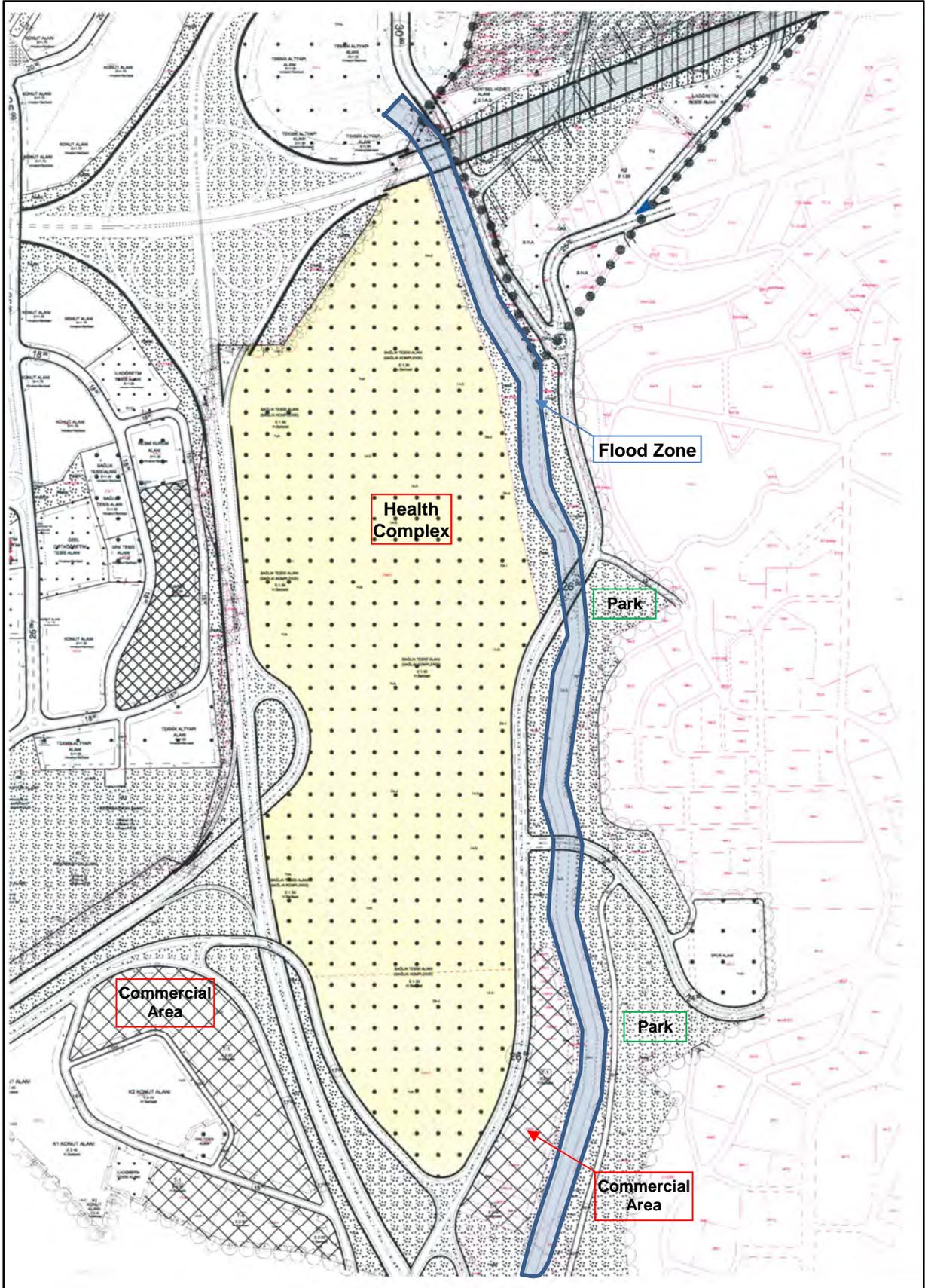


Figure 11. 1/1000 Zoning Plan

New roads and intersections which are proposed by plans, are being designed by General Directorate of Highways and Istanbul Metropolitan Municipality. These intersections will be analyzed in the following titles below.

#### 4.1.1. Olimpiyat Intersection

The Olimpiyat Intersection, located on north of the project area, is planned as a semi directional intersection. This intersection is located on the North Marmara Motorway link to provide connection to TEM (E-80). The intersection of two main roads, allows to pass all four directions. The separation arms of Ankara road are planned as directional roads, because, estimated traffic volume from Ankara to TEM (E-80) Motorway direction is high. (see Figure 12).

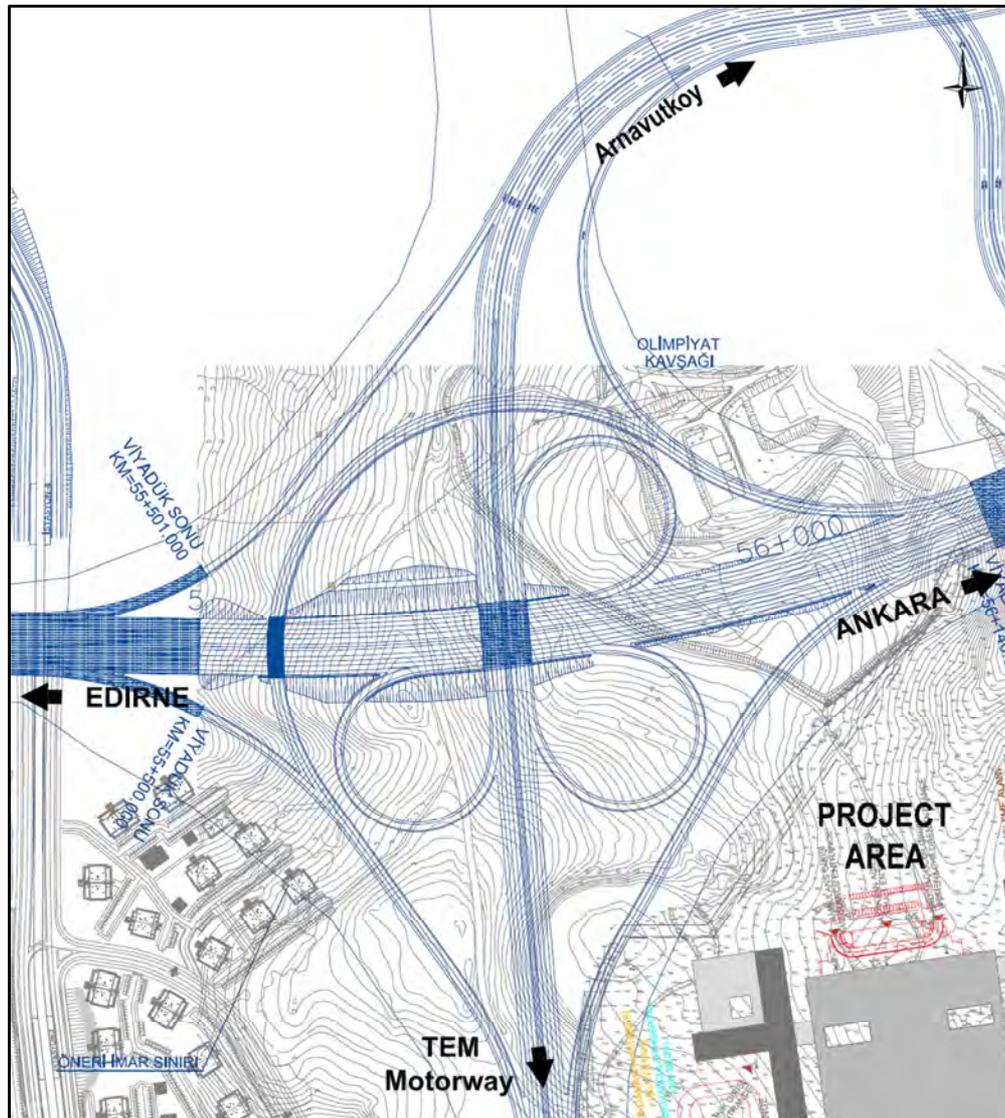


Figure 12. Olimpiyat Intersection

#### 4.1.2. Health Campus Intersection

Health Campus Intersection, located south of the project area is planned as a half cloverleaf intersection. This intersection is located on the North Marmara Motorway - TEM (E-80) Motorway link and make a connection to Olimpiyat Boulevard direction.

The intersection is not planned as a four-armed full clover intersection, two north arms don't work as a regular clover intersection. The distance between south separation arms and north arms is too short for the vehicle movements and weaving will be generated (see Figure 13).

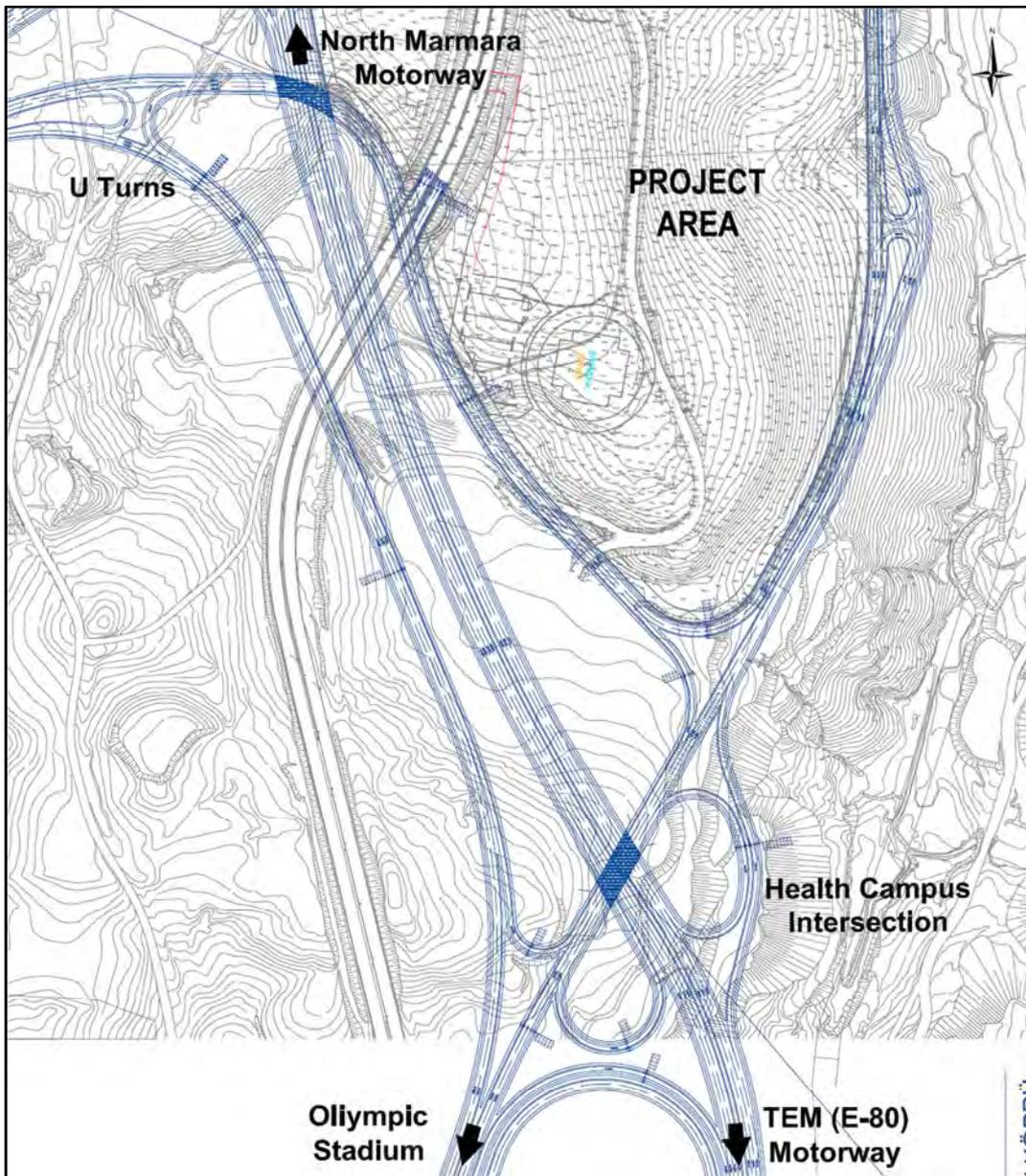


Figure 13. Health Campus Intersection

#### 4.1.3. ISKI Intersection

İSKİ Intersection, located south of the project area is planned as a trumpet intersection. This intersection is located on the TEM (E-80) Motorway - North Marmara Motorway link and it provides connection to Kayasehir direction. However, insufficient turning arm length, may cause congestion problems in this area (See Figure 14).

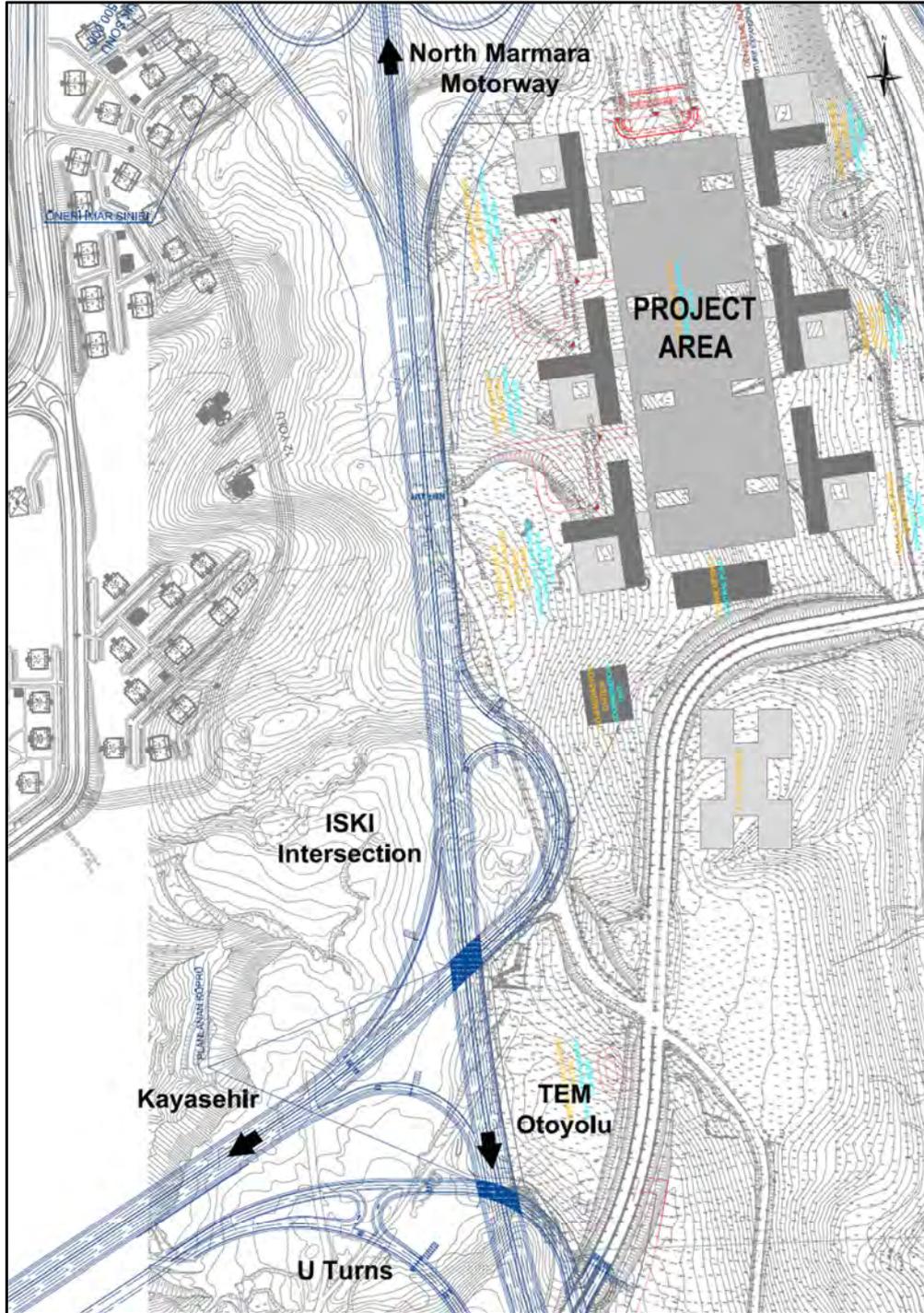


Figure 14. ISKI Intersection

## 4.2. North Marmara Motorway Project

The North Marmara Motorway Project is planned to be an alternative to existing TEM (E-80) Motorway and the D-100 (formerly E-5) Highway. The project starts from Tekirdag, continue to the north of Istanbul, Paşakoy and project area then it ends by connecting to TEM (E-80) Motorway in Akyazı-Sakarya.

The North Marmara Motorway - TEM (E-80) Motorway link road, pass just north of the health campus. Planned roads in the zoning plan around project area, provide a connection to the TEM (E-80) Motorway.

The motorway project is divided into three sections. The second section Odayeri - Paşaköy is under construction at the present, which involve Istanbul 3rd bridge of Bosphorus pass. After completion of this section, Sakarya connection and finally Tekirdag connection will be built (see Figure 15).



**Figure 15. North Marmara Motorway Project (Between Kınalı-Akyazı)**

## 5. SCOPE OF PROJECT

İstanbul İkitelli Integrated Health Campus Project architectural design process is under development in present and draft project is given by the employer. In this section, draft project's main function calculations and evaluations will take place.

### 5.1. Architectural Project Scope

The most attracted functions of the architectural project, like hospital and commercial area trip values are calculated. Accordingly, the hospital is planned to have 2,682 bed and 775 doctors within 7.311 staff to work in total. For the outpatient ambulatory treatment capacity is determined as 21,660 (Table 4).

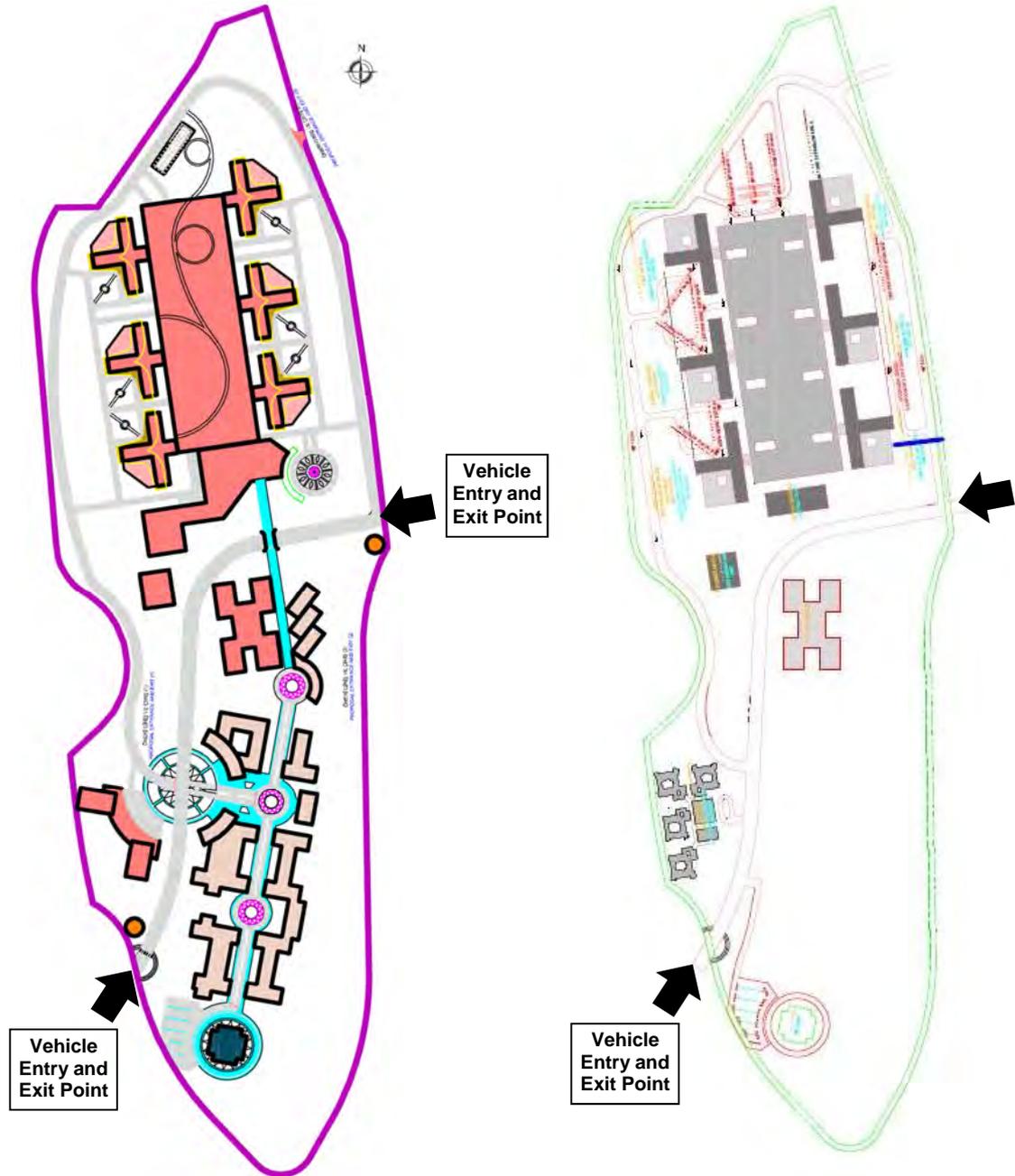
**Table 4. Health Campus Daily Trip Values**

	Description	Value
1	Bed Capacity	2.682
2	Days Stayed in the Hospital	4
3	Hospitalized and Released Patients	671
4	Inpatient Referral	4.291
5	Daily Referral for Each Bed	2
6	Daily Visitor to Inpatients	5.364
<b>Total Daily Inpatient Trips (3+4+6 - Person)</b>		<b>10.326</b>
7	Doctors	775
8	Exam Rooms in the Policlinic Area	722
9	Doctor Rooms in the Policlinic Area	380
10	Outpatients Examined by One Doctor Daily (16 min. per Examine)	40
11	Outpatient Come to Polyclinics	28.880
12	Outpatient Referral Come to Polyclinics	28.880
13	Total People Come to Polyclinics	57.760
14	Patients Come to Emergency	14.440
<b>Total Daily Outpatient Trips (13+14 - Person)</b>		<b>72.200</b>
15	Staff Work for Administration	4.300
16	Staff Work for SPV	3.011
<b>Total Staff (15+16)</b>		<b>7.311</b>
<b>Maximum (Friday) Religious Building Trips</b>		<b>1.500</b>
<b>Total Daily Commercial Area Trips</b>		<b>15.125</b>
<b>TOTAL DAILY TRIPS (Person)</b>		<b>106.462</b>

## 5.2. Project and Estimated Transit System Evaluation

Conceptual design of the draft project is given below (see Figure 17). The draft area plan project in design stage is shared for this report and it is the updated version as of the date of 01.17.2014. In site plan, entry and exit points of the project area located on the Olympic Boulevard.

The revised draft site plan from the employer is obtained on 12.20.2013. This plan is used as basis for traffic study because of being the most current version. Although it doesn't contain commercial and social area located south of Olimpiyat Boulevard. In both layout is shown in Figure 16.



**Figure 16. Architectural Project Draft Plan\***

\* First Draft Site Plan (Master Plan) on the left, Revised Draft Site Plan obtained on 12.20.2014 that is seen on the right.

## 6. TRAFFIC DEMAND

While estimating traffic demand, firstly the hinterland of “Istanbul İkitelli Integrated Health Campus” is accepted as provincial-wide. And secondly, demand is calculated by district population according to district directions. Then, demand of time and density is calculated in accordance with the data given by the employer. Finally, parking demand is calculated by using various urban standards of different countries and cities.

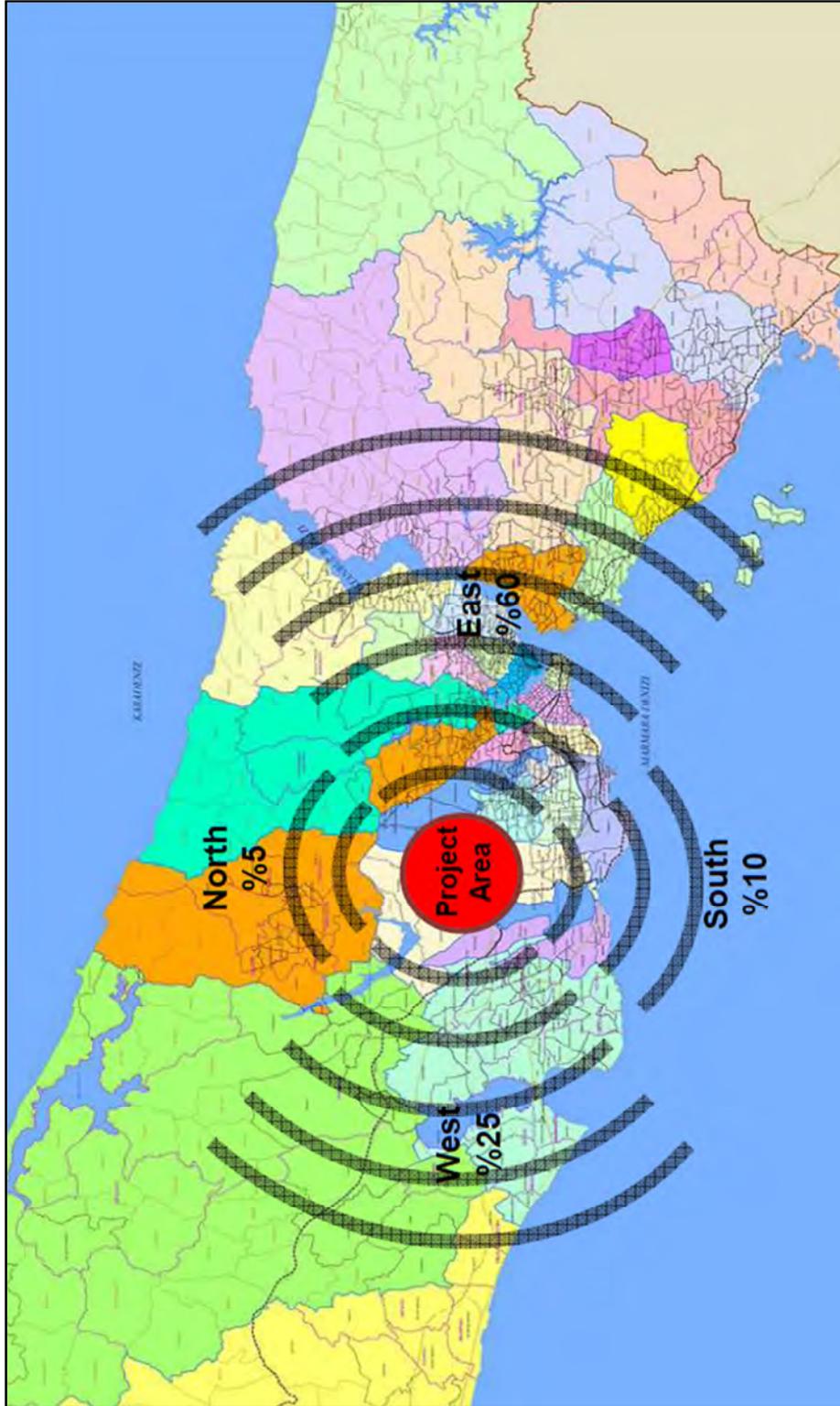
### 6.1. Location and Direction Distribution of Demand

To estimate the demand of the project area, firstly surrounding district population have been studied. Then, according to population, demand is calculated. Two main flow direction has been accepted on east and west of Olimpiyat Boulevard to determine the density of traffic. (see Table 5 and Figure 17)

**Table 5. Distribution of Traffic Demand According to Districts**

Districts	Population	Population	Direction	Percent	Accepted
Adalar	14.552				
Bağcılar	749.024				
Bahçelievler	600.162				
Bakırköy	221.336				
Bayrampaşa	269.774				
Beşiktaş	186.067				
Beyoğlu	246.152				
Esenler	458.694				
Eyüp	349.470	6.102.146	East	45%	55%
Fatih	428.857				
Gaziosmanpaşa	488.258				
Güngören	307.573				
Kağıthane	421.356				
Sarıyer	258.035				
Sultangazi	492.212				
Şişli	318.217				
Zeytinburnu	292.407				
Avcılar	395.274				
Beylikdüzü	229.115				
Büyükkçekmece	201.077	1.553.559	West	11%	25%
Çatalca	36.863				
Esenyurt	553.369				
Silivri	137.861				
Küçükçekmece	721.911	721.911	South	5%	10%
Arnavutköy	198.165	198.165	North	2%	5%
Ataşehir	395.758				
Beykoz	220.364				
Çekmeköy	188.290				
Kadıköy	521.005				
Kartal	443.293				
Maltepe	460.955				
Pendik	622.200	4.823.636	Anatolian Side	35%	5%
Sancaktepe	277.312				
Sultanbeyli	302.388				
Ümraniye	645.238				
Üsküdar	535.916				
Şile	13.260				
Tuzla	197.657				
Başakşehir	311.095	311.095		2%	
<b>TOTAL</b>	<b>13.710.512</b>	<b>13.710.512</b>		<b>100%</b>	<b>100%</b>

\*Source: Population of province and district centers– 2012 TÜİK



**Figure 17. Project Area Distribution of Demand by Directions**

The highest demand comes on the east direction, with the value of %60 and second highest value is the West direction (25%)

## 6.2. Distribution of Demand by Density and Time

Incoming traffic demand of the project area is calculated with the data which is given by the employer.

Within the project area; main hospital (general hospital, orthopedic and neurological science, cardiovascular disease hospital, maternity hospital, children hospital, oncology hospital), psychiatric hospital, rehabilitation center, clinic hotel, social and commercial areas are planned.

In the scope of this section, daily trip demand is calculated depending on the data given. Then, the demand is split by trip purpose and used vehicle types. Then suggestions are improved.

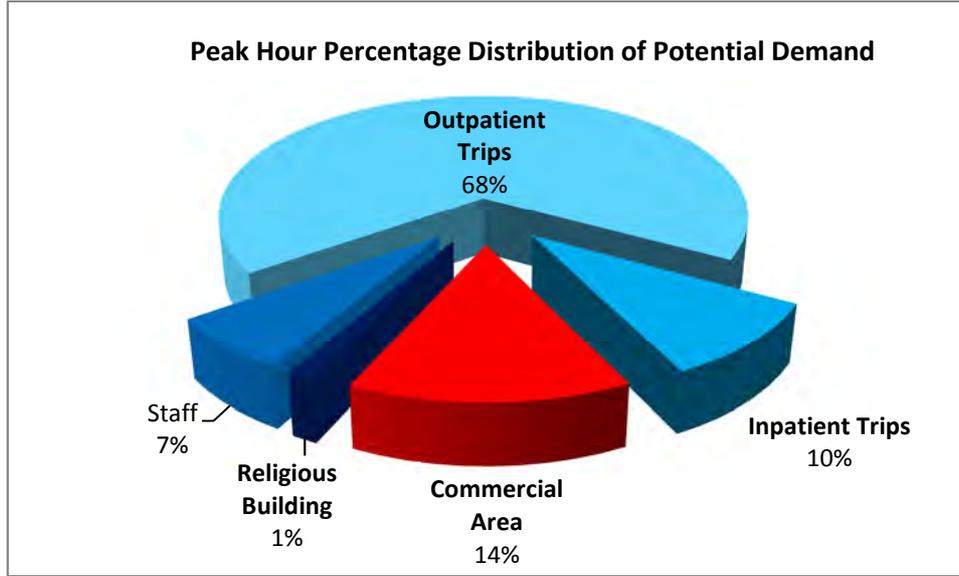
To calculate the demand distribution, the trips are examined in five main groups. First group contains staff and doctors working in the hospital, second group contains the daily outpatients and their visitors and third group contains inpatients, referrals and their visitors. Commercial area and hotel total staff and visitor trips are examined in fourth group. Demand generated by mosque is examined in the last group (see Table 6).

**Table 6. Peak Hour Potential Demand Distribution of Functions\***

Functions		Total Trips		Peak Hour (08:00-09:00)		Private Car – Public Transit						
Hospitals	Staff	7%	7.311	30%	2.193	PC	50%	1.097				
						PT	50%	1.097				
	Outpatient Trips	68%	72.200	17%	12.274	PC	40%	2.592				
						PT	60%	3.888				
	Inpatient Trips	10%	10.326	10%	1.033	PC	50%	516				
						PT	50%	516				
Commercial Area		14%	15.125	7%	1.059	PC	30%	318				
						PT	70%	741				
Religious Building		1%	1.500	2%	30	PC	30%	9				
						PT	70%	21				
TOTAL		100%	106.462	16%	16.589	PC	41%	6.849		1,6	4.281	
						PT	59%	9.739		Metro	40%	3.896
										Metrobus, Bus	50%	4.870
										Shuttle	10%	974
<b>Number of Private Car Come to Health Campus at Peak Hour</b>											<b>4.281</b>	

\*Peak hour range is determined the hours between 8:00-9:00 a.m. and this range is used for calculations.

To calculate the demand, Bogazici Project case studies are examined. Density of demand direction and peak hour identification is evaluated for Istanbul İkitelli Health Campus. According to working hours of staff and visitors' to the facility, various assumptions are taken. Demand analyze is calculated based on these assumptions. The demand percentage distribution is shown in Figure 18.



**Figure 18. Peak Hour Percentage Distribution of Potential Demand**

Staff, start to work in the morning hours and a part of them start according to their rotating shifts. Outpatients, mostly come to hospital early in the morning for reasons to get tested, waiting for the test results etc. The outpatients leave the hospital after the examination, treatment, rehabilitation or therapy. Except morning hours which are expected to be denser, regarding the hospital appointment system, daily demand for the rest of the day is evenly split amongst working hours.

Third group inpatients, mostly comes to hospital early in the morning and hospitalize for reasons to their complaints and surgery status. Inpatients stays average 4 days in the hospital. Mostly, they release from the hospital in the afternoon. Inpatient visitors come to see the patients between the visiting hours.

Accordingly, 50% of staff arrives to the hospital by private car, 50% of staff arrives by public transit in the morning peak hour (08:00- 09:00). Besides, 40% of outpatients and referrals use private car and 60% use public transit, 50% of inpatients and referrals use private car.

Commercial area is designed to meet the needs of hospitals and other functions. Mostly trips will be experienced in the afternoon hours. Needs related with the hospital will take place in the morning with a low travel intensity.

Mostly staff will come to the commercial area at morning peak hour. And also visitors related with hospital will come to for buying their needs (medical materials, medicine or food etc.). It is assumed that 7% of total commercial area trips will come by private car and 70% of these trips will come by public transport at the morning peak hour.

Religious building is designed to meet the needs for doctors, patients, referral, visitors and people around. During all the week, evening hours have intensive usage and maximum value is seen on Friday noon pray times. According to calculations based on area size, maximum value will reach around 1500 people on Friday noon time. For morning peak hour (08:00- 09:00), because of not being in the pray time period, it is provided that the range will be very low. Thus, it is accepted that, 2% of mosque trips is done at the morning peak hour and 30% of them travel by private car and 70% of them travel by public transit and in hospital shuttles.

According to all incoming data and assumptions; the study area peak hour trips and private car trips are calculated. As its result, in total 16.589 people will come to campus in a weekday and 6.849 people will use private car, 9.739 people will use public transit. Then, assuming the private vehicle occupancy rate as 1,6, the number of peak hour vehicles come to hospital, commercial area, hotel and religious building is calculated as 4.281 vehicles.

Beside these calculations, 9.739 people of morning peak hour public transport trips are distributed to different modes of transportation. Due to this calculations it is assumed that, 40% of public transit users of the health campus will come by metro, 50% of them will come by bus and 10% of them will come by shuttles (see 0).

### 6.3. Parking Demand

As well as estimating the vehicle demand for project area, number of cars using the parking area is calculated in order to design required parking area.

According to data taken from the employer, the parking needs for functions in the project, are given below with comparison of different standards. Parking requirements, have been adopted by given data and the ministry specified standards are adopted.

The adopted comparative table of parking needs is shown below (see 6.3).

**Table 7. Calculated Parking Needs According to Different Standards**

	Area (m <sup>2</sup> )	Number of Bed	Parking Needs According to İstanbul Building Bylaw*		Parking Needs According to Ankara Building Bylaw		Parking Needs According to England Standards		Parking Needs According to Hong Kong Standards		Project Parking Area (m <sup>2</sup> )	Project Parking Unit
			1 PA per 125m <sup>2</sup>	3.719	1 PA per 75m <sup>2</sup>	6.198	0.4 PA per bed	942	1,5 PA per bed	3.531		
<b>Main Hospital</b>	464.835	2.354	1 PA per 125m <sup>2</sup>	3.719	1 PA per 75m <sup>2</sup>	6.198	0.4 PA per bed	942	1,5 PA per bed	3.531	<b>241.878</b>	<b>7.318</b>
<b>Rehabilitation Hospital</b>	38.681	200	1 PA per 125m <sup>2</sup>	309	1 PA per 75m <sup>2</sup>	516	0.4 PA per bed	80	1,5 PA per bed	300	<b>21.120</b>	<b>640</b>
<b>Psychiatry Hospital</b>	17.551	128	1 PA per 125m <sup>2</sup>	140	1 PA per 75m <sup>2</sup>	234	0.4 PA per bed	51	1,5 PA per bed	192	<b>3.840</b>	<b>128</b>
<b>Technical Center</b>	25.017	-	1 PA per 125m <sup>2</sup>	200	1 PA per 75m <sup>2</sup>	334	0.4 PA per bed	-	1,5 PA per bed	-	<b>4.455</b>	<b>135</b>
<b>Commercial Area</b>	175.840	-	1 PA per 50m <sup>2</sup>	3.517	1 PA per 25m <sup>2</sup>	7.034	1 PA per 100m <sup>2</sup>	1.758	1 PA per 150m <sup>2</sup>	1.172	<b>106.800</b>	<b>3.560</b>
<b>Religious Facility</b>	7.895	-	1 PA per 200m <sup>2</sup>	39	1 PA per 100m <sup>2</sup>	79	-	-	1 PA per 16 units	-	<b>1.200</b>	<b>40</b>
<b>TOPLAM</b>	<b>729.819</b>	<b>2.782</b>		<b>7.925</b>		<b>14.394</b>		<b>2.881</b>		<b>5.205</b>	<b>379.293</b>	<b>11.821</b>

\* IMM: Hospitals, Health Institutions - 125 m<sup>2</sup> construction area

### 6.4. Distribution of Demand Around the Project Area

Demand distribution of districts according to the direction, the traffic demand of functions and density were examined at morning peak hour between the hours of 08:00-09:00 a.m. This survey conducted separately for staff, patients and visitors. Accordingly, the greatest demand for hospital, hotel, commercial area and religious building functions, is produced from the eastern direction between the hours of 08:00-09:00 in the morning peak hour.

The calculated flow of traffic demand distribution for the project area and its surroundings is shown in Figure 19.

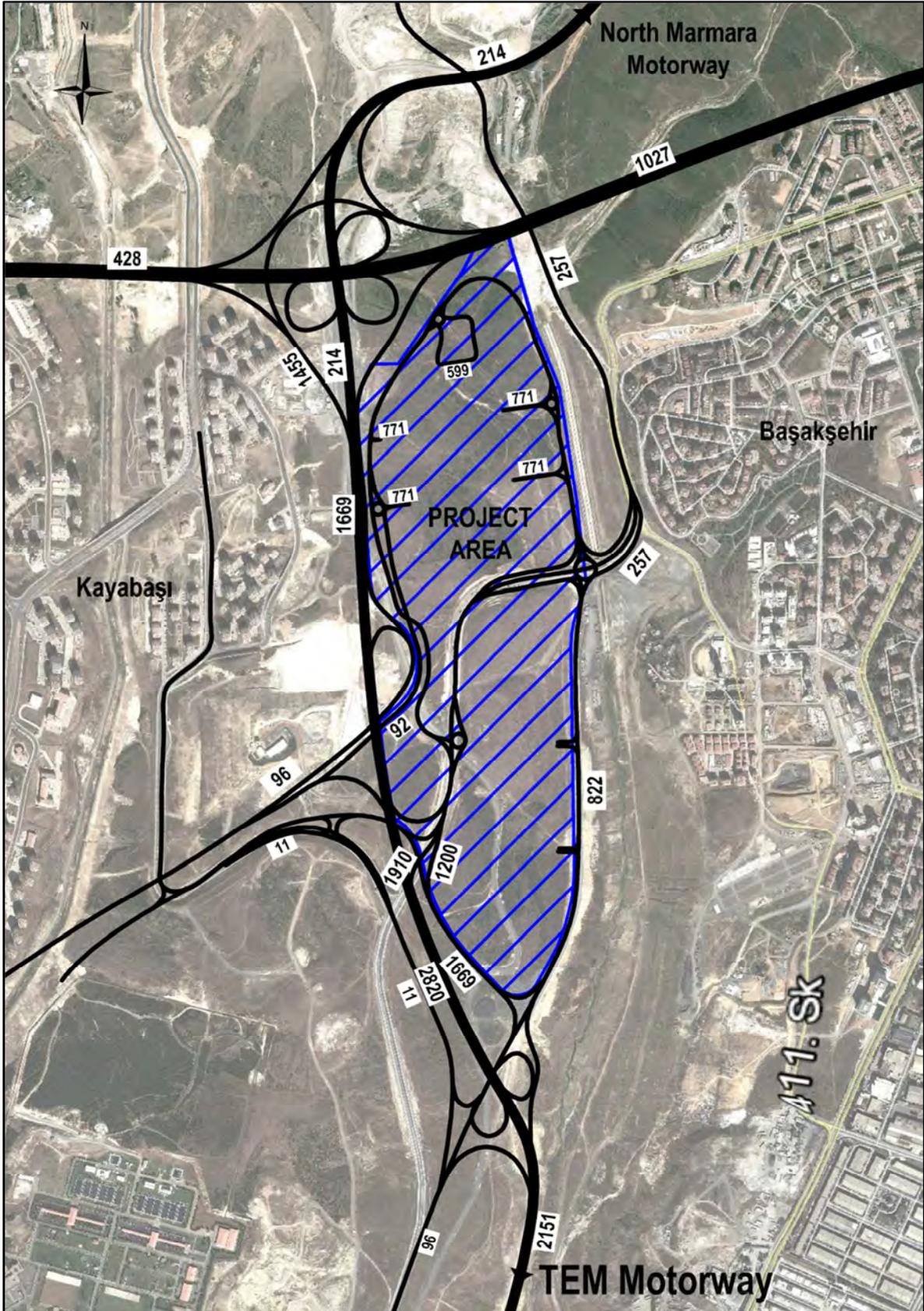


Figure 19. Distribution of Production Demand to Flow Arms (Morning Peak Hour)

## 7. EXISTING SITUATION EVALUATION and RECOMENDATIONS

In previous sections, existing situation analysis of the project area and its surroundings are examined. In this section, the effects of the existing structure to transportation are evaluated.

### 7.1. Location

- Project area is located on Olimpiyat Boulevard, which connects TEM (E-80) Motorway on north.
- Great attractions such as olympic stadium and mass housing projects are located around the project area.
- Densities of residential and commercial areas will be increased as a result of new mixed use projects around the project area and as the city grows in this direction.
- Empty lots which are open to development, exist around the project area.
- The terrain of the study area is quiet sloping. Especially on southeast direction of the area slope rises up to 45%.
- Access to project area from Ankara direction is available with the side road of TEM (E-80) Motorway and Mahmutbey West Intersection, which connects to Olimpiyat Boulevard. Besides, TEM (E-80) Motorway Mahmutbey West Intersection provides connection to Ataturk Boulevard. Likewise, access from Tekirdag direction is available by connecting to Ataturk Boulevard too.

## 7.2. Road System

- Project area is located near the TEM (E-80) Motorway and Mahmutbey West Intersection.
- Olimpiyat Boulevard is about 22 m wide, 2x2 dual carriageway that, pass through the project area. This road continues east through the Basaksehir intersection and it is connected to Mimar Kemalettin and Atatürk Boulevard. In continuation of southwest, the boulevard is directly connected to the TEM (E-80) Motorway or Kayasehir through Kayasehir Intersection.
- Existing roads and intersections meets the needs of existing residential areas. However empty plots will be developed and area will reach its maximum capacity soon. As a result of increase in housing density, accessibility demand will also increase and this will cause more traffic problems to appear.
- Basaksehir Intersection is an uncontrolled intersection with 3 arms and it connects the flow coming from Ataturk Boulevard to Olimpiyat Boulevard through the Mimar Kemalettin Boulevard. The width of the arm connecting Mimar Kemalettin Boulevard to Olimpiyat Boulevard is 4,5 m. (1 lane) and this narrow connection causes increase at density and decrease at speed.
- Kayasehir Intersection is an uncontrolled intersection with 3 arms and it connects the flow coming from Kayasehir Road to Olimpiyat Boulevard. Because of adjacent housing areas are still under construction and not occupied completely, intersection meets the current demand so far.

## 7.3. Public Transit and Pedestrian System

- Project area has strong road connections because of its close location to TEM (E-80) Motorway, however pedestrian and public transport access is insufficient.
- Although there are bus stops at housing areas around, due to the vacancy of project area in presence, reaching the project area by bus is not available.
- Locations of current bus stops around are out of the walking distance, hence new bus stops should be planned in order to meet the future demand.

- M3 Metro line runs on east of the project area and constitutes a strong access for surrounding zones. This metro line is planned to connect to the project area by Istanbul Metropolitan Municipality, until 2019.

#### **7.4. Strategic Decisions of Development Plans**

- According to zoning plans, project area is not divided by any roads but surrounded by highway connections and intersections on all directions.
- Surrounding housing areas are still under construction and expected to reach full capacity soon.
- North Marmara Motorway Project, will trigger urban development around the area.

## 8. PROPOSED TRAFFIC PLAN

Within the project area and around, transportation relations and demand attractions are evaluated to increase accessibility, to ensure traffic safety and to solve problems on all identified transportation, access, geometric arrangements. Project area on site road, intersections and geometric arrangements are planned, in accordance with the assessment and recommendations of 7th. section. Facilitate and make comfortable the access to health campus by private car and public transport is aimed to serve in a long term within the scope of these assessments, planned transportation system is integrated with the environment transportation system. Qualified and long term arrangements are made to meet the needs.

Project area future transportation system and the road network hierarchy is shown in Figure 20.

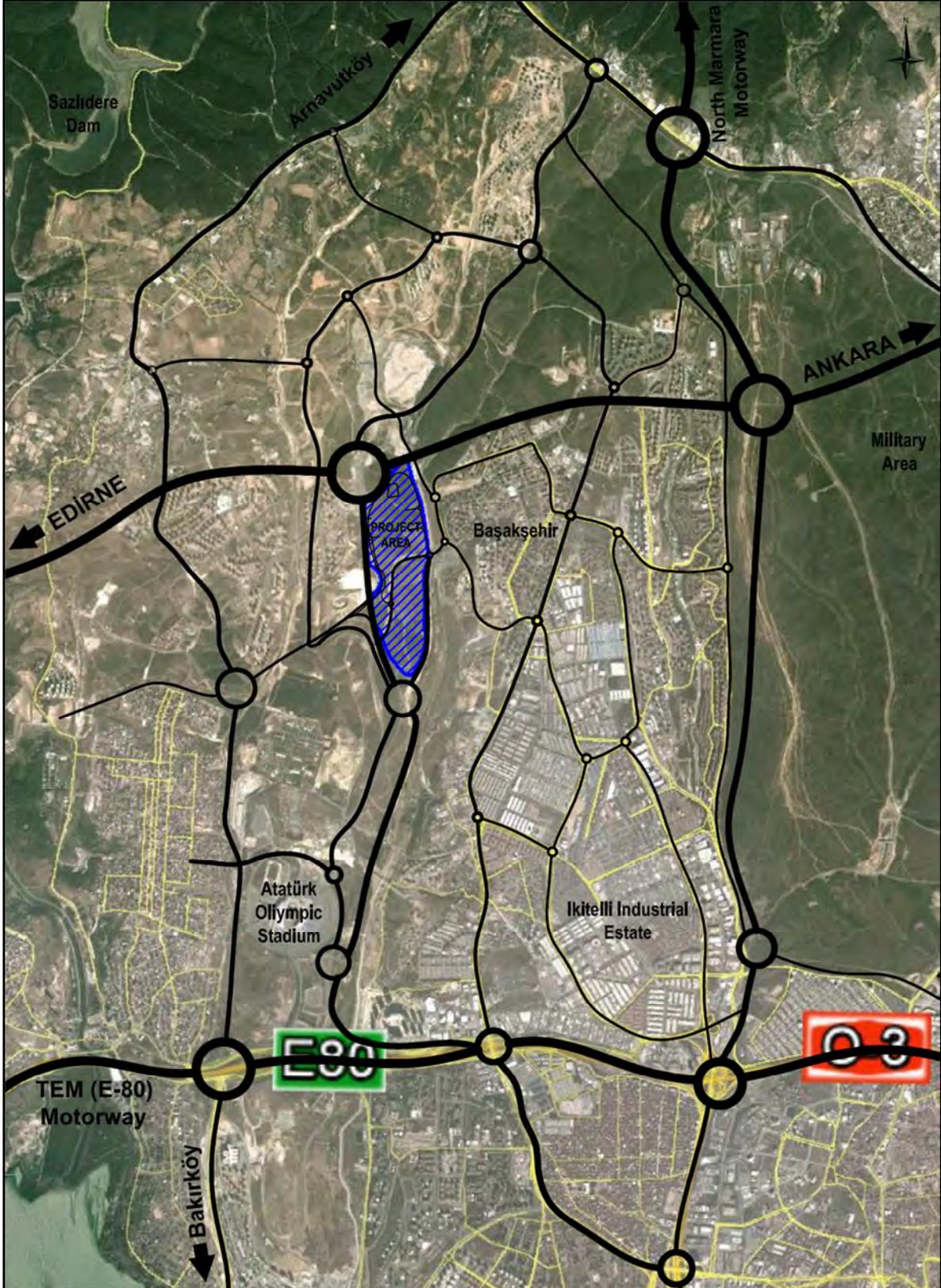


Figure 20. Proposed Traffic Plan and Integration to Transportation System Hierarchy

## 8.1. Proposed Transportation and Traffic Plan

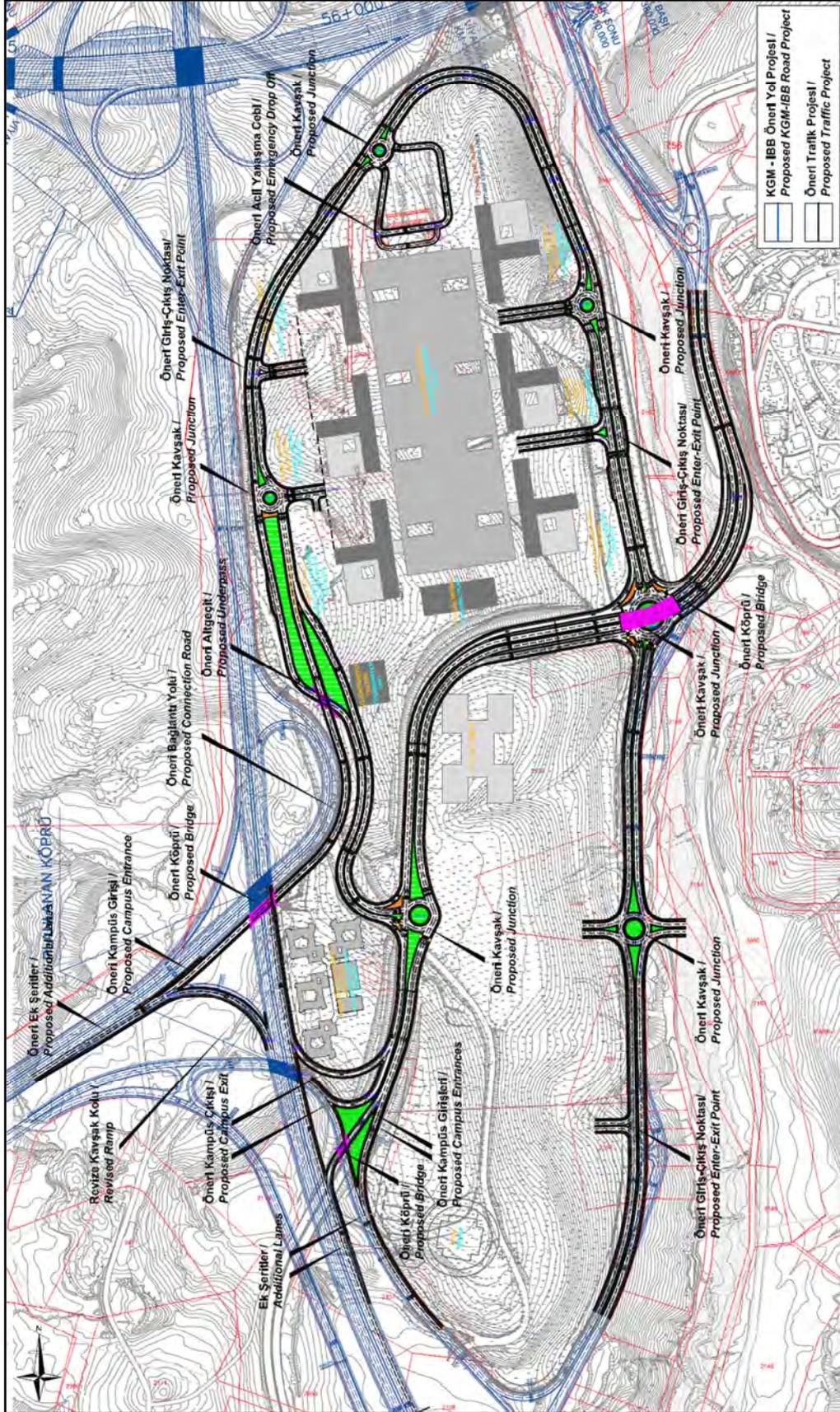
In accordance with current transportation network, zoning plans, traffic demand, architectural design of project, proposed highway projects examined in previous sections, first transportation plan for the project area is designed. Then in line with this plan, traffic circulation and management project is prepared.

First, designing a ring road system, which connects main roads surrounding project area is decided. For this purpose, circulation path is designed and it is connected to main roads via proposed intersections. In order to provide a continuous traffic flow, a ring road with a limited number of intersections is designed. Among these intersections, some of them are designed as one way exit intersections. These intersections will not interfere the ring road traffic at all. For providing access to all directions, roundabout intersections at 5 points are designed.

In existing situation, neither the main roads surrounding the project area nor the intersections are constructed yet. In order to integrate the project to the road network, new or revised intersections are suggested. Regarding the demand calculations, attributes of these intersections (nr of lanes, arms, signalization plans etc) are designed.

Dimensions of roads and pavements are designed regarding needs of pedestrians for a comfortable and safe walk and needs of vehicles for maneuvering safely. Traffic circulation plan within the project area and its integration to surrounding road network is shown in Figure 21.

In order to meet the high and rapid parking demand of hospital, it is required to reach rapidly to underground car park. For this purpose, drop off points and entrance ramps are designed.(see Figure 21).



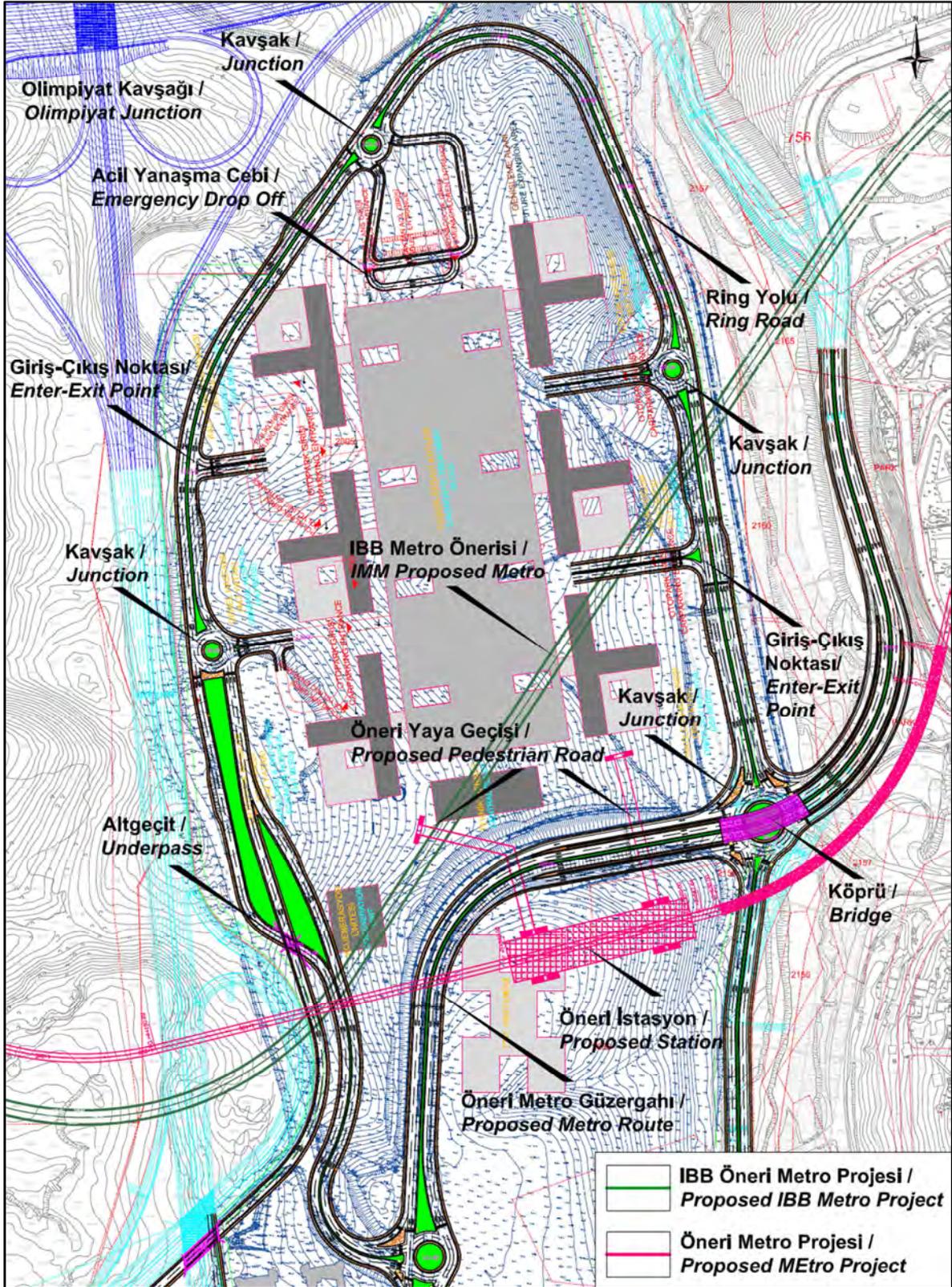
**Figure 21. Proposed Traffic Plan**

In order to provide public transport access to all polyclinics and main hospital, bus stops are located on the ring. These bus stops are located in bus pullout bays to protect the speed and safety level of traffic flow on the ring.

To provide safety and easy movement for pedestrians, footpaths and crosswalks are planned. In this terms, not only for vehicles, but also pedestrian accessibility is provided.

Accessing the project area by metro system will be available by a new line suggested by Istanbul Metropolitan Municipality. Draft route of suggested metro line passes under the main hospital building. Draft route for this new line is shown with green line in Figure 22.

In order to provide access for whole project area, the part of the draft line within project area is revised and a new metro station on this section is suggested (Revised line is shown with purple in Figure 22).



**Figure 22. Proposed Metro Route**

## 8.2. Proposed Intersection Plans

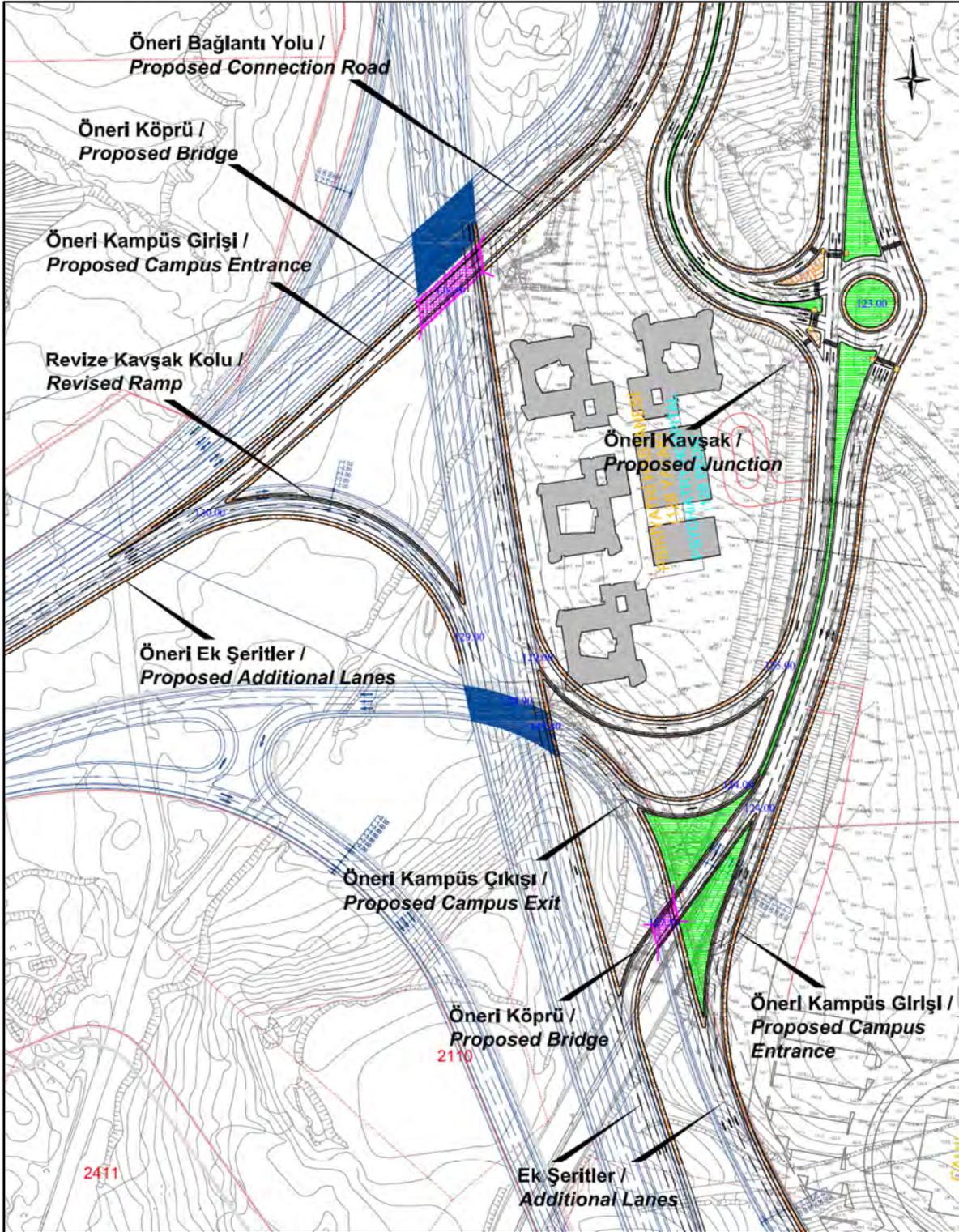
In the project area, major road arrangements have been made, because of expected high density volumes. Especially, at the surrounding roads and intersections connection points to the onsite ring road is solved in detail. Also, detailed solutions have been made at the intersections on the ring road and at the high-capacity indoor parking entry and exit points. The proposed plans on İSKİ Intersection and other intersections and entry-exit points have been examined in detail in the following sub-headings.

### 8.2.1. Proposed İSKİ Intersection

One of the main entrance to the project area is planned on İSKİ Intersection. The intersection is planned west of the project area as a trumpet intersection. It is located between the North Marmara Motorway connection link road and TEM (E-80) Motorway. İSKİ Intersection make a connection from Kayasehir direction to the project area. To provide an entry from this intersection and to solve the problems will be experienced at the roundabout intersection, new arrangement are made.

İSKİ Intersection also provide a direct connection to the area, with two-lane link road through a bridge from Kayasehir direction. To arrange the direct flow, additional lanes are planned before the bridge. Due to the expanding geometry of intersection because of additional lanes and bridge, two lanes were revised on the right arm separation.

To provide another main entrance to the project area, 2 additional lane and a single lane bridge has been designed. Besides, this also provide directly connection for vehicles coming from South TEM Motorway to the project area. Also, this entry point connects the route coming from Health Campus Intersection to 2 additional laned route. Therefore, 3 laned entry point from South is provided for the project area (see Figure 23).



**Figure 23. Proposed ISKI Intersection**

### 8.2.2. Proposed East Intersection

East Intersection is planned close to existing Basaksehir Intersection. East intersection is planned as a cross over for east-west traffic and provide a directional pass through two lane without affecting hospital traffic (see Figure 24).

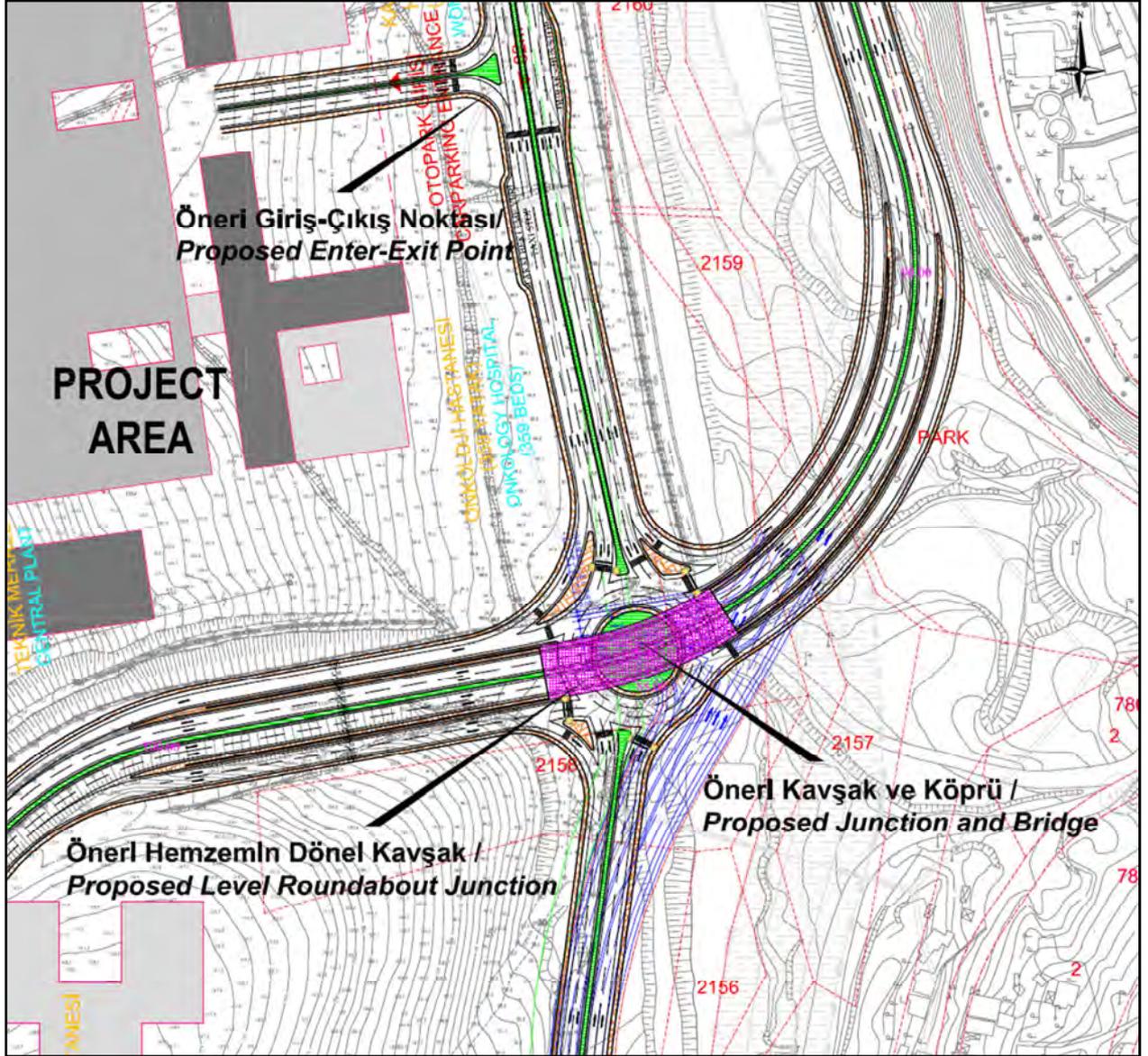


Figure 24. Proposed East Intersection

### 8.2.3. Proposed On Site Ring System

For onsite traffic, a ring system is formed as a main circulation route, that route will be the areas' most important transportation artery. Connections from Hospital functions and other units to the ring system, also connection to the link roads are provided.

A large part of the main circulation road is designed in 2x2 dual carriageway. The section, where connections is provided from East Intersection to the North hospital units, is started with 3 lane section in order to meet the peak demand of ring road. Safety island is designed on the road and division of the island is not allowed except intersections (see Figure 25).

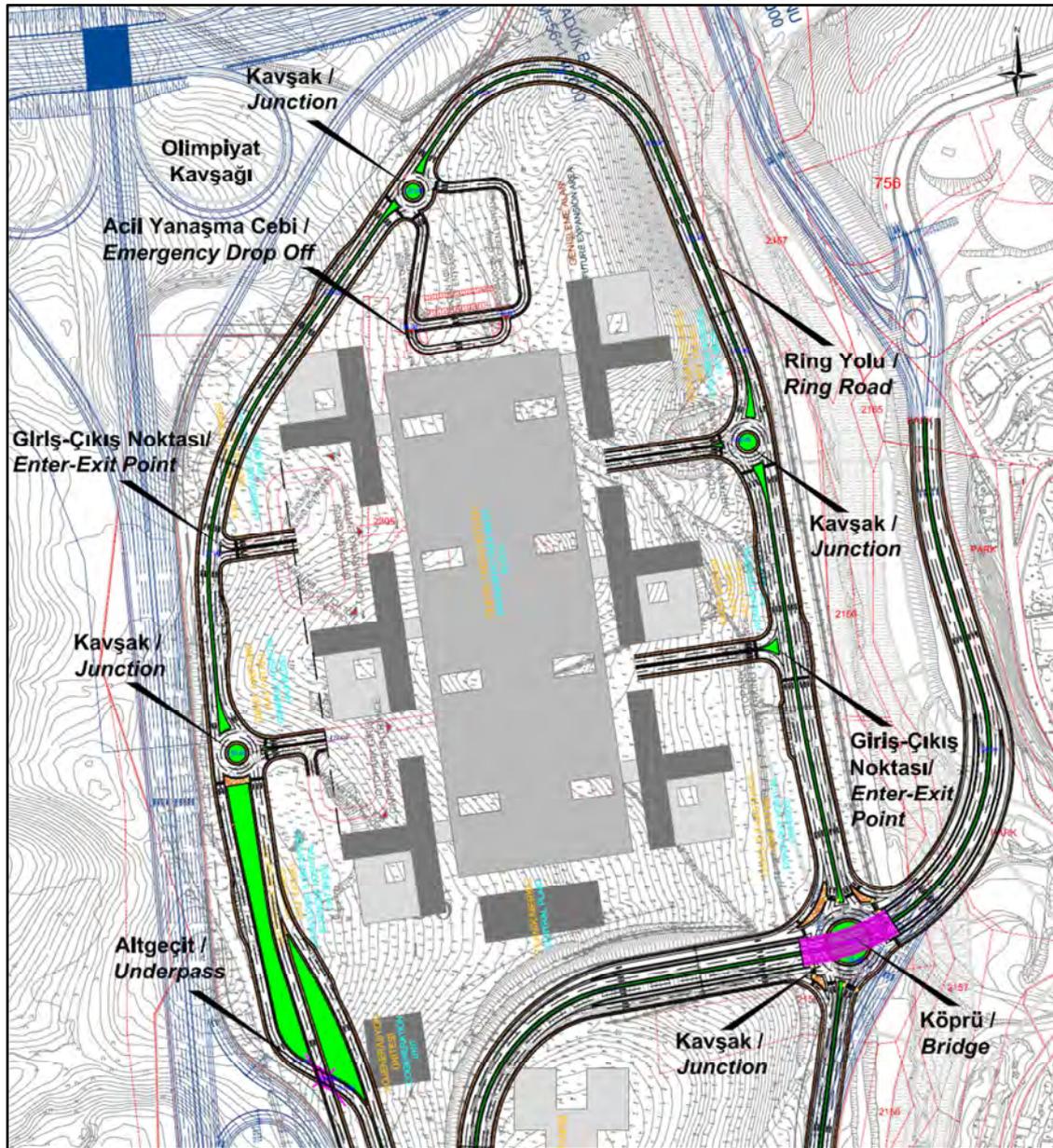


Figure 25. Proposed On Site Ring System

### 8.3. Proposed Stop Points

Health campus will be accessed by public transportation systems and on foot, as well as by private cars. Regarding this access model for various systems, stop points for each have been created in the project area. During decision process of these stop point locations, serving access to main functions has been aimed. In current situation of project area many stop points exist around the area, with design criteria mentioned above, sufficient amount of stop points have been suggested.

Metro line, which is planned to pass through the project site, is suggested to be located in the middle of project area with a station.

As well as bus and rail transport, a stop point is planned for taxicab. This place (stop point) will be serving as depot site for cabs. Also, these cabs will be able to serve all through the site via radio communication systems.

Existing and suggested stop points within and surrounding the project site is given below. (see Figure 26).

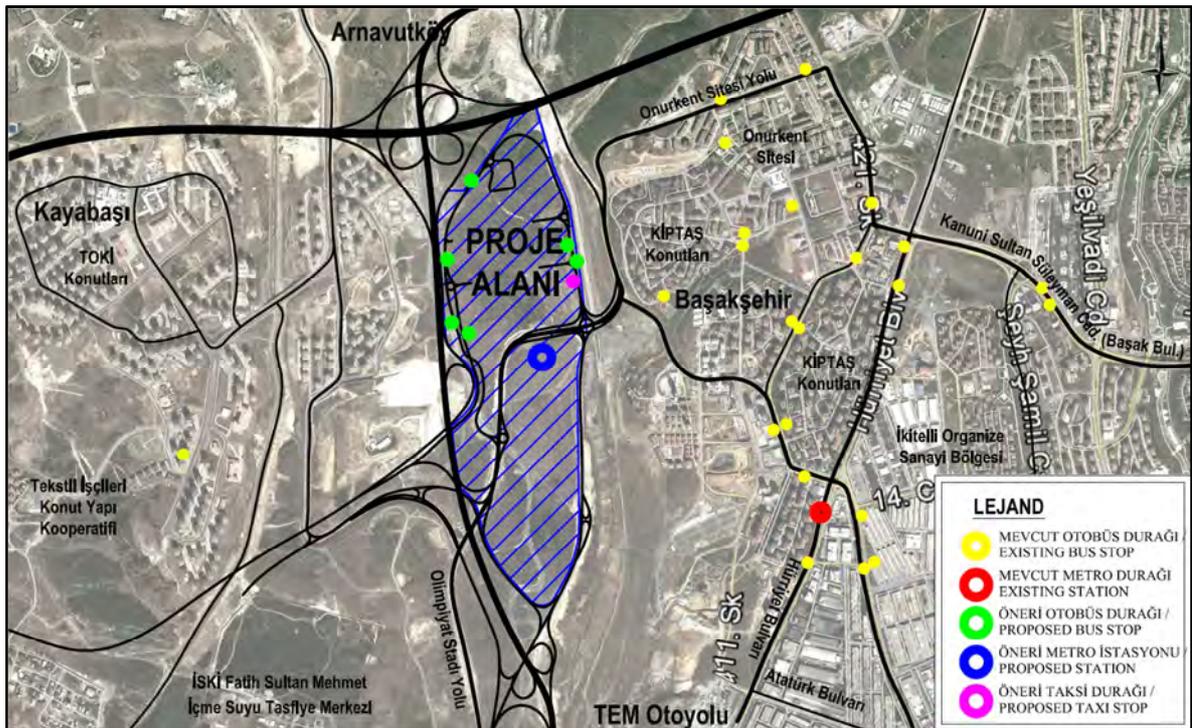


Figure 26. Proposed Stop Points

## 8.4. Simulation Results

In order to design the traffic circulation project, existing transportation network is examined. Then, a simulation model is prepared to observe the effects of additional traffic demand, which is expected by İkitelli Health Campus Project Traffic Design. PTV Vissim 5.40 software is used for preparation of simulation model.

In addition to the traffic demand calculations given in the previous chapters, traffic volume of heavy vehicles and trucks is also used in the model (it is assumed as 5% of total traffic demand).

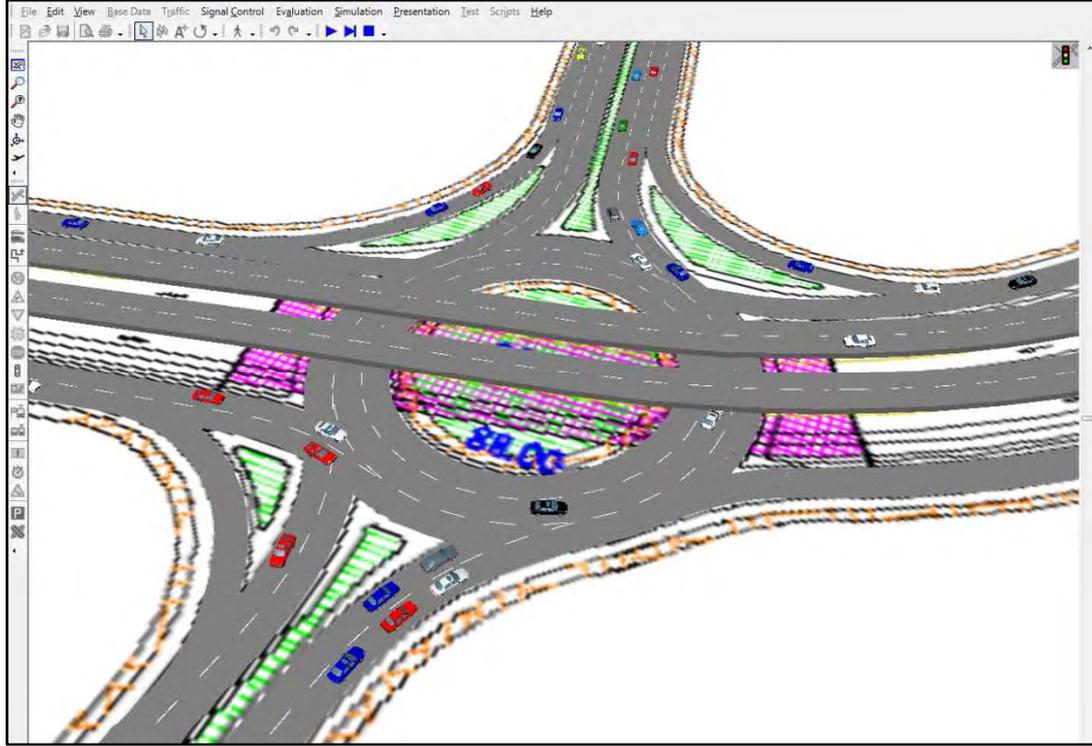
During morning peak hour period (08:00 a.m. - 09:00 a.m.), total traffic volume estimation for all functions is calculated as 4.281 per car unit. According to this estimation, a simulation for morning peak hour (3600 secs) is evaluated. 60% of total traffic is estimated to come from districts in east direction and city center, 25% comes from districts in West direction (District of Büyükçekmece direction), 10% comes from district of Kucukçekmece in South and 5% comes from north.

Simulation model is prepared due to these traffic volumes estimated from demand calculations. Results of the model shows that traffic is running at optimum speed, delay time and count of stops runs is acceptable. (see Table 8).

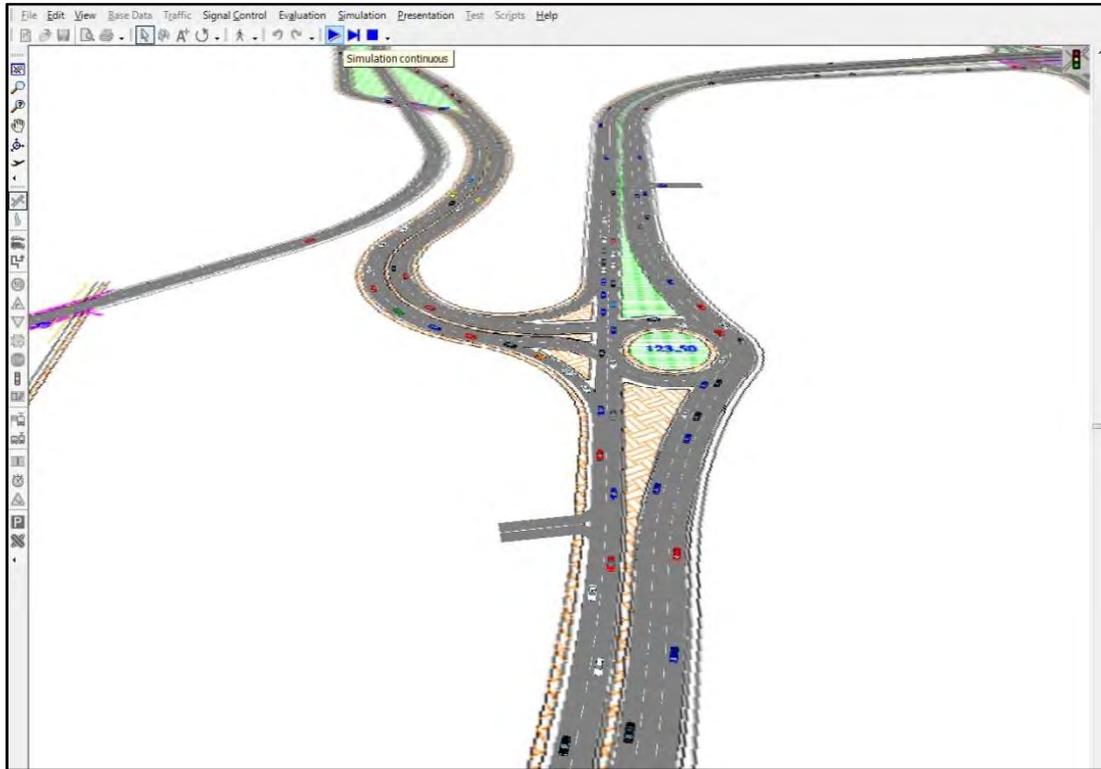
**Table 8. Suggested Project – Analysis of Projections**

Analysed Network	Avg. Speed (km/h)	Avg. Delay time per car (sec)	Avg. Delay time per car per stop (sec)	Avg. Nr. Of stops per carı
Suggested Project	37.31	31.96	6.84	0.94

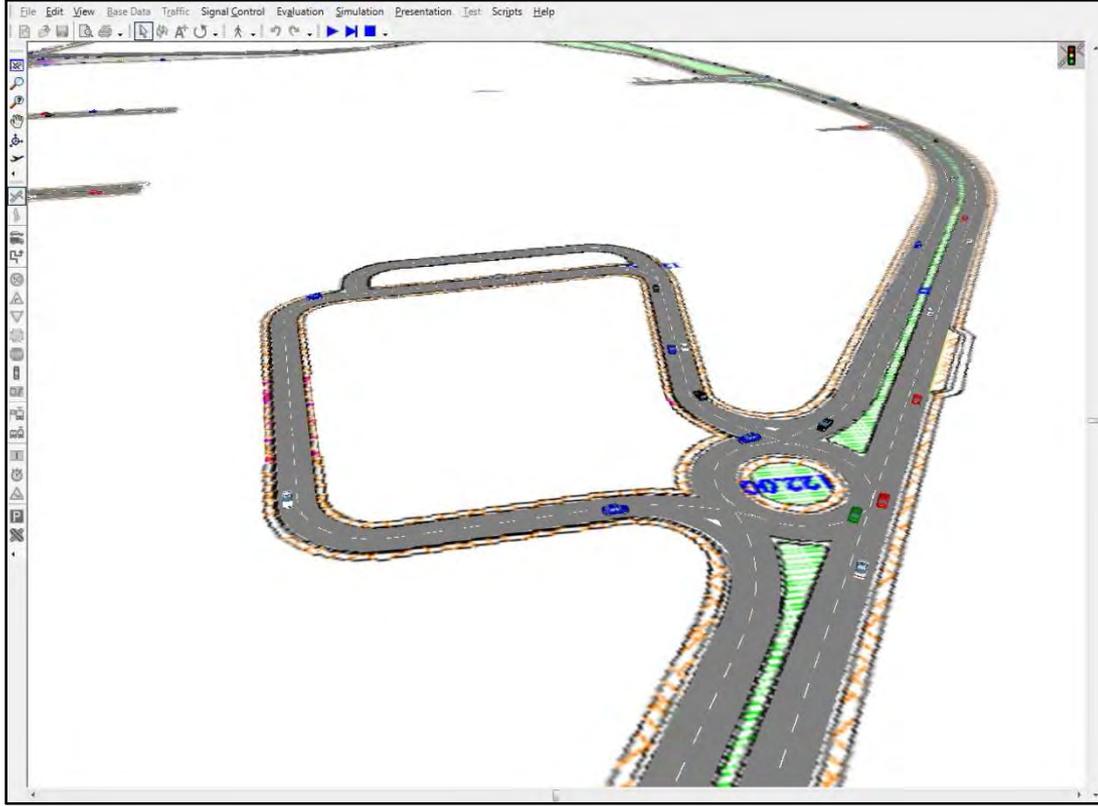
Direct access to both underground parking area and surface parking space along with roads, without having heavy traffic is provided by proposed inner ring road, suggested connections to surrounding network, crossover and grade intersections. Factors causing traffic density on intersections, ring road and connections are prevented with these design solutions. Simulation model shows that proposed intersections which serves to various function areas within project area, can supply estimated traffic. (Figure 27, Figure 28, Figure 29).



**Figure 27. Traffic Simulation of Eastern Entry of Project Site**



**Figure 28. Traffic Simulation of Southern Entry of Project Site**



**Figure 29. Traffic Simulation of Emergency Service Entry**

## 9. ACCESS AND EGRESS OF THE AREA

Location of project area, which consists of various functions such as health, retail, residential zones, social facilities etc. cause the area to become a major focus point. Also it is located in a position of having strong access to potential and planned transportation network.

There are existing and planned mass housing areas, flood zone, recreational and sports area, commercial zones, motorway connections to surrounding intersections around the campus area.

While coming from Ankara direction, project area can be accessed by Olimpiyat Boulevard via side road of Mahmutbey Western Intersection of TEM Highway or by Ataturk Boulevard via Mahmutbey Western Intersection of TEM Highway. Access from Tekirdağ direction also provided by Ataturk Boulevard via Mahmutbey Western Intersection of TEM Highway

Not only access to campus is provided by private car, but also it is possible to access by using public transport systems. However, on site does not have any stop points for these systems in existing circumstances.

Both North Marmara Highway designed by the General Directorate of Highways and connection roads designed by Istanbul Metropolitan Municipality surrounds campus area. These investments provide a very strong transportation network for the project area.

Regarding existing and designed transportation projects, an access map is prepared and shown in Figure 30.

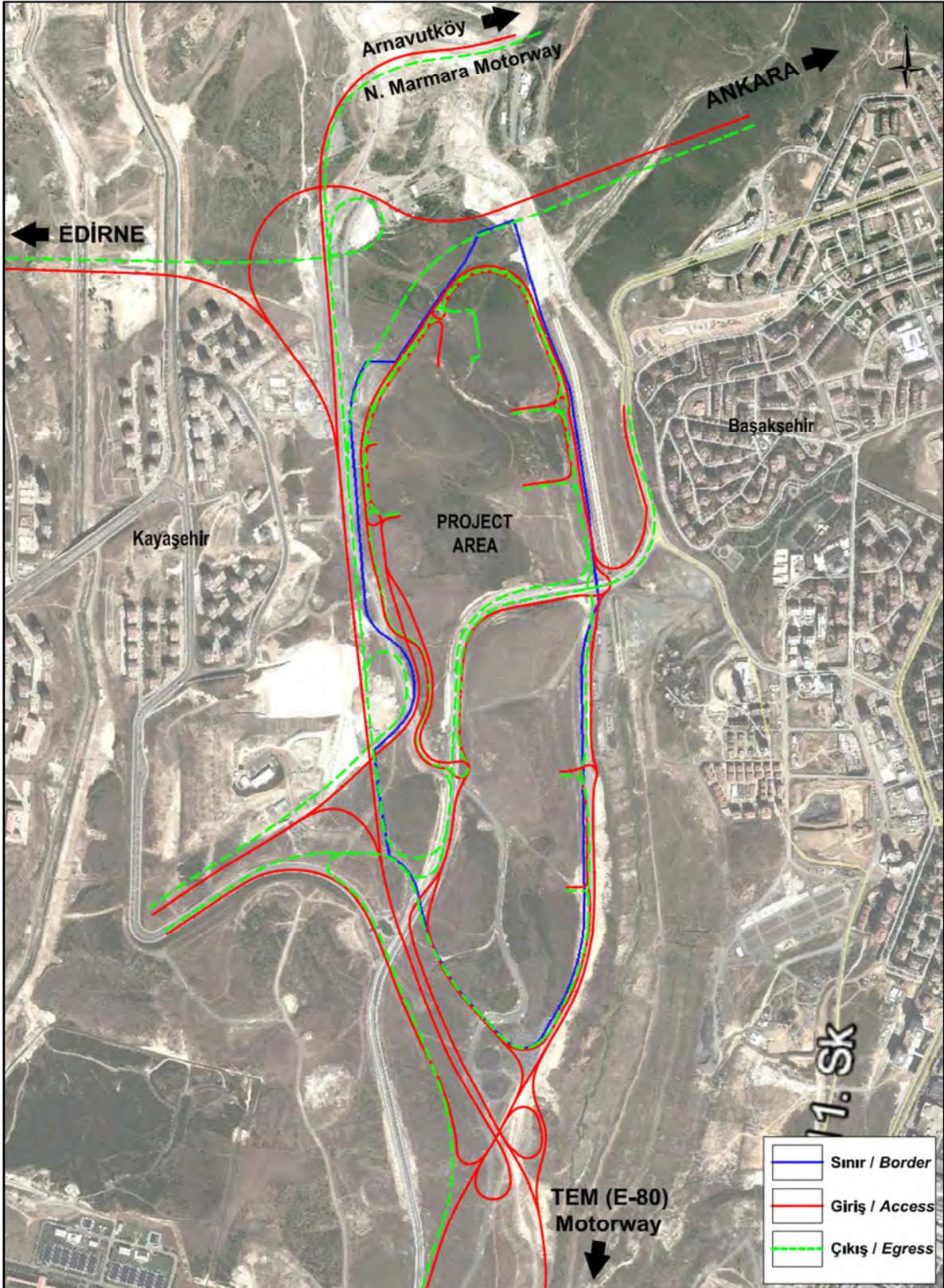


Figure 30. Access Plan

## 10. CONCLUSION

To design the traffic plan and solve possible traffic problems, access, geometric design, to improve access, to provide traffic safety, assessments are made on existing situation within the project area and its environment. These assessments include use of function analyses, planned government projects, transportation relations and traffic demand. To ease and make comfortable the access by public and private vehicles and by walking is aimed. In this context, to meet the both local and regional needs, Ikitelli Health Campus Transportation - Traffic Plan has been prepared. The design and main decisions of the project can be summarized as follows.

- The location of the project area has strong transportation infrastructure, functional diversity and chance to develop the environment settlements.
- After implementation of the project, vehicle and pedestrian trips will significantly increase.
- Project area attractiveness will increase over time, functions around campus will develop and vehicle traffic load will also increase.
- Campus need a strong, long lived transportation design, which is both for project area and its environment.
- To design the best campus transportation system and to make the project long lived, the project area has been integrated to current and proposed general transportation system.
- With hierarchical transportation system planning, managing the outside and inside traffic become comfortable and safe.
- In the campus area, a main 2x2 and 2x3 dual carriageway is planned. The road designed wider where demand volume increases. This road connects the main on site road to the surrounding traffic system.
- Road width is planned to maneuver easily for all vehicles, pavement width is planned to walk easily for pedestrians and all roads are planned integrated with zoning plans.
- For all intersections, high standard geometric designs are planned.
- Daily heavy traffic demand of campus functions will be meet the campus needs.

- To meet the needs of vehicle demand faster, drop off points and strong parking area links are provided.
- To provide access by public transport, drop off points are designed close to functions.

All of these criteria's and designed traffic plan, will be provided with an effective traffic management and guiding pedestrians and drivers correctly.

## 11. REFERENCES

- Istanbul Metropolitan Municipality, Highway Public Transit Stops <http://www.iett.gov.tr>. (Figure 3 Bus Stops Around Project Area, Figure 26 Proposed Stop Points)
- Istanbul Metropolitan Municipality, Railway System Route Plan after 2019 <http://istanbulunmetrosu.com/istanbulda-rayli-sistemler.html> (Figure 4 İstanbul Existing and Planned Railway System, Figure 5 İstanbul Existing and Planned Railway System – Saglikkent Station)
- Trip Generation Manual – 9th Edition, Institute of Transportation Engineers, 2012 (6. TRAFFIC DEMAND).
- TUIK, Population of Province and District Centers– 2012 TUIK – 2012 (Table 5 Distribution of Traffic Demand )
- İstanbul Otopark Yönetmeliği, 2010 (Table 5 Distribution of Traffic Demand According to Districts)
- Ankara Büyükşehir Belediyesi İmar Yönetmeliği ve İlgili Mevzuat, 2010 (6.3 Parking Demand
- As well as estimating the vehicle demand for project area, number of cars using the parking area is calculated in order to design required parking area.

According to data taken from the employer, the parking needs for functions in the project, are given below with comparison of different standards. Parking requirements, have been adopted by given data and the ministry specified standards are adopted.

The adopted comparative table of parking needs is shown below (see 6.3).

- Calculated Parking Needs According to Different Standards).
- Parking Standards, The Planning Service, 2008 (6.3 Parking Demand
- As well as estimating the vehicle demand for project area, number of cars using the parking area is calculated in order to design required parking area.

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- Hong Kong Planning Standards and Guidelines (6.3 Parking Demand
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The adopted comparative table of parking needs is shown below (see 6.3).

- Calculated Parking Needs According to Different Standards).
- Traffic Engineering Handbook – 6th Edition, Institute of Transportation Engineers, 2010 (8.PROPOSED TRAFFIC PLAN)
- Transportation Planning Handbook – 3rd Edition, Institute of Transportation Engineers, 2009 (8.PROPOSED TRAFFIC PLAN)
- Manual of Transportation Engineering Studies – 2nd Edition, Institute of Transportation Engineers, 2010 (8.PROPOSED TRAFFIC PLAN)
- Urban Street Geometric Design Handbook, Institute of Transportation Engineers, 2008 (8.PROPOSED TRAFFIC PLAN)

## 12. APPENDIX

### 12.1. Traffic Count Matrice

### 12.2. Zonning Plan

### 12.3. Traffic Site Plan

LOCATION	Olimpiyat Boulevard - Mimar Kemalettin Boulevard
NAME	Başakşehir Intersection
FLOW NUMBER	1
RECORDING DATE	22.11.2013

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
07:00	07:15	120	30	29	9	30	17	3	5	6	0	188	61	249
07:15	07:30	140	41	44	15	29	23	0	5	0	0	213	84	297
07:30	07:45	240	59	41	6	30	30	5	3	0	3	316	101	417
07:45	08:00	255	100	44	14	41	35	5	8	3	9	348	166	514
08:00	08:15	237	110	59	24	24	24	0	3	3	3	323	164	487
08:15	08:30	240	100	48	15	14	17	5	8	6	3	313	143	456
08:30	08:45	179	69	41	15	17	24	5	3	9	3	251	114	365
08:45	09:00	161	64	32	6	11	5	3	10	6	0	213	85	298
COLUMN TOTAL		1572	573	338	104	196	175	26	45	33	21	348	166	514
PEAK HOUR VALUE										07:30 - 08:30		1300	574	1874
TOTAL TRAFFIC VALUE										07:00 - 09:00		2165	918	3083

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
12:00	12:15	67	17	18	2	11	6	5	5	9	6	110	36	146
12:15	12:30	50	13	24	2	2	12	0	5	6	0	82	32	114
12:30	12:45	62	24	32	3	6	14	0	8	6	0	106	49	155
12:45	13:00	58	17	12	8	6	14	3	5	15	3	94	47	141
13:00	13:15	63	23	32	5	2	11	0	3	9	3	106	45	151
13:15	13:30	68	27	18	2	11	9	3	8	21	6	121	52	173
COLUMN TOTAL		368	121	136	22	38	66	11	34	66	18	121	52	173
PEAK HOUR VALUE										12:30 - 13:30		427	193	620
TOTAL TRAFFIC VALUE										12:00 - 13:30		619	261	880

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
17:00	17:15	59	25	26	5	15	23	3	3	6	0	109	56	165
17:15	17:30	52	31	17	12	9	9	5	3	9	3	92	58	150
17:30	17:45	62	22	23	5	11	21	3	5	9	0	108	53	161
17:45	18:00	52	29	8	2	12	15	0	3	0	0	72	49	121
18:00	18:15	71	23	21	3	17	18	3	3	6	0	118	47	165
18:15	18:30	38	27	15	3	20	12	5	10	3	6	81	58	139
18:30	18:45	52	36	29	3	18	17	0	8	3	6	102	70	172
18:45	19:00	49	38	20	2	8	9	5	5	3	3	85	57	142
COLUMN TOTAL		435	231	159	35	110	124	24	40	39	18	118	70	172
PEAK HOUR VALUE										18:00 - 19:00		386	232	618
TOTAL TRAFFIC VALUE										17:00 - 19:00		767	448	1215

LOCATION	Olimpiyat Boulevard - Mimar Kemalettin Boulevard
NAME	Başakşehir Intersection
FLOW NUMBER	2
RECORDING DATE	22.11.2013

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
07:00	07:15	29	0	11	0	15	3	0	0	6	0	61	3	64
07:15	07:30	25	0	11	0	15	0	5	0	6	0	62	0	62
07:30	07:45	54	0	14	0	23	0	5	0	3	0	99	0	99
07:45	08:00	51	1	9	0	17	0	0	0	3	0	80	1	81
08:00	08:15	39	0	32	2	12	0	5	0	12	0	100	2	102
08:15	08:30	50	5	20	0	14	2	0	0	6	0	90	7	97
08:30	08:45	62	1	14	0	17	0	5	0	9	0	107	1	108
08:45	09:00	58	0	18	2	3	0	3	0	15	0	97	2	99
COLUMN TOTAL		368	7	129	4	116	5	23	0	60	0	107	7	108
PEAK HOUR VALUE										07:30 - 08:30		394	12	406
TOTAL TRAFFIC VALUE										07:00 - 09:00		696	16	712

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
12:00	12:15	68	2	39	2	8	0	0	0	0	0	115	4	119
12:15	12:30	55	3	26	0	3	0	3	0	3	0	90	3	93
12:30	12:45	56	3	41	3	3	0	3	0	3	0	106	6	112
12:45	13:00	56	4	36	0	0	2	3	0	6	0	101	6	107
13:00	13:15	47	3	39	0	2	0	0	0	0	0	88	3	91
13:15	13:30	57	2	33	0	0	0	5	0	0	0	95	2	97
COLUMN TOTAL		339	17	214	5	16	2	14	0	12	0	115	6	119
PEAK HOUR VALUE										12:30 - 13:30		390	17	407
TOTAL TRAFFIC VALUE										12:00 - 13:30		595	24	619

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
17:00	17:15	71	2	32	0	27	0	3	0	3	3	136	5	141
17:15	17:30	110	3	27	5	17	0	5	0	3	0	162	8	170
17:30	17:45	98	3	38	0	26	0	5	0	3	0	170	3	173
17:45	18:00	121	3	51	0	6	0	3	0	6	0	187	3	190
18:00	18:15	141	3	38	0	27	0	0	0	3	0	209	3	212
18:15	18:30	161	3	30	3	23	0	0	0	6	0	220	6	226
18:30	18:45	185	0	60	2	23	0	5	0	3	0	276	2	278
18:45	19:00	196	5	35	2	27	0	3	0	0	0	261	7	268
COLUMN TOTAL		1083	22	311	12	176	0	24	0	27	3	276	8	278
PEAK HOUR VALUE										18:00 - 19:00		966	18	984
TOTAL TRAFFIC VALUE										17:00 - 19:00		1621	37	1658

LOCATION	Olimpiyat Boulevard - Mimar Kemalettin Boulevard
NAME	Başakşehir Intersection
FLOW NUMBER	3
RECORDING DATE	22.11.2013

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
07:00	07:15	14	0	2	0	5	0	0	0	0	0	21	0	21
07:15	07:30	24	1	6	0	15	0	3	0	0	0	48	1	49
07:30	07:45	27	2	8	0	24	3	0	0	0	0	59	5	64
07:45	08:00	42	0	2	2	11	0	5	0	0	3	60	5	65
08:00	08:15	21	2	6	0	15	0	3	0	0	0	45	2	47
08:15	08:30	35	3	8	2	14	0	13	0	0	0	70	5	75
08:30	08:45	30	4	5	0	5	0	0	0	0	0	40	4	44
08:45	09:00	40	3	8	0	15	2	10	0	0	0	73	5	78
COLUMN TOTAL		233	15	45	4	104	5	34	0	0	3	73	5	78
PEAK HOUR VALUE										07:30 - 08:30		228	16	244
TOTAL TRAFFIC VALUE										07:00 - 09:00		416	27	443

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
12:00	12:15	17	2	15	2	14	0	3	0	9	0	58	4	62
12:15	12:30	16	1	5	2	5	0	5	0	3	0	34	3	37
12:30	12:45	24	1	3	0	9	0	8	0	0	0	44	1	45
12:45	13:00	20	2	5	0	11	0	0	0	3	0	39	2	41
13:00	13:15	23	1	8	0	20	0	8	0	0	0	59	1	60
13:15	13:30	29	2	6	0	11	0	0	0	0	0	46	2	48
COLUMN TOTAL		129	9	42	4	70	0	24	0	15	0	59	4	62
PEAK HOUR VALUE										12:30 - 13:30		188	6	194
TOTAL TRAFFIC VALUE										12:00 - 13:30		280	13	293

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
17:00	17:15	22	1	18	0	23	0	5	0	0	0	68	1	69
17:15	17:30	44	2	9	0	17	2	0	0	3	0	73	4	77
17:30	17:45	50	2	5	0	29	0	8	0	0	0	92	2	94
17:45	18:00	59	1	11	0	14	0	5	0	3	0	92	1	93
18:00	18:15	50	4	20	0	29	0	10	0	0	0	109	4	113
18:15	18:30	75	5	27	2	18	0	0	0	0	0	120	7	127
18:30	18:45	80	1	15	0	20	0	8	0	3	0	126	1	127
18:45	19:00	56	0	23	0	17	0	0	0	3	0	99	0	99
COLUMN TOTAL		436	16	128	2	167	2	36	0	12	0	126	7	127
PEAK HOUR VALUE										18:00 - 19:00		454	12	466
TOTAL TRAFFIC VALUE										17:00 - 19:00		779	20	799

LOCATION	Olimpiyat Boulevard - Kayışehir Road
NAME	Kayışehir Intersection
FLOW NUMBER	1
RECORDING DATE	22.11.2013

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
07:00	07:15	12	39	2	6	2	23	0	5	3	0	19	73	92
07:15	07:30	9	54	6	14	2	23	0	8	0	0	17	99	116
07:30	07:45	19	54	5	18	6	48	0	3	3	3	33	126	159
07:45	08:00	15	74	8	3	2	35	0	8	3	6	28	126	154
08:00	08:15	20	57	15	18	2	27	3	5	9	12	49	119	168
08:15	08:30	19	64	5	23	2	39	0	8	6	6	32	140	172
08:30	08:45	15	91	6	14	3	30	0	3	12	9	36	147	183
08:45	09:00	19	80	11	17	3	17	0	10	9	9	42	133	175
COLUMN TOTAL		128	513	58	113	22	242	3	50	45	45	49	147	183
PEAK HOUR VALUE										08:00 - 09:00		142	511	653
TOTAL TRAFFIC VALUE										07:00 - 09:00		256	963	1219

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
12:00	12:15	16	63	6	30	2	21	0	10	9	6	33	130	163
12:15	12:30	19	65	8	24	0	8	0	13	12	3	39	113	152
12:30	12:45	20	59	8	36	0	14	0	5	6	6	34	120	154
12:45	13:00	12	59	9	32	0	14	0	8	6	0	27	113	140
13:00	13:15	9	62	6	27	0	23	0	13	6	3	21	128	149
13:15	13:30	16	61	12	32	3	12	0	3	0	6	31	114	145
COLUMN TOTAL		92	369	49	181	5	92	0	52	39	24	39	130	163
PEAK HOUR VALUE										12:00 - 13:30		113	475	588
TOTAL TRAFFIC VALUE										12:00 - 13:30		185	718	903

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
17:00	17:15	19	100	2	30	6	32	0	8	3	9	30	179	209
17:15	17:30	28	163	9	26	0	39	0	8	0	3	37	239	276
17:30	17:45	26	144	6	38	3	30	3	8	3	12	41	232	273
17:45	18:00	14	191	3	30	0	27	0	5	3	3	20	256	276
18:00	18:15	20	184	6	29	0	51	0	13	6	6	32	283	315
18:15	18:30	15	249	2	33	8	35	0	0	6	3	31	320	351
18:30	18:45	16	272	3	32	3	47	0	5	3	9	25	365	390
18:45	19:00	15	278	8	39	2	33	0	8	3	3	28	361	389
COLUMN TOTAL		153	1581	39	257	22	294	3	55	27	48	41	365	390
PEAK HOUR VALUE										17:30 - 18:30		116	1329	1445
TOTAL TRAFFIC VALUE										17:00 - 19:00		244	2235	2479

LOCATION	Olimpiyat Boulevard - Kayaşehir Road
NAME	Kayaşehir Intersection
FLOW NUMBER	2
RECORDING DATE	22.11.2013

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
07:00	07:15	10	21	6	5	0	17	0	8	15	0	31	51	82
07:15	07:30	12	43	5	8	0	12	0	3	3	0	20	66	86
07:30	07:45	29	39	3	12	8	14	0	5	3	0	43	70	113
07:45	08:00	23	34	2	11	14	17	0	0	6	0	45	62	107
08:00	08:15	26	31	8	12	3	2	0	3	3	0	40	48	88
08:15	08:30	22	28	11	6	2	3	0	3	15	3	50	43	93
08:30	08:45	18	19	17	11	6	14	0	3	15	3	56	50	106
08:45	09:00	11	23	3	11	2	9	0	3	3	0	19	46	65
SÜTUN TOPLAM		151	238	55	76	35	88	0	28	63	6	56	70	113
ZİRVE SAATLİK DEĞER										08:00 - 09:00		178	223	401
TOPLAM TRAFİK DEĞERİ										07:00 - 09:00		304	436	740

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
12:00	12:15	11	26	2	9	2	3	0	0	12	0	27	38	65
12:15	12:30	14	22	5	3	0	2	0	3	6	3	25	33	58
12:30	12:45	9	24	5	3	0	2	0	0	9	3	23	32	55
12:45	13:00	16	28	3	9	0	0	0	3	9	0	28	40	68
13:00	13:15	8	19	2	3	0	3	0	3	6	3	16	31	47
13:15	13:30	9	27	3	6	2	3	0	3	24	6	38	45	83
SÜTUN TOPLAM		67	146	20	33	4	13	0	12	66	15	38	45	83
ZİRVE SAATLİK DEĞER										12:00 - 13:30		105	148	253
TOPLAM TRAFİK DEĞERİ										12:00 - 13:30		157	219	376

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
17:00	17:15	16	46	6	15	2	9	0	3	6	12	30	85	115
17:15	17:30	17	36	5	11	2	6	0	3	3	0	27	56	83
17:30	17:45	6	48	3	17	2	8	0	5	0	0	11	78	89
17:45	18:00	13	41	5	12	2	12	0	3	0	0	20	68	88
18:00	18:15	9	54	5	15	0	5	0	3	0	3	14	80	94
18:15	18:30	4	51	5	6	0	12	0	3	0	6	9	78	87
18:30	18:45	8	61	2	17	0	14	0	0	3	0	13	92	105
18:45	19:00	7	52	2	11	5	12	0	3	0	0	14	78	92
SÜTUN TOPLAM		80	389	33	104	13	78	0	23	12	21	30	92	115
ZİRVE SAATLİK DEĞER										17:30 - 18:30		50	328	378
TOPLAM TRAFİK DEĞERİ										17:00 - 19:00		138	615	753

LOCATION	Olimpiyat Boulevard - Kayaşehir Road
NAME	Kayaşehir Intersection
FLOW NUMBER	3
RECORDING DATE	22.11.2013

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
07:00	07:15	140	46	33	14	51	15	8	3	0	3	232	81	313
07:15	07:30	229	83	56	8	59	17	15	3	0	3	359	114	473
07:30	07:45	258	82	53	23	53	6	13	3	3	0	380	114	494
07:45	08:00	314	96	53	5	53	11	15	3	3	3	438	118	556
08:00	08:15	311	100	69	6	32	12	3	0	3	0	418	118	536
08:15	08:30	267	88	56	11	29	3	13	3	0	12	385	117	502
08:30	08:45	221	85	42	9	29	9	13	3	3	6	308	112	420
08:45	09:00	199	70	26	9	18	8	8	0	9	9	260	96	356
SÜTUN TOPLAM		1959	650	388	85	324	81	88	18	21	36	438	118	556
ZİRVE SAATLİK DEĞER										08:00 - 09:00		1621	467	2088
TOPLAM TRAFİK DEĞERİ										07:00 - 09:00		2780	870	3650

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
12:00	12:15	65	23	24	8	20	2	10	3	6	6	125	42	167
12:15	12:30	57	16	29	6	9	3	10	3	6	0	111	28	139
12:30	12:45	74	21	23	8	20	8	8	0	9	9	134	46	180
12:45	13:00	57	27	21	5	18	0	8	3	15	15	119	50	169
13:00	13:15	79	28	23	3	14	2	3	0	0	9	119	42	161
13:15	13:30	88	17	23	8	21	3	8	3	15	3	155	34	189
SÜTUN TOPLAM		420	132	143	38	102	18	47	12	51	42	155	50	189
ZİRVE SAATLİK DEĞER										12:00 - 13:30		527	172	699
TOPLAM TRAFİK DEĞERİ										12:00 - 13:30		763	242	1005

RECORDING TIME		CAR		PICKUP/ PANELVAN/ SUV		MINIBUS		PUBLIC BUS		TRUCKS		TOTAL TRAFFIC		TOTAL
		1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	1-2	1-3	
17:00	17:15	67	31	27	11	26	8	8	3	3	3	131	56	187
17:15	17:30	78	24	29	8	30	5	15	3	6	3	158	43	201
17:30	17:45	67	30	15	5	29	12	5	3	12	0	128	50	178
17:45	18:00	69	31	20	9	23	12	5	8	0	0	117	60	177
18:00	18:15	76	24	24	11	36	12	8	3	3	6	147	56	203
18:15	18:30	89	41	11	8	33	15	8	0	3	0	144	64	208
18:30	18:45	78	32	27	3	33	6	8	5	6	9	152	55	207
18:45	19:00	87	17	12	11	15	8	10	3	6	12	130	51	181
SÜTUN TOPLAM		611	230	165	66	225	78	67	28	39	33	158	64	208
ZİRVE SAATLİK DEĞER										17:30 - 18:30		573	226	799
TOPLAM TRAFİK DEĞERİ										17:00 - 19:00		1107	435	1542





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## **ANNEX K**

### **Ecology Supporting Information**

Annex K-1: Flora Species of the Project Site and Surroundings and their Characteristics

Annex K-2: Fauna Species of the Project Site and Surroundings and their Characteristics

## **ANNEX K-1**

### **Flora Species of the Project Site and Surroundings and their Characteristics**















## **LEGEND FOR THE FLORA TABLE**

### **ENDEMISM:**

R: Regional endemic  
W: Widespread Endemic

### **BERN (BERN Convention):**

App1: Strictly protected flora species

### **CITES:**

App1: Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.  
App2: Species not necessarily threatened with extinction, but their trade must be controlled to avoid utilization incompatible with their survival.  
App3: Species protected in at least one country, and their trading is under control by CITES.

### **T.S. THREAT CATEGORIES: BASED ON IUCN CATEGORIES (Ekim et al., 2000)**

EX : Extinct  
EW : Extinct in nature  
CR : Critically endangered  
EN : Endangered  
VU : Vulnerable  
LR : Lower risk  
NT : Near threatened  
LC : Least concern  
DD : Data deficient

### **HABITAT CLASSES:**

1. Maquis  
2. Garig  
3. Maquis opening, meadow  
4. Plantation site

### **RELATIVE ABUNDANCE:**

1: Very rare  
2: Rare  
3: Medium  
4: Abundant  
5: Very abundant

## **ANNEX K-2**

### **Flora Species of the Project Site and Surroundings and their Characteristics**

## Fauna Species of the Project Site and Surroundings and Their Characteristics

CLASSIS Ordo	Family	Species (Scientific name)	Species (English name)	Species (Turkish name)	IUCN	BERN	CITES	MAK	EU Bird Directive
<b>REPTILIA</b>									
Testudines	Testudinidae	<i>Testudo graeca*</i>	Spur-thighed Tortoise	Tosbağa	VU	App-II	-	App-I	-
Squamata	Lacertidae	<i>Ophisops elegans*</i>	Snake-eyed lizard	Tarla kertenkelesi	NE	App-II	-	App-I	-
Squamata	Lacertidae	<i>Lacerta trilineata</i>	Balkan green lizard	Büyük yeşil kertenkele	LC	App-II	-	App-I	-
Squamata	Lacertidae	<i>Lacerta viridis</i>	Green lizard	Yeşil kertenkele	LC	App-II	-	App-I	-
Squamata	Lacertidae	<i>Podarcis muralis</i>	Common wall lizard	Duvar kertenkelesi	LC	App-II	-	App-I	-
Squamata	Lacertidae	<i>Podarcis sicula</i>	Italian wall lizard	İstanbul kertenkelesi	LC	App-II	-	App-I	-
Squamata	Lacertidae	<i>Podarcis tauricus</i>	Balkan wall lizard	Trakya kertenkelesi	LC	App-II	-	App-I	-
Squamata	Scincidae	<i>Ablepharus kitaibelii</i>	European copper sking	İnce kertenkele	LC	App-II	-	App-I	-
Squamata	Colubridae	<i>Dolichophis caspius</i>	Caspian whip snake	Hazer yılanı	NE	App-II	-	App-I	-
Squamata	Colubridae	<i>Coronella austriaca</i>	Smooth snake	Avusturya yılanı	NE	App-II	-	App-I	-
Squamata	Colubridae	<i>Telescopus fallax</i>	Soosan snake	Kedi gözlü yılan	LC	App-II	-	App-I	-
<b>AVES</b>									
Ciconiiformes	Ciconiidae	<i>Ciconia ciconia</i>	White Stork	Leylek	LC	App-II	-	App-I	Ann-I
Falconiformes	Accipitridae	<i>Circaetus gallicus</i>	Short-Toed Eagle	Yılan kartalı	LC	App-II	App-II	App-I	Ann-I
Falconiformes	Accipitridae	<i>Accipiter nisus</i>	Sparrowhawk	Atmaca	LC	App-II	App-II	App-I	-
Falconiformes	Accipitridae	<i>Buteo buteo</i>	Buzzard	Şahin	LC	App-II	App-II	App-I	-
Falconiformes	Accipitridae	<i>Buteo rufinus</i>	Long-Legged Buzzard	Kızıl Şahin	LC	App-II	App-II	App-I	Ann-I
Falconiformes	Falconidae	<i>Falco tinnunculus*</i>	Kestrel	Kerkenez	LC	App-II	App-II	App-I	-
Falconiformes	Falconidae	<i>Falco vespertinus*</i>	Red-Footed Falcon	Aladoğan	NT	App-II	App-II	App-I	Ann-I
Charadriiformes	Laridae	<i>Larus cachinnans*</i>	Yellow-Legged Gull	Gümüş martı	LC	App-III	-	App-II	Ann-IIB
Columbiformes	Columbidae	<i>Streptopelia decaocto*</i>	Collared dove	Kumru	LC	App-III	-	App-II	Ann-IIB
Columbiformes	Columbidae	<i>Columba livia*</i>	Rock dove	Kaya güvercini	LC	App-III	-	App-III	Ann-IIA
Strigiformes	Strigidae	<i>Athene noctua</i>	Little Owl	Kukumav	LC	App-II	-	App-I	-
Apodiformes	Apodidae	<i>Apus apus</i>	Swift	Ebabil	LC	App-III	-	App-I	-
Apodiformes	Apodidae	<i>Tachymarptis melba*</i>	Alpine Swift	Ak karınlı ebabil	LC	App-II	-	App-I	-
Coraciiformes	Meropidae	<i>Merops apiaster</i>	Bee-Eater	Arikuşu	LC	App-II	-	App-I	-
Coraciiformes	Upupidae	<i>Upupa epops</i>	Eurasian Hoopoe	İbibik	LC	App-II	-	App-I	-
Passeriformes	Alaudidae	<i>Galerida cristata</i>	Crested Lark	Tepeli toygar	LC	App-III	-	App-II	-
Passeriformes	Alaudidae	<i>Alauda arvensis</i>	Skylark	Tarlakuşu	LC	App-III	-	App-II	Ann-IIB
Passeriformes	Hirundinidae	<i>Hirundo rustica*</i>	Swallow	Kırlangıç	LC	App-II	-	App-I	-
Passeriformes	Hirundinidae	<i>Delichon urbica</i>	House Martin	Ev kırlangıcı	LC	App-II	-	App-I	-
Passeriformes	Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	Sarı Kuyruksallayan	LC	App-II	-	App-I	-
Passeriformes	Motacillidae	<i>Motacilla alba</i>	Pied Wagtail	Ak Kuyruksallayan	LC	App-II	-	App-I	-
Passeriformes	Muscicapidae	<i>Erithacus rubecula</i>	Robin	Kızılgerdan	LC	App-III	-	App-I	-
Passeriformes	Muscicapidae	<i>Phoenicurus ochruros</i>	Black Redstart	Kara Kızılkuşuk	LC	App-III	-	App-I	-

CLASSIS Ordo	Family	Species (Scientific name)	Species (English name)	Species (Turkish name)	IUCN	BERN	CITES	MAK	EU Bird Directive
Passeriformes	Muscicapidae	<i>Phoenicurus phoenicurus</i>	Redstart	Kızılkuyruk	LC	App-III	-	App-I	-
Passeriformes	Muscicapidae	<i>Saxicola rubetra</i>	Whinchat	Çayır Taşkuşu	LC	App-III	-	App-I	-
Passeriformes	Muscicapidae	<i>Saxicola torquata</i>	Stonechat	Taşkuşu	LC	App-III	-	App-I	-
Passeriformes	Muscicapidae	<i>Oenanthe isabellina</i>	Isabellina Wheatear	Boz Kuyrukkakan	LC	App-III	-	App-I	-
Passeriformes	Muscicapidae	<i>Oenanthe oenanthe</i>	Northern Wheatear	Kuyrukkakan	LC	App-III	-	App-I	-
Passeriformes	Muscicapidae	<i>Muscicapa striata</i>	Spotted flycatcher	Benekli sinekkapan	LC	App-III	-	App-I	-
Passeriformes	Turdidae	<i>Turdus merula</i>	Blackbird	Karatavuk	LC	App-III	-	App-III	Ann-IIB
Passeriformes	Sylviidae	<i>Sylvia atricapilla*</i>	Blackcap	Kara başlı ötleğen	LC	App-II	-	App-I	-
Passeriformes	Sylviidae	<i>Phylloscopus collybita</i>	Chiffchaff	Çıvgın	LC	App-II	-	App-I	-
Passeriformes	Paridae	<i>Parus caeruleus</i>	Blue Tit	Mavi Baştankara	LC	App-II	-	App-I	-
Passeriformes	Paridae	<i>Parus major</i>	Büyük Baştankara	Great Tit	LC	App-II	-	App-I	-
Passeriformes	Laniidae	<i>Lanius collurio*</i>	Red-Backed Shrike	Kızıl sırtlı örümcekuşu	LC	App-II	-	App-I	Ann-I
Passeriformes	Laniidae	<i>Lanius minor</i>	Lesser Grey Shrike	Kara Alınlı Örümcekuşu	LC	App-II	-	App-I	Ann-I
Passeriformes	Corvidae	<i>Pica pica*</i>	Magpie	Saksağan	LC	-	-	App-III	Ann-IIB
Passeriformes	Corvidae	<i>Corvus corone pallescens</i>	Hooded Crow	Leş Kargası	LC	-	-	App-III	Ann-IIB
Passeriformes	Corvidae	<i>Corvus monedula*</i>	Eurasian Jackdaw	Küçük karga	LC	-	-	App-III	Ann-IIB
Passeriformes	Sturnidae	<i>Sturnus vulgaris</i>	Starling	Siğircık	LC	-	-	App-III	Ann-IIB
Passeriformes	Rasseridae	<i>Passer domesticus*</i>	House sparrow	Serçe	LC	-	-	App-III	-
Passeriformes	Fringillidae	<i>Fringilla coelebs*</i>	Chaffinch	İspinoz	LC	App-III	-	App-II	-
Passeriformes	Fringillidae	<i>Carduelis chloris</i>	Greenfinch	Florya	LC	App-II	-	App-I	-
Passeriformes	Fringillidae	<i>Carduelis carduelis</i>	Goldfinch	Saka	LC	App-II	-	App-I	-
Passeriformes	Emberizidae	<i>Emberiza hortulana</i>	Ortolan	Kirazkuşu	LC	App-II	-	App-II	Ann-I
Passeriformes	Emberizidae	<i>Miliaria calandra</i>	Corn Bunting	Tarla Kirazkuşu	LC	App-III	-	App-II	-
<b>MAMMALIA</b>									
Êrinaceomorpha	Erinaceidae	<i>Erinaceus roumanicus*</i>	Northern White-breasted Hedgehog	Balkan kirpisi	LC	-	-	-	-
Soricomorpha	Talpidae	<i>Talpa europaea *</i>	European Mole	Avrupa köstebeği	LC	-	-	-	-
Rodentia	Spalacidae	<i>Nannospalax leucodon*</i>	Lesser mole rat	Beyazdişili körfare	DD	-	-	-	-
Rodentia	Muridae	<i>Apodemus sylvaticus</i>	Wood Mouse	Dağ faresi	LC	-	-	-	-

\* Species which are directly observed during field study. Other species are listed according to literature data and/or the suitability of the habitat.

## LEGENDS FOR THE FAUNA TABLE

### IUCN CATEGORIES

(<http://www.iucnredlist.org/>)

EX : Extinct  
EW: Extinct in nature  
CR : Critically endangered  
EN : Endangered  
VU : Vulnerable  
NT : Near threatened  
LC : Least concern  
DD : Data deficient  
NE : Not evaluated

### BERN (BERN Convention):

App-II: Strictly protected fauna species  
App-III: Protected fauna species

### CITES:

App1: Species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.  
App2: Species not necessarily threatened with extinction, but their trade must be controlled to avoid utilization incompatible with their survival.  
App3: Species protected in at least one country, and their trading is under control by CITES.

### MAK:

Appendix-I: List of wild animals protected by the Ministry of Forestry and Water Works.  
Appendix-II: List of game animals protected by MAK.  
Appendix-III: List of game animals whose hunting is allowed for certain periods for 2013-2014 season.

### EU Bird Directive

Annex I: The species mentioned in Annex I shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

Annex IIA: The species referred to in Annex II, Part A may be hunted in the geographical sea and land area where this Directive applies.

Annex IIB: The species referred to in Annex II, Part B may be hunted only in the Member States in respect of which they are indicated.

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## **ANNEX L**

### **Archaeology Supporting Information**

Annex L-1: İkitelli Integrated Health Campus Project Cultural Heritage Assessment Report

Annex L-2: İkitelli Integrated Health Campus Archaeo-geophysics Research Report

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## **ANNEX L-1**

# **İkitelli Integrated Health Campus Project Cultural Heritage Assessment Report**



# İKİTELLİ INTEGRATED HEALTH CAMPUS PROJECT

## Cultural Heritage Assessment Report

Nov. 26, 2013

Ferudun Ozgumus, Ph.D, Assoc. Prof.

Sevket Donmez, Ph.D, Assoc. Prof.

Ayse Didem Ozger-Bayvas, Art Historian

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## 1. Introduction

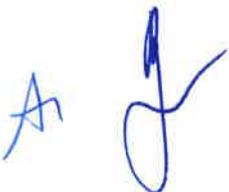
ELC Consulting and Engineering Inc (ELC) requested an assessment of the cultural heritage aspects at the İkitelli Integrated Health Campus Project site located in the Bahçeşehir District of Istanbul Province, Turkey. The Project location is provided in Figure 1. The Google Earth view of the Project Area is shown in Figure 2.

An archeological assessment consisting of walkthrough at the site was conducted by Assoc. Prof. Ferudun Ozgumus, Assoc. Prof. Sevket Donmez and Art Historian Ayse Didem Ozger-Bayvas on October 2013. The report itself was made not only as table based work but also with an archaeological field survey made by Art Historian Ayse Didem Ozger-Bayvas between Oct. 3 and 7, 2013. All drawings in the report which indicates archaeologically potential sites were made by Archaeology Student Fidane Abazoğlu. The CVs of the project team are given in Annex I.

The report has been prepared to include:

- Site Lists and Coordinates
- Description of Site Location Patterns in the Project Area
- References of all sites and single artefacts
- Site Photographs

For this work the work team provides acknowledgements go to Fidane Abazoğlu, Can Kandaz and Nurcan Koç from the Istanbul University, Departments of Archaeology and Fine Arts.



## 2. List of Abbreviations-Bibliography

TEBE : Türk Eskiçağ Bilimleri Enstitüsü

TTK : Türk Tarih Kurumu

The bibliography that has been used in this report includes the following literature:

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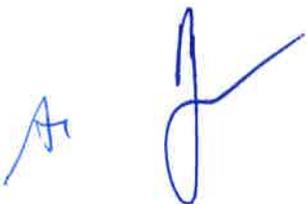
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### 3. Site List and Coordinates

The site locations for potential cultural heritage value finds as shown in the various maps within this report are as follows:

01	41° 5'52.14"N	28°46'34.52"E	Kurgan ?
02	41° 5'52.03"N	28°46'33.66"E	Kurgan ?
03	41° 5'51.48"N	28°46'35.02"E	Kurgan ?
04	41° 5'50.96"N	28°46'34.54"E	Kurgan ?
05	41° 5'50.69"N	28°46'34.93"E	Kurgan ?
06	41° 5'49.86"N	28°46'35.08"E	Kurgan ?
07	41° 5'48.91"N	28°46'35.13"E	Kurgan ?
08	41° 5'47.40"N	28°46'35.44"E	Ancient Wall Ruins ?
09	41° 5'46.40"N	28°46'41.41"E	Kurgan ?
10	41° 5'52.92"N	28°46'41.48"E	Kurgan ?
11	41° 5'53.33"N	28°46'41.24"E	Ancient Road ?
12	41° 5'53.29"N	28°46'40.79"E	Farm House ?
13	41° 5'54.95"N	28°46'42.19"E	Byz. Column Capital
14	41° 5'55.20"N	28°46'41.62"E	Ancient Road ?
15	41° 6'23.54"N	28°46'31.34"E	Ancient Wall or Road ?
16	41° 6'24.79"N	28°46'29.96"E	Ancient Wall Ruins ?
17	41° 6'24.63"N	28°46'29.20"E	Ancient Wall Ruins ?
18	41° 6'30.92"N	28°46'30.82"E	Illegal excavation pit
19	41° 6'32.59"N	28°46'30.32"E	Ancient Road ?



## 4. Brief Text Description of Site Location Patterns in the Project Area

### 4.1 Literature Survey Results

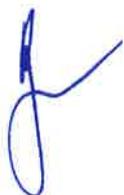
There are no prehistoric or ancient remains reported in the vicinity of the site area in the literature. The closest area is located at 5.5km South of the area where the Yarımburgaz Cave in which lower Paleolithic (400 000 BC), Neolithic (6<sup>th</sup>Millennium BC), Chalcolithic (5<sup>th</sup>MillenniumBC) and Byzantine artefacts have been unearthed.

The nearest (Apprx. 10km) ancient settlement to the present working area is *Rhegium*. Although its ruins almost disappeared because of condense construction activities, its location and major monuments were discovered in 1940-41 and 1948by the Ord.Prof.Dr. A.M.Mansel of Istanbul University on the western coast of the Küçük Çekmece Lake (Apprx. 10km to the site). In this ancient city, which is on the ancient rout of *Via Egnatia*, a large walled Byzantine complex was found after cleaning an area of 5000 square meter. Some of its buildings were decorated with floor mosaics. Rhegium was not an independent settlement but it was a region under ancient Byzantium indicated as *akome* (ancient village) in the 12 Roman mileswest of Byzantium on famous ancient map of *TabulaPeutingeriana*.

Near the site area is another ancient settlement called *Bathonea* (Apprx. 10km to the site) near the eastern shore of the Küçük Çekmece Lake which is open any archaeological debate on its origin and name. In this so called *Bathonea*, excavations started in 2009 and are still underway. Some late ruinous Byzantine buildings, some other later remains were unearthed.

In the neighbouring modern settlements called Altınşehir (Apprx. 3km to the site) and Küçük Çekmece (Apprx. 10km to the site), there are cisterns, fountains, ect which belong to Byzantine and Ottoman Period which were all studied and reported by Prof.Dr. Semavi Eyice in 1978 (*see Map 01*).

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## 4.2 Finds at the Site Area

The investigated area extends approximately 500m East and West and 2km in the North and South and is rather hilly. The highway coming from the Atatürk Olympic Stadium goes through the area towards Kiptaş Housing and consequently divides the area into two. For this reason, the site portions were named as the South and the North (see Map 02-03-04) Areas in this report.

In the beginning of the work the Southern Area was examined. This South Area is gently sloping from the West to the East. In the West some potential archaeological ruins were identified. These consisted of some small artificially made circular hills and foundations of stone walls. Those small hills are six in total and four of them have better preserved until today. Their diameters are approximately 8m and their heights are approximately 1 m (see Photo 01 – Figure 01 – Photo 02 – Figure 02 – Photo 03 – Figure 03). They are made of debris and pebble (see Photo 04). At first glance they seem like debris-hill *kurgan* type graves. In order to understand the exact function of them archaeo-geophysical researches are needed. This kind of researches may also reveal that they are natural. If those hills are real Kurgan type graves then comes the question of their identity. The work area is part of Ancient Thrace. This name comes from the natives of the region called *Thracians*. According to the literary sources, those Thracians had the burial traditions of *Tumuli* and *Kurgans* since the beginning of Early Bronze Age (3500 BC). This type of burials is common in Bulgarian and Greek Thrace (Western Thrace). In the Turkish Thrace (Eastern Thrace) however, just one *kurgan* was excavated. This kurgan which is in the Province of Kırklareli at the location of Taşlıcabayır belongs to the Late Bronze Age (13<sup>th</sup>-12<sup>th</sup> c. BC). All these evaluations will be valid if those hills prove to be archaeological. Further archaeological and archaeo-geophysical works will help to determine more precisely information.

Archaeologically potential findings did not only consist of these hills but also some long and smooth wall ruins which were visible on the surface (see Photo 05 – Figure 04). Of these walls, one is extending 150m North and South and its width is about 2 m. The other wall is extending 100m East and West and its width is 1 m (see Map 05). These two walls meet at the South-East corner of the site area and make a perfect corner. Those walls are made of pebble without mortar. To determine its function there needs to be further archaeological investigations. About the original function of the walls, two options may be put forward. One of these is a *peribolos* wall which encloses the graves but if those hills are not graves this hypothesis will not be valid. Secondly, these walls may have been made for defence purpose.

In the eastern part of the Southern research area, some ruins and artefacts were identified with potential archaeological importance. One of them is a rectangular

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foundation of a structure made of pebble which is the most attractive one among the other findings. It may have been a part of a bigger complex (see Photo 06 – Figure 05). Prof. Eyice mentions some Late Roman and Byzantine Farm Houses in his article of the region. This structure may belong to one of these buildings. Not only here but in the entire research area no post sherds found and this brings a kind of difficulty for the present work to judge the date of those structures.

About 50m North of these ruins, is a marble Middle Byzantine Column Capital (12<sup>th</sup>c.) and flat stone paved road that seems to be badly destroyed. On the *kalathos* of the capital, is a Greek Cross surrounded by two floral figures (see Photo 07 – Figure 06) and on the other side are two rosettes (see Photo 08), one is badly damaged. It must have been brought to this area from the other parts of the city. According to Prof. Semavi Eyice, during the works of other ancient sites near our working area (Küçükçekmece and its neighbourhood) similar column capitals were found and taken to the Istanbul Archaeological Museums.

Aforementioned stone paved road was brought to light and badly damaged because of heavy rain falls (see Photo 09).

Northern research area does not present archaeological findings so much as the Southern area does. Major part of this area was used to dump excavation debris from the nearby constructions and the original surface of the ground was completely covered by the debris.

Approximately 200m north of this area there is another wall extending 120m from the North-West to the South-East. Its width is 1 m. It completely is made of pebble and must have been used for defence purposes (see Photo 10 – Figure 07 – Map 06).

Approximately 200m north of this long wall there are two holes rather big and excavated most likely by illegal treasure hunters (see Photo 11 – 12 – Coordinates: 41° 6'24.79" N 28°46'29.96" E and 41° 6'24.63" N 28°46'29.20" E).

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## 5. Conclusions

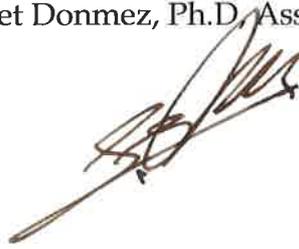
This future hospital area bears archaeological potential which needs further archaeological investigations. Before the Hospital construction, a 'Convenient Archeological Strategy' must be organised and all the aforementioned archaeological data should be informed to the related Protection and Heritage Board and the Istanbul Archaeological Museums. A Scientific Committee of Scholars (Archaeologists, Art Historians) must be formed for the entire construction work which will help sustainable archaeological strategy of the Project.

The column capital found during the work should be informed to the museum and if necessary should be taken to the museum by land owner of the Project area.

Ferudun Ozgumus, Ph.D, Assoc. Prof.



Sevket Donmez, Ph.D Assoc. Prof.

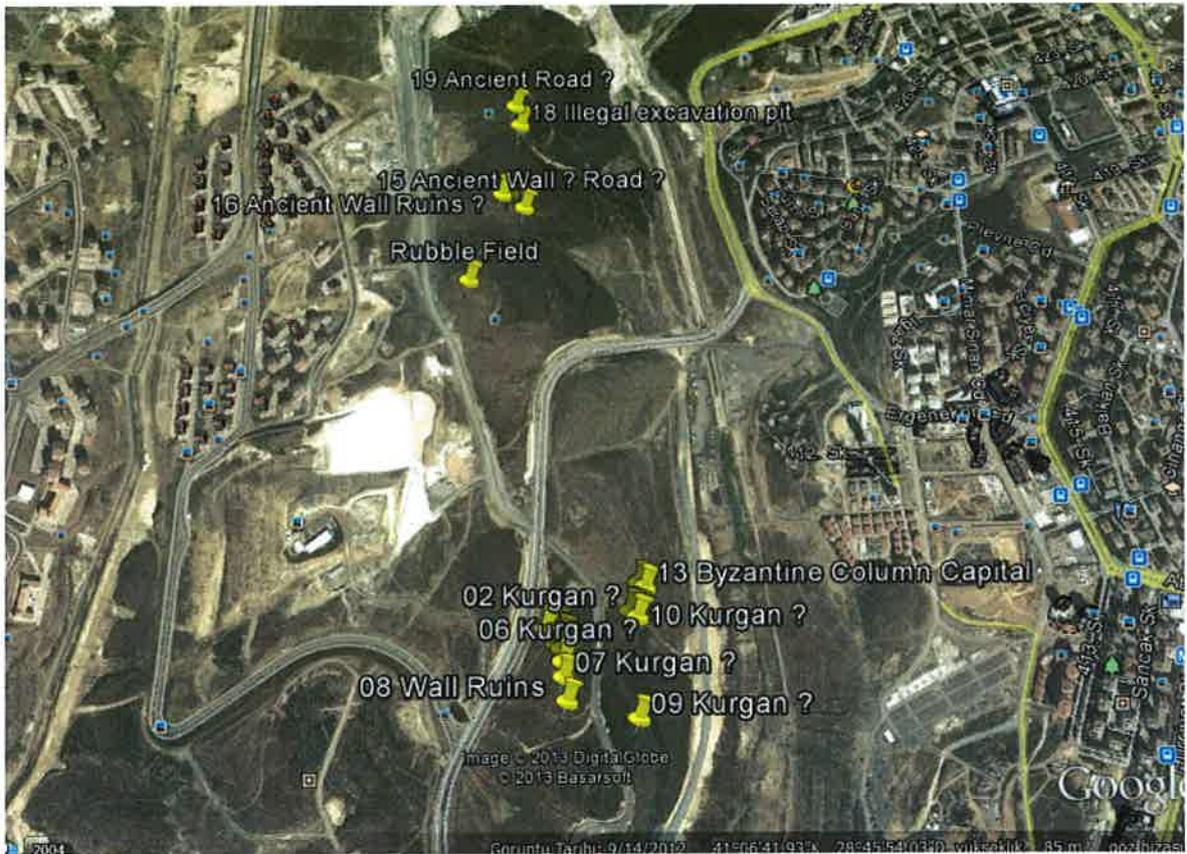


Ayse Didem Ozger-Bayvas, Art Historian



Nov. 26, 2013





Map 02



Map 03

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Map 04



GÜNEY ARAZI, UZUN TAŞ DUVAR (SUR DUVARI?)

Map 05 41° 5'47.40"N 28°46'35.44"E

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KUZEY ARAZI, UZUN TAŞ DUVAR (SUR DUVARI?)

41° 6' 24,79"  
28° 46' 29,96"

*Map 06*

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PHOTOGRAPHS



Photo 01 – Potential *Kurgan* Type Graves 41° 5'52.14"N 28°46'34.52"E



Photo 02 – Potential *Kurgan* Type Graves 41° 5'52.03"N 28°46'33.66"E

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*Photo 03 – Potential Kurgan Type Graves 41° 5'52.03"N 28°46'33.66"E*



*Photo 04 – Debris and pebble*

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*Photo 05 – Wall ruins in the South area 41° 5'47.40"N 28°46'35.44"E*

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*Photo 06 – A part of a complex (Farm House ?) 41° 5'53.29"N 28°46'40.79"E*

*Handwritten signature in blue ink.*

*Handwritten signature in brown ink.*



Photo 07- Middle Byzantine Column Capital 41° 5'54.95"N 28°46'42.19"E

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*Photo 08– Middle Byzantine Column Capital 41° 5'54.95"N 28°46'42.19"E*



*Photo 09 – Stone paved road in the North area 41° 5'55.20"N 28°46'41.62"E*

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*Photo 10 - Wall ruins in the North area 41° 6'24.79"N 28°46'29.96"E*

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*Photo 11 – Illegal excavation pit 41° 6'30.92"N 28°46'30.82"E*



*Photo 12 – Illegal excavation pit 41° 6'30.92"N 28°46'30.82"E*

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FIGURES

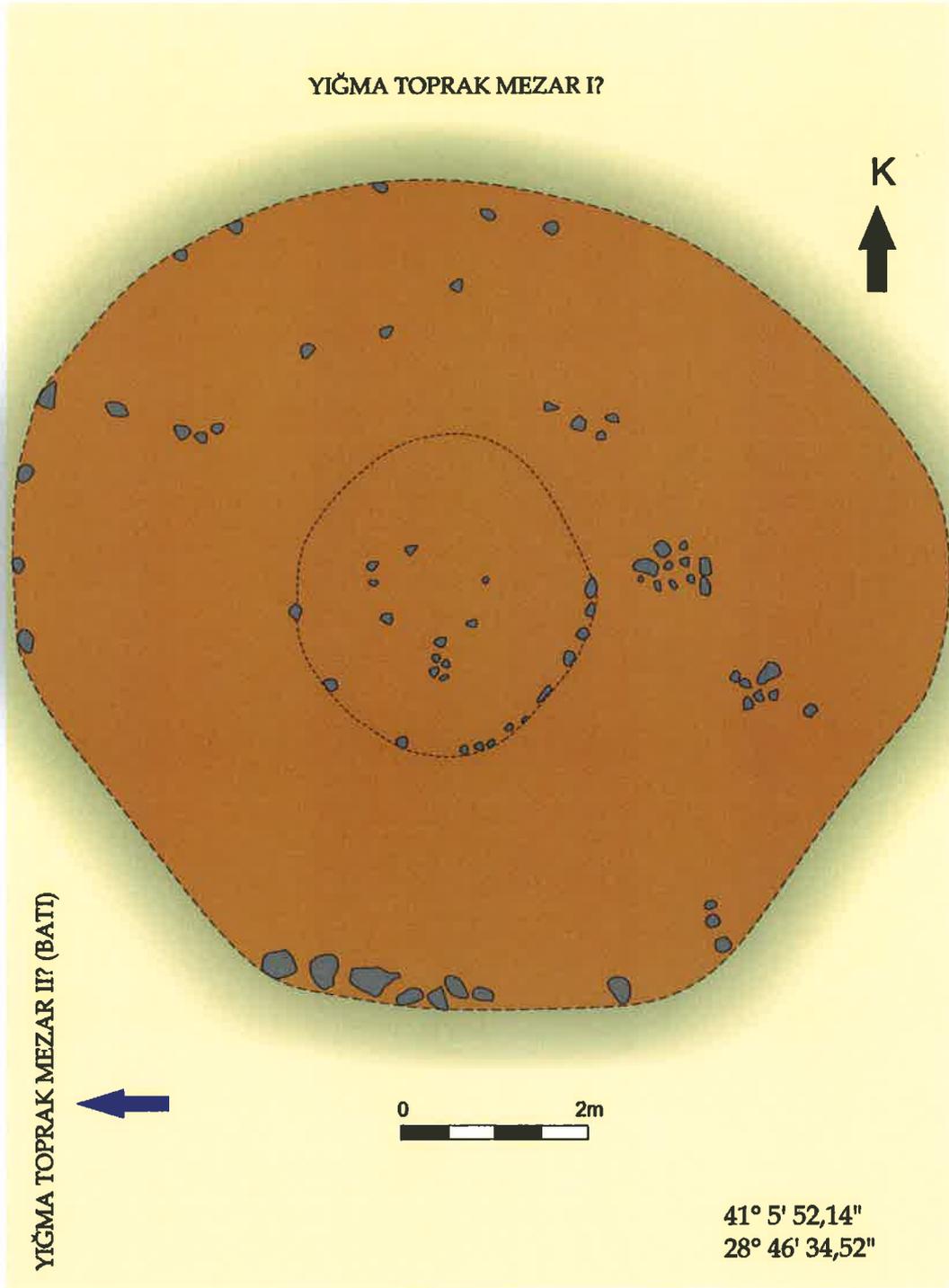


Figure 01 – Potential Kurgan Type Graves

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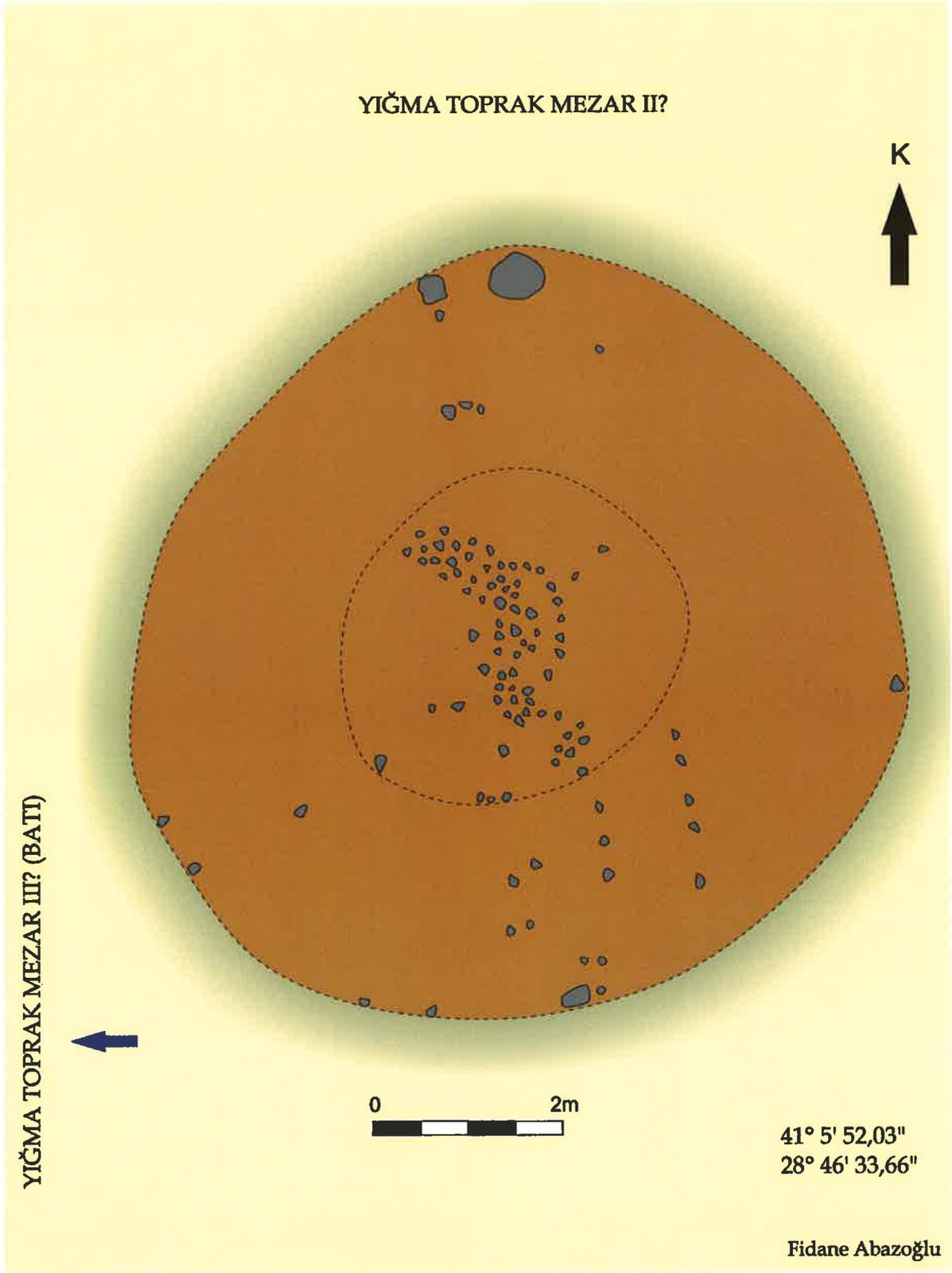


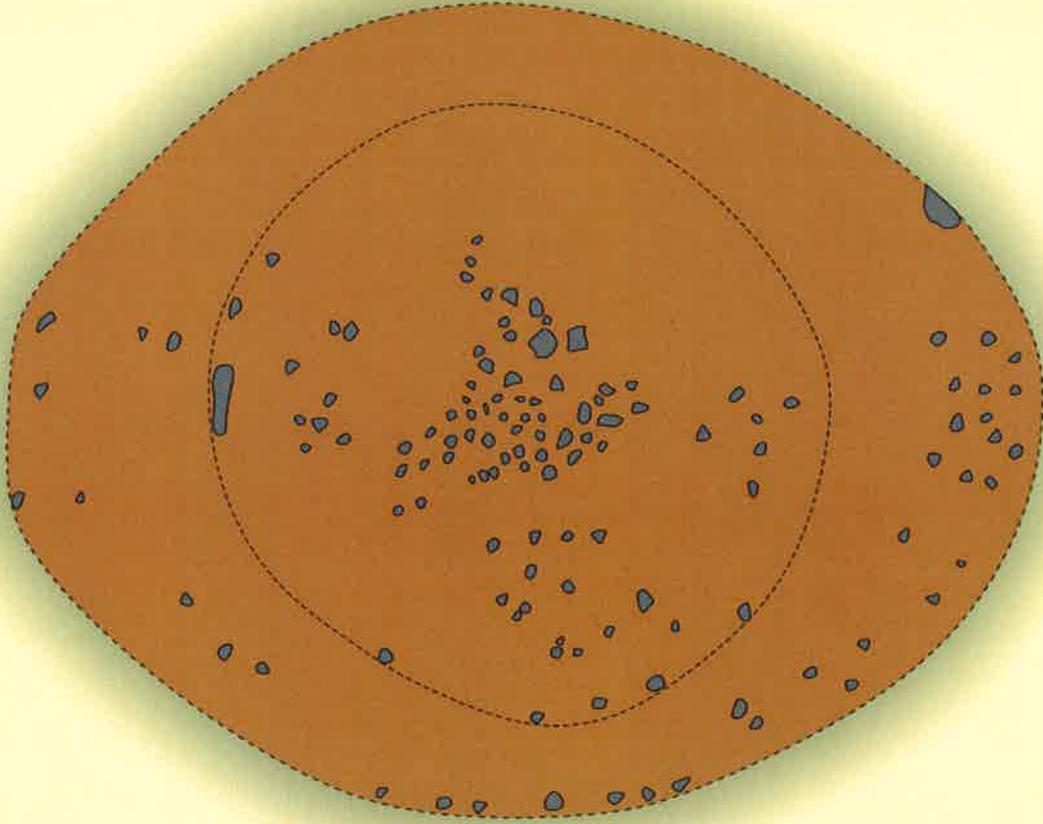
Figure 02 – Potential *Kurgan* Type Graves

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YIĞMA TOPRAK MEZAR III?

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41° 5' 52,03"  
28° 46' 33,66"

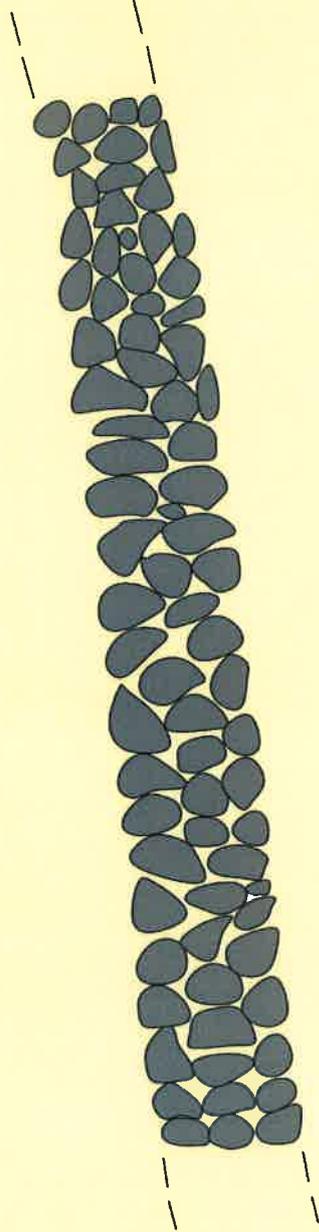
Fidane Abazoğlu

Figure 03 - Potential *Kurgan* Type Graves

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Güney Arazi, Uzun Taş Duvar(SUR DUVARI?)



41° 5' 50,96"  
28° 46' 34,54"

Fidane Abazoğlu

Figure 04 – Wall ruins in the South area 41° 5'47.40"N 28°46'35.44"E

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Güney Arazi, Yamaçtaki Yapı Kalıntısı

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41° 5' 53,29"  
28° 46' 40,78"

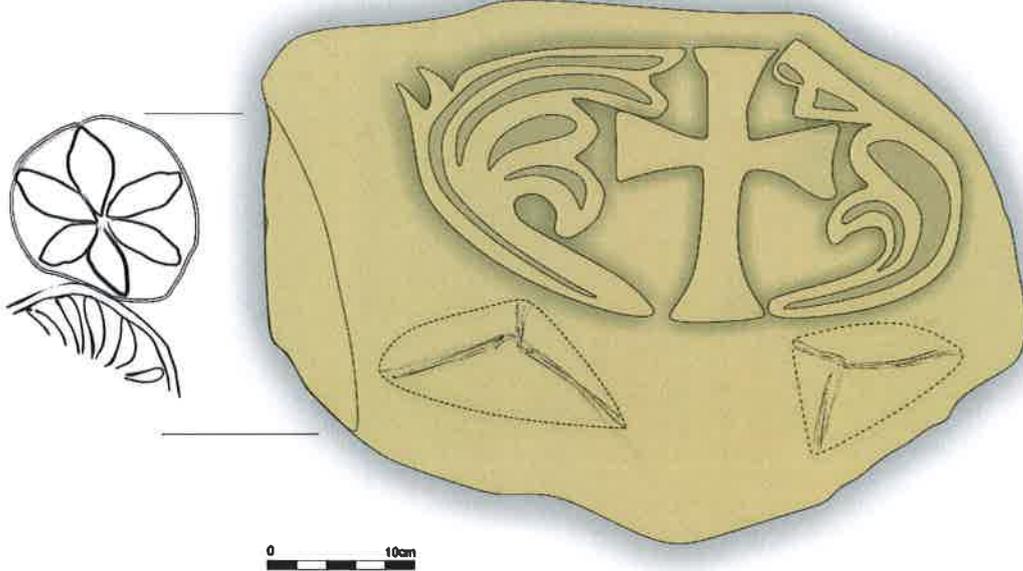
Fidane Abazoğlu

Figure 05 - A part of a complex (Farm House ?)

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Orta Dönem Bizans Sütun Başlığı



41° 5' 54,9"  
26° 46' 42,19"

Fidene Abazojlu

Figure 06 – Middle Byzantine Column Capital

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Kuzey Arazi, Uzun Taş Duvar

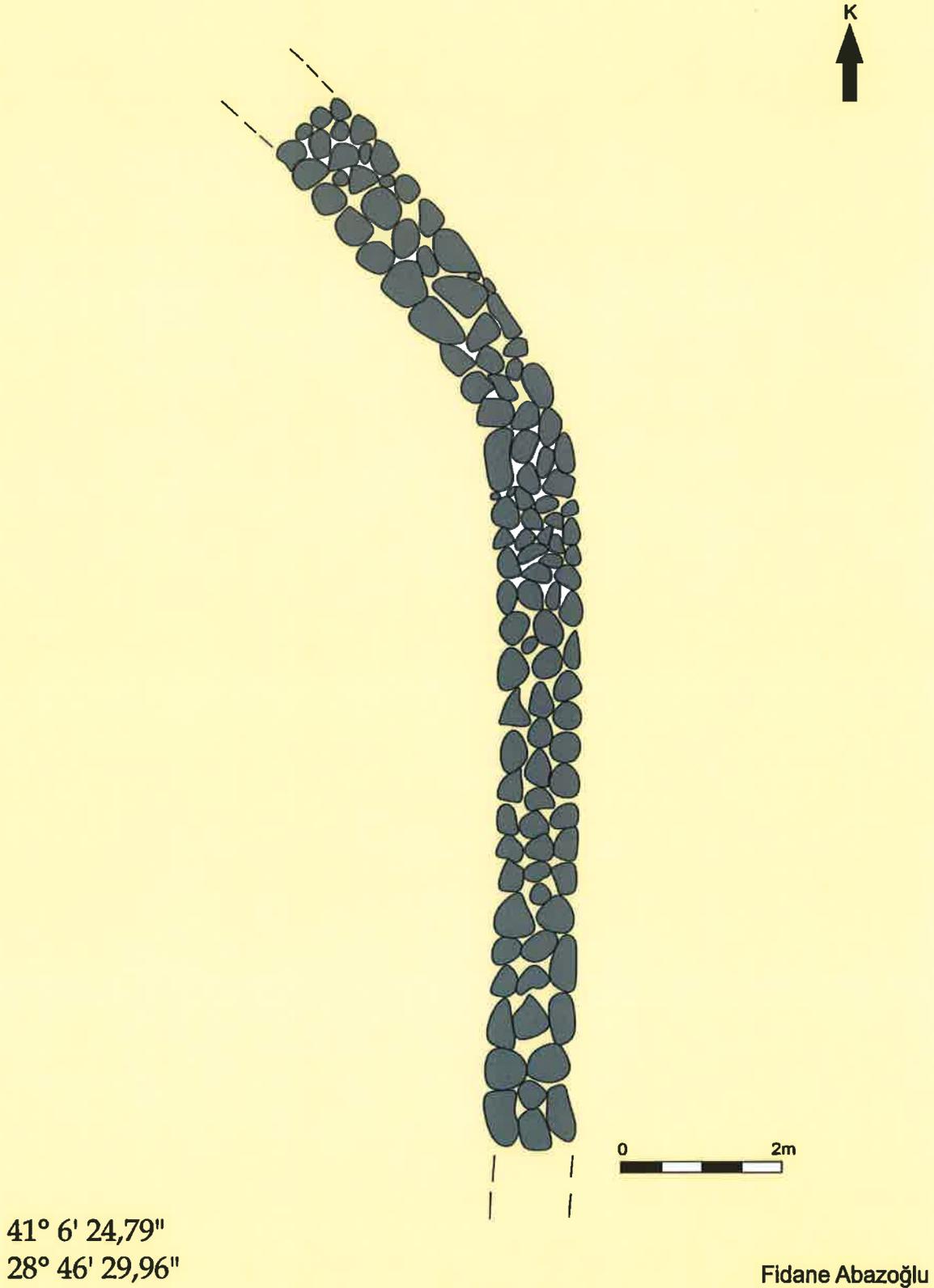


Figure 07 - Wall ruins in the North area

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## **ANNEX L-2**

# **İkitelli Integrated Health Campus Archaeo-geophysics Research Report**



ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



**ISTANBUL PROVINCE AND DISTRICT OF  
BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 Block, 1 Plot (Previous 1305 Block, 1 Plot),  
1356 Block, 2 Plot (Previous 1305 Block, 2 Plot),  
İKİTELLİ INTEGRATED HEALTH CAMPUS  
ARCHAEOGEOPHYSICS RESEARCH**

**IHC İSTANBUL İKİTELLİ  
INTERNATIONAL HEALTH BUSINESS  
INVESTMENTS AND ENTERPRISE INC.**



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVİOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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## **ABSTRACT**

This work has been carried out in the area of Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , This aim of the work is to reasearch whether the remains of belonging ancient times in the İkitelli Integrated Health Campus exist or not. With the purpose, Geo-radar (Ground Penetrating -GPR), Multi-Electrode Electrical Tomography (2D) and Self Potential (SP) methods of Geophysics has been used.

This archaeogeophysics research project, has been carried out belonging IHC Ikitelli International Health Property Investment and Management Company by Geometrik Engineering Underground Researches Consulting Company.



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**ISTANBUL PROVINCE AND DİSTRİCT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
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## 1. INTRODUCTION

This work has been carried out in the area of Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus.

This aim of the work is to reasearch whether the remains of belonging ancient times in the İkitelli Integrated Health Campus exist or not. With the purpose, Geo-radar (Ground Penetrating -GPR), Multi-Electrode Electrical Tomography (2D) and Self Potential (SP) methods of Geophysics has been used.

This work has been carried out in the area of Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus, which are also shown in the layout plan, Geo-radar measures (in total of 9 the region, 1.0 m interval, in a total of 190 profiles), Multi-Electrode Electrical Tomography measurements (in a total of 28 profiles) and S.P. (Self Potential) measurements (in total of 5 the region). As a result of geophysical studies carried out, two and three dimensional underground images (Geo-radar, Electrical Tomography, Self-Potential (S.P.) have been gained.

This study, measuring devices and equipment of Mala GPR brand (ProEx unite, 250 Mhz antenna, notebook, DGPS antenna) were used. GPR data (radargram) is interpreted, using Reflex 2D ve three dimensional graphics software (Slice 3D) and measuring Multi-Electrode Electrical Tomography and also Self-Potential (S.P.) were used Metz Sas503brand (for resistivity) and other equipment.





## 2. AREA OF STUDY

This work has been carried out in the area of Istanbul Province and District of Basaksehir, İkitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus.



**İmage 1**, In the area of Istanbul Province and District of Basaksehir, İkitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus Geophysical study area Site Layout Air Picture (GoogleEarth).





### 3. GEOPHYSICAL RESEARCH

Geophysical methods of analysis for the purposes of this study the geo-radar (Ground Penetrating Radar-GPR) , Multi-Electrode Electrical Tomography and Self Potential (SP) methods are used.

#### 3.1. Ground-Penetrating Radar (GPR) Method

Ground penetrating radar (GPR) has been widely used in the geological and archeological industries since 1970. The foundations of GPR lie in electromagnetic (EM) theory. The history of this field spans more than two centuries and is the subject of numerous texts such as Jackson (1962) and Smythe (1989). This overview outlines the basic building blocks needed to work quantitatively with GPR.

A typical GPR system has three main components: Transmitter and receiver that are directly connected to an antenna, and a control unit . The transmitting antenna radiates a short high-frequency EM pulse into the ground, where it is refracted, diffracted and reflected primarily as it encounters changes in dielectric permittivity and electric conductivity.

Maxwell's equations mathematically describe the physics of EM fields, while constitutive relationships quantify material properties. Combining the two provides the foundations for quantitatively describing GPR signals.

$$\nabla \times \mathbf{e} = -\mu \frac{\partial \mathbf{h}}{\partial t}$$

and

$$\nabla \times \mathbf{h} = \epsilon \frac{\partial \mathbf{e}}{\partial t}$$

is find. The wave equations;

$$\nabla^2 \mathbf{h} = \mu \epsilon \left( \frac{\partial^2 \mathbf{h}}{\partial t^2} \right)$$





and

$$\nabla^2 \mathbf{e} = \mu \epsilon (\partial \mathbf{e} / \partial t^2)$$

is given. Solutions that of these equations;

$$\mathbf{E} = \mathbf{E}_0 e^{-i(\omega t - kz)}$$

and

$$\mathbf{H} = \mathbf{H}_0 e^{-i(\omega t - kz)}$$

is given.  $E_0$  and  $H_0$  are initial values for the plane wave. is given.  $E_0$  and  $H_0$  are initial values for the plane wave. The movement of electromagnetic energy within the subsurface is governed by the propagation constant of the material it travels through.  $k^2 = \mu_0 \epsilon_0 \omega^2$  be remembered that here. Free space  $\epsilon = 8.854 \times 10^{-12}$  Farad / M is taken is defined by the relative permittivity  $\epsilon / \epsilon_0$ . The relative permeability,  $\mu$  EM wave propagation effects, but  $\mu / \mu_0$  rate is close to the value of the unit (Free space  $\mu_0 = 4\pi \times 10^{-7}$ ).

E and H using the values obtained from the solution of the wave equations Z impedance value,

$$Z = E_x / H_y = \mu_0 \omega / k$$

is obtained. Free space Z value,

$$Z_0 = (\mu_0 / \epsilon_0)^{1/2} = 120\pi = 377 \text{ ohm}$$

is find.





Due to the conductivity the definition is made difficult of the place. So the definition is made that "complex permittivity",

$$\epsilon' = \epsilon + i \sigma / \omega$$

loss tangent

$$\tan \delta = \sigma / \omega \epsilon$$

Size of the loss tangent refers to the height of the damping. Impedance formula conductive environments

$$Z_0 = \mu_0 e^{-i\delta/2} / (\epsilon + \sigma / \omega)^{1/2}$$

is given. In practice, is not much used in the impedance equation. The electromagnetic propagation factor in the subsurface can be expressed as:

$$k = \alpha + i\beta = \omega \mu_0 \epsilon^{1/2} (1 + \delta)^{1/4} e^{i \text{atan} \delta / 2}$$

is given,

$$\alpha = \omega \mu_0 \epsilon^{1/2} (1 + \delta)^{1/4} \cos(\frac{1}{2} \text{atan} \delta) = \omega \mu_0 \epsilon^{1/2} (1 + \delta)^{1/4} \cos(\frac{1}{2} \text{atan} \delta)$$

and

$$\beta = \omega \mu_0 \epsilon^{1/2} (1 + \delta)^{1/4} \sin(\frac{1}{2} \text{atan} \delta) = \omega \mu_0 \epsilon^{1/2} (1 + \delta)^{1/4} \sin(\frac{1}{2} \text{atan} \delta)$$





is find. If phase velocity of plane wave, displacement ratio of phase front is defined;

$$wt - \alpha z = \text{sabit}$$

is written.

Here you need to increase in the depth of  $z$  as  $t$  increases for stability condition. The rate of changes is given velocity formula,

$$v = dz/dt = 2\pi f / \alpha.$$

It is obtained that wavelength of electromagnetic field divided by frequency of wave velocity for any material,

$$\lambda = v / f = 2\pi / \alpha$$

damping factor  $\delta_e$

$$\delta_e = 1/\beta = (\omega \mu_0 \epsilon)^{1/2} \left( \frac{\sigma}{2\omega \epsilon} \right)^{-1/2} \left( 1 - \left( \frac{\sigma}{2\omega \epsilon} \right)^2 \right)^{-1/2}$$

is be written (Pekşen, 2011). Where,  $\omega$  is the angular frequency of electromagnetic wave;  $\epsilon$  is the permittivity of medium;  $\sigma$  is the electric conductivity of medium;  $\mu$  is the magnetic conductivity of medium;  $\alpha$  is the phase coefficient;  $\beta$  is the attenuation coefficient.

André Marie Ampère (1775-1836), Michael Faraday (1791-1867), (Sears ve diğ., 1982) and Karl Friedrich Gauss (1777-1855) were made studies. In free space radio waves travel at the speed of light,  $c$ ,

$$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$$





where,  $\epsilon_0$  is the permittivity of space;  $\mu_0$  is the magnetic conductivity of space (  $\epsilon_0 = 8.854 \cdot 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$ ,  $\mu_0 = 4 \pi \cdot 10^{-7} \text{ Wb A}^{-1} \text{ m}^{-1}$ ,  $c \cong 3 \cdot 10^8 \text{ m/s}$  )

and in case the spread of the electromagnetic wave in the material;

$$w = \frac{1}{\sqrt{\epsilon\mu}}$$

Relative permittivity of material K, If  $K_m$  is defined as the relative permeability:

$$\epsilon = K \epsilon_0$$

$$\mu = K_m \mu_0$$

c,  $\epsilon$  and  $\mu$  Equations between w velocity between relationship:

$$w = \frac{c}{\sqrt{K_m K}}$$

is obtained. Relative permeability for poor magnetic materials  $K_m \cong 1$  can be taken. In this case, the electromagnetic wave velocity w Bu durumda elektromanyetik dalga hızı w only K will be a function of relative permittivity material:

$$w = \frac{c}{\sqrt{K}}$$

The electromagnetic wavelength for a given frequency “f”;

$$\lambda = \frac{w}{f}$$

can be written as.





At this stage, the reflection and transmission of electromagnetic waves, the principles can be examined. Where  $R$  is the reflection coefficient and  $T$  is the transmission coefficient. In the case of normal incidence, the reflection and transmission coefficients are given as ( $\lambda_1$  and  $\lambda_2$ : the wavelength related with the medium)

$$R = \frac{\lambda_2 - \lambda_1}{\lambda_2 + \lambda_1}$$

and

$$T = 1 - R$$

is defined. The relationship between ( $w$  and  $\lambda$ ) with ( $R$  and  $T$ ); for  $R$  and  $T$  (Annan ve diğ., 1975; Hollender ve Tillard, 1998):

$$R = \frac{\sqrt{K_1} - \sqrt{K_2}}{\sqrt{K_1} + \sqrt{K_2}}$$

$$T = \frac{2\sqrt{K_2}}{\sqrt{K_1} + \sqrt{K_2}}$$

where  $K_1$  and  $K_2$  are the permittivite of the first and second media. Dielectric constant, DC electrical conductivity, propagation velocity and attenuation properties of common geologic materials. (Sources: Davis & Annan, 1989; A-CUBED, 1983; Ulriksen, 1982).





**Table 1.** Relative permittivity values of different environments.

Material	K	Material	K
Air	1	İron	1
Copper	1	Pure Water	81
Sea water	81	İce	4
Dry Sand	3-6	Wet Sand	20-30
Silt	5-30	Clay	5-40
Wet Soil	30	Planted in the soil	15
Stony Soil	7	Dry Sandy Soil	3
Wet Sandy Soil	25	Dry Clay Soil	2
Wet Clay Soil	15	Dry Concise Soil	2
Wet Concise Soil	19	Wet Sandstone	6
Wet Claystone	5-15	Dry Limestone	7
Wet Limestone	4-8	Wet Basalt	8
Dry Granite	5	Wet Granite	7
Asphalt	4-6		

The typical propagation velocity of radar energy in a variety of materials is given in Table I. The propagation velocity in water tends to be fairly constant and the typical values shown in the table are generally employed to calculate water depth. When it comes to measuring the thickness of lake-bottom sediment layers, velocity determination become more important as the propagation velocity in sediment can vary considerably.

The depth to which GPR can image below the surface is dependant on three main factors: 1) the number of interfaces that generate reflections and the dielectric contrast at each interface, 2) the rate at which the signal is attenuated as it travels through the subsurface, and 3) the centre frequency of the antennas. As the GPR pulse arrives at each interface, a portion of it is returned to the surface and the rest continues into the next layer. As the number of interfaces increases, the proportion of energy that propagates to depth is reduced. In addition, the greater proportion of energy that is reflected back to the surface at each interface, the less energy that is available to propagate deeper into the ground. In sediment, localized dielectric





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contrasts can create chaotic reflections. This limits the depth of investigation because the reflections of interest get masked by the clutter of the chaotic returns.

The depth range of GPR is limited by the electrical conductivity of the ground, the transmitted center frequency and the radiated power. As conductivity increases, the penetration depth decreases. This is because the electromagnetic energy is more quickly dissipated into heat, causing a loss in signal strength at depth. Higher frequencies do not penetrate as far as lower frequencies, but give better resolution. Optimal depth penetration is achieved in ice where the depth of penetration can achieve several hundred metres. Good penetration is also achieved in dry sandy soils or massive dry materials such as granite, limestone, and concrete where the depth of penetration could be up to 15-metre (49 ft). In moist and/or clay-laden soils and soils with high electrical conductivity, penetration is sometimes only a few centimetres.

Ground penetrating radar survey is one method used in archaeological geophysics. GPR can be used to detect and map subsurface archaeological artifacts, features, and patterning. The concept of radar is familiar to most people. With ground penetrating radar, the radar signal – an electromagnetic pulse – is directed into the ground. Subsurface objects and stratigraphy (layering) will cause reflections that are picked up by a receiver. The travel time of the reflected signal indicates the depth. Data may be plotted as profiles, as planview maps isolating specific depths, or as three-dimensional models. GPR can be a powerful tool in favorable conditions (uniform sandy soils are ideal). Like other geophysical methods used in archaeology (and unlike excavation) it can locate artifacts and map features without any risk of damaging them. Among methods used in archaeological geophysics it is unique both in its ability to detect some small objects at relatively great depths, and in its ability to distinguish the depth of anomaly sources. The principal disadvantage of GPR is that it is severely limited by less-than-ideal environmental conditions. Fine-grained sediments (clays and silts) are often problematic because their high electrical conductivity causes loss of signal strength; rocky or heterogeneous sediments scatter the GPR signal, weakening the useful signal while increasing extraneous noise.



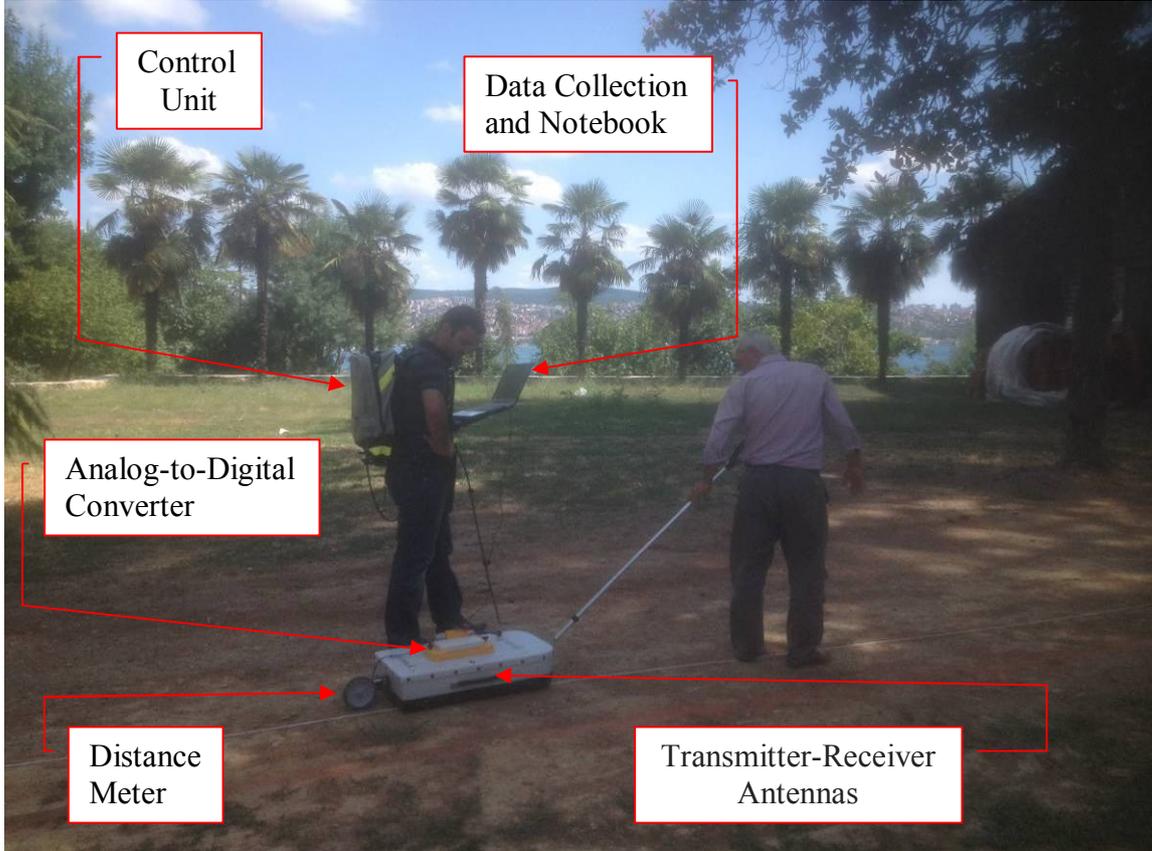
**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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Antenna frequencies used in practice 80 MHz, 100 MHz, 120 MHz, 300 MHz, 500 MHz, 750 MHz, 900 MHz, 1 GHz ve 2.5 GHz. Example; 80 MHz antenna is a depth of penetration of 20–30m. While in the wall is be analyzed with 2.5 GHz antenna and it is a depth of penetration of 40 cm.



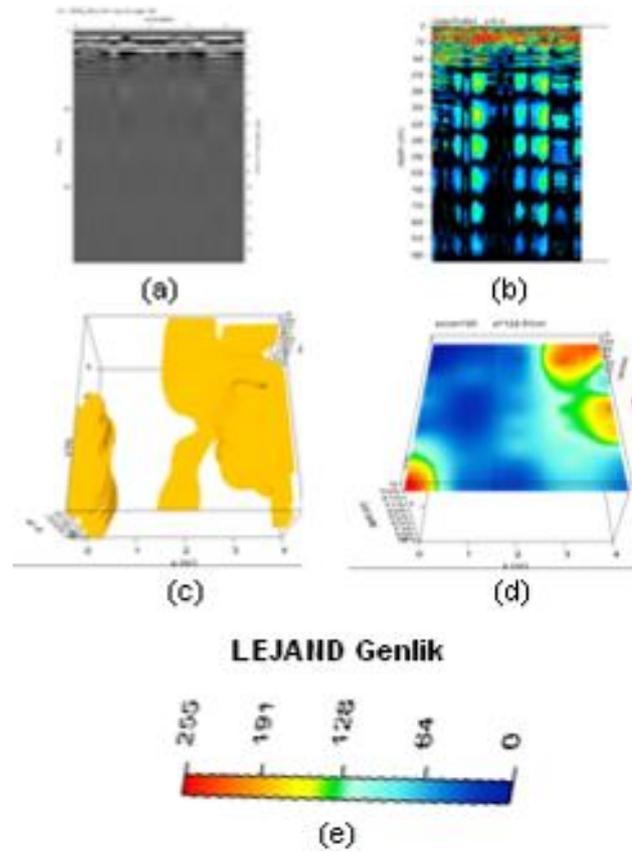
**Picture 1, Georadar and Equipment**

### **3.2. The Data Processing**

After the measurements were checked in the area, at first the unwanted data has been eliminated with “static correction”, the continuation of “devow filtre (subtract-mean)” has been applied, than while gain functions and band-pass filter has been applied (bandpass butterworth). This, data quality has been improved and eliminated unwanted noise.



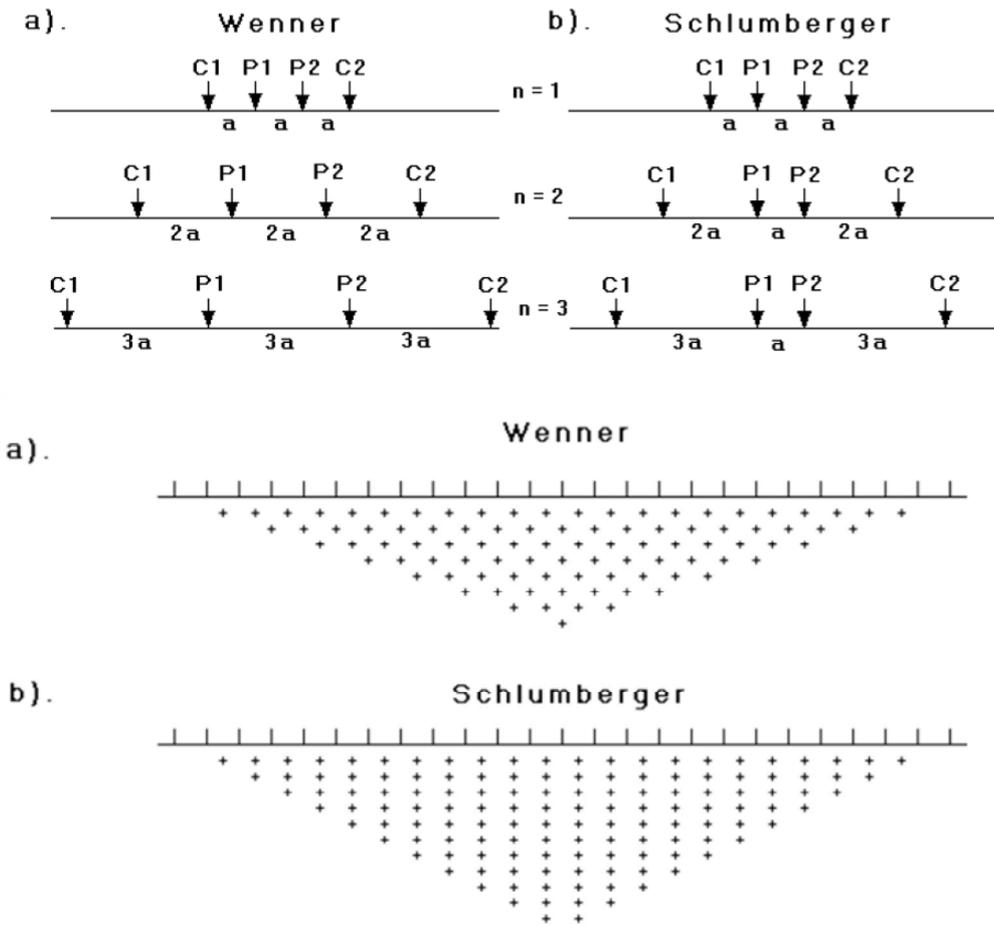
After the work time, two and three dimensional underground geo-radar images of the datas (which have been obtained from the geophysics measure works in the research area) have been formed. In these images, layouts that are determined as anomaly and regular anomaly places which are caused by historical relics have been marked. (Chapter 3.3. Evaluation and Appendix -1 Layout Plan)



**İmage 2,** As a result of radargram obtained with GPR measurements with 250 MHz antenna, a) the raw data (PROFILE\_0001\_A1.DAT), b) after data processing, c) radargram section and parallel lines obtained from the three-dimensional (3D) georadar view, d) layer maps, e) Amplitude Scale (Lejand)

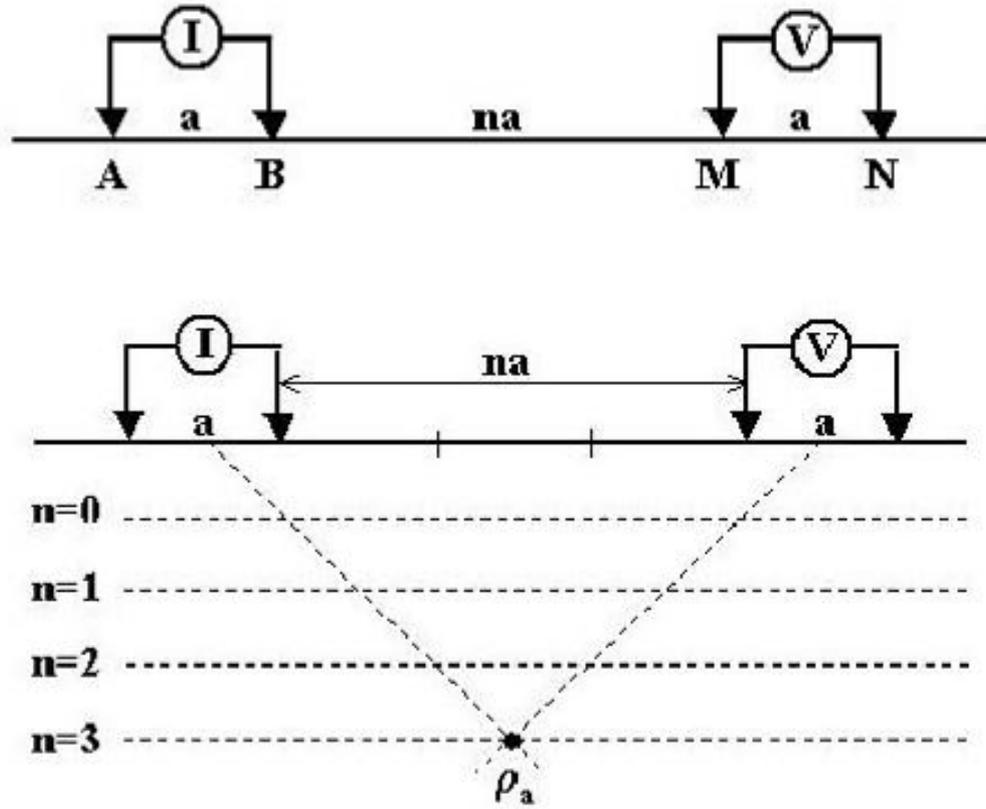
### 3.2. Multi-Electrode Electrical Tomography Methods

In the study area, 2-D resistivity tomography has revealed both the lateral and vertical variation in depth. If resistivity mapping is possible, depending on conductivity of the units of underground. Thus, the lateral and vertical changes in the environment can be determined, depending on geological, physical and geometric properties of the material. Multi-Electrode Electrical Tomography Methods is applied Wenner-Schlumberger and Dipol Dipol methods (Candansaya, 2001; Keceli, 2009).



$$\rho = \pi n(n+1) a R$$

**İmage 3**, Wenner-Schlumberger Sequence, Geometry and Resistivity Calculation



$$\rho_A = \frac{V}{I} \pi a n (n + 1)(n + 2).$$

**İmage 4**, Dipol Dipol Sequence, Geometry and Resistivity Calculation

While in the field A-B current electrode spacing  $a=5.0$  m. is being selected, potential electrodes of each MN is scrolled, the total work has been completed as  $n=21$ . Voltage (millivolts) the current  $I$  (milliamperes) and resistivity value (calculated) were recorded for each. Records are evaluated with Res2dinV software; measured apparent resistivity 2D, calculated apparent resistivity 2D and calculated inversed true resistivity section are determined.



### **3.3. S.P. Self Potential (Polarization) Yöntemi**

Self and Spontaneous Potential-SP method is an electrical method of natural sources. This method which is the oldest geophysical methods, used to research of sulfuric ores (Fox, 1830). Use of systematic has begun in 1920s. This method is sensitivited electric charge in ground. As the name suggests, measurement of the natural potential difference is based on between two points on the earth (Parasnis, 1962). The reason for this self potential, electrochemical and electrokinetic phenomena is caused in mineral and solutions. This potential is constant in some places and in some places is variable. Potential of constant and unchanging direction are caused from electrochemical events where surface rocks and of them embedded in structures. DU method, potential difference can be measured between 1.2 to 10.20 millivolts. Potential value can be measured as a negative value until few hundred millivolts in the mining areas which minerals of great electrical conductivity (sulfur, graphite, magnetite, galena). In places where groundwater flow is measured positive valuable self potentials. Therefore, a very rainy period in mining area should be given SP measurements.

In recent years the SP method has found increasing use in geothermal, environmental and engineering applications to help locate and delineate sources associated with the movement of thermal fluids and grounwater. Specific applications include mapping of seepage flow associated with dams, dekies and reservoir floors and delineation of flow patterns in the vicinity of water wells, faults, landslides and sinkholes. As the method offers relatively rapid filed data acquisition, it is often cost effectivite for initial investigation of an area prior to more intensive studies using other geophysical methods. As a result of earth's magnetic field and lightning occuring telluric currents alternating currents of small amplitude) is rarely reached 5mV. This natural potential, in studies with direct current voltage measurements are the main sources of noise. To destroy this noise is used arithmetic average of replicate measurements taken at different times

Polarization of natural causes are listed in the following headings.





### **3.3.1. Streaming/ Electrofiltration Potential**

Streaming potential originates from the flow of an electrolyte (water) over naturally charged solids (i.e., surfaces that acquired electrokinetic or zeta potential). The streaming potential appears when mud filtrate is forced into the formation under the differential pressure between mud column and formation. The streaming potential is produced when the flow takes place across mud-cake in front of permeable formations, across permeable formations being invaded, and across shale beds. It is generally accepted that the streaming potential across the mud-cake is compensated by that across the shale. As such, in most cases, the spontaneous potential measured is only related to the electrochemical potential.

Streaming potential direction (gradient) the direction is the same as the pressure direction. In geophysics, streaming potential is associated with ground water flow and flow of thermal solution. The potential is changed between a few millivolts to several hundred millivolts (Dobrin and Savit, 1988). Applications are the measurement of streaming potential:

- 1- Over zones of water leakage through fissures in the rock floor of reservoirs (Ogilvy ve diğ., 1969)
- 2- In the vicinity of water wells during pumping (Bogolovsky and Ogilvy, 1973)
- 3- Over terrains of large elevation changes (Corwin ve Hoover, 1979; Nayak, 1981)
- 4- Geothermal areas
- 5- Due to possession property of difference load (as sand and clay), boundaries of this units is determined

Again, groundwater, passing through pore rocks Streaming potential occurs. Measuring the potential values with SP methods, location of water and direction of flow are determined.





### 3.3.2. Thermoelectric Potential

Due to solution of difference temperature is created. If a temperature gradient is maintained across a rock sample. The ratio of the voltage to the temperature difference is called "Thermoelectric Coupling Coefficient (TEC)". Observational data for a variety of rock types give TEC values ranging from -0.09 ile +1.36 mV/ 0°C, with an average of about 0.27 mV/ 0°C (Nourbehecht, 1963). SP anomalies generated by this mechanism are of smaller amplitudes than usually seen in geothermal areas. More concentrated area of high temperature at shallow depth, such as thermal fluids in a fault zone, could give rise to anomalies of shorter wavelength and greater amplitude. The boundaries of SP anomalies measured in several geothermal areas appear to correlate with the zones of known anomalous high heat flow. The allows for the possibility that at least a portion of these anomalies is generated by a thermoelectric mechanism.

### 3.3.3. Nernst and Diffusion Potential

If the concentration of electrolytes in the ground varies locally, potential difference are set up due to the difference in mobilities of anions and cations in solutions different concentrations. These potential are called the liquid-junction/diffusion potentials which can be maintained in natural system by a source (speculated to interact in some way with atmospheric oxygen) that will continuously regenerate concentration differences. Electric potential is also generated when to identical metal electrodes are immersed in solutions of different concentrations. This is called the Nerst potential. The combined diffusion and Nerst potential generated in the ground are known as the electrochemical, or static, self-potential. One of the most common natural electrolytes is NaCl. For NaCl solutions of different concentrations ( $C_1, C_2$ ) but at the same temperature,  $T^\circ\text{C}$ , the amplitude of the electrochemical self-potential (Telford et al., 1990).



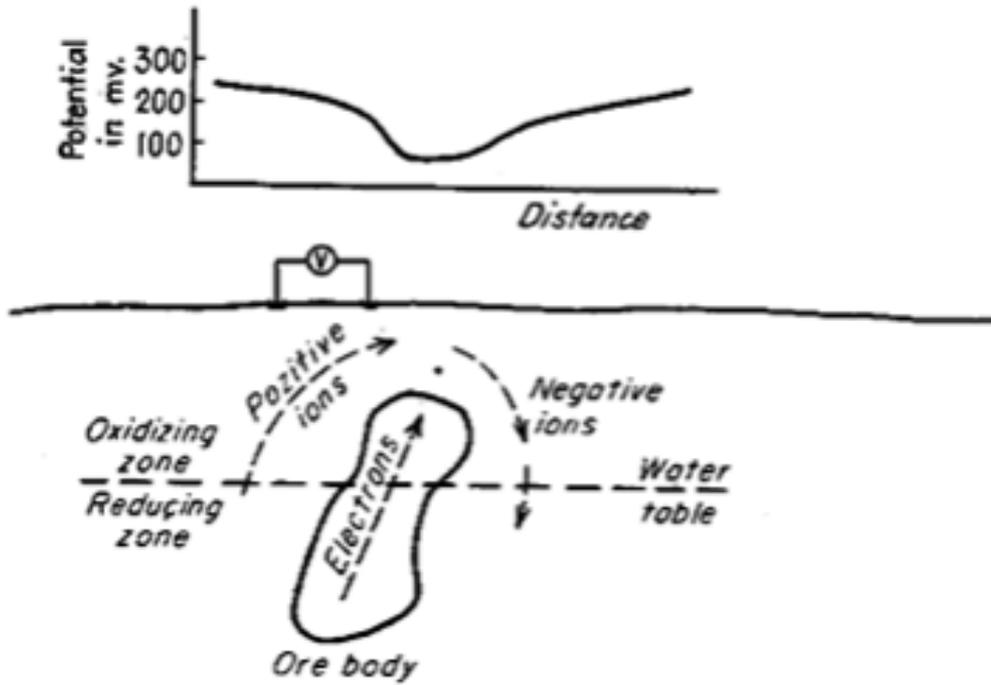
### 3.3.4. Mineralization Potential

Relatively strong self-potentials (maximum amplitude in the range 100-1000 mV) are known to occur over deposits of pyrite, chalcopyrite, pyrrite, magnetite and graphite. The potentials are almost invariably negative over the top of the deposit and are quite stable in time. Their origin is not completely understood, early theories attributed mineralization potential to oxidation of parts of a mineral body above the water table, but such an explanation can not fit graphite, which shows high SP anomalies but doesn't oxidize appreciably. Moreover, extensive oxidation would leave the upper end of the body with a net positive charge due to loss of electrons. In fact the charge observed is almost always negative. Given the size SP, the measured value was found to change over time. The reason for this is not fully understood. The mechanism for this type of voltage has been proposed the following two different views:

### 3.3.5. Galvanic Structure Opinion

To explain this Image 4 as in a model are discussed. Field tests, the investigations; usually some of underground mineralization shows that cut by underground water level. The upper portion is rich in oxygen and earth conditions are influenced easily. The following parts, the poorer oxygen reduction zone (the reduction zone) is situated inside. During the stabilization process, electrons are released from the base of the ore. Causing a flow of electrons that can be measured with a voltage is generated on the earth. Such an ore body is in view of galvanic cells, acts as a simple battery. Pyrite, chalcopyrite, galena minerals that could be explained with SP symptoms. However, graphite that given the large SP value not oxidize adequate amount and this opinion is not valid for this mineral.





**Image 5**, Consisting of sulphide ores cut by ground water level (Dobrin,1986). Electrical charge is negative within area of oxidation zone, the bottom is positive and a charge would flow from the bottom upwards.

### 3.3.6. Sato and Mooney (1960) Opinion

Sato and Mooney (1960) proposed a more detailed theory of mineralization potential which requires the causative body to straddle the water table. They postulated two electrochemical reactions of opposite sign. Below the water table electrolytes in the pore fluids undergo oxidation and release electrons which are conducted upward through the ore-body, while above the water table there is chemical reduction of substances in solutions. A circuit is thus established in which current is carried electrolytically in the pore fluids and electronically in the ore-body. The mineral body, being a good conductor, merely serves to transport electrons from the lower to the upper and of the body without directly participating in the electrochemical process. Sato and Mooney's theoretical estimates of maximum possible SP effects are much lower than those actually observed. The theory also fails to account for the large potentials observed over sulfide zones that are totally submerged under the water table.

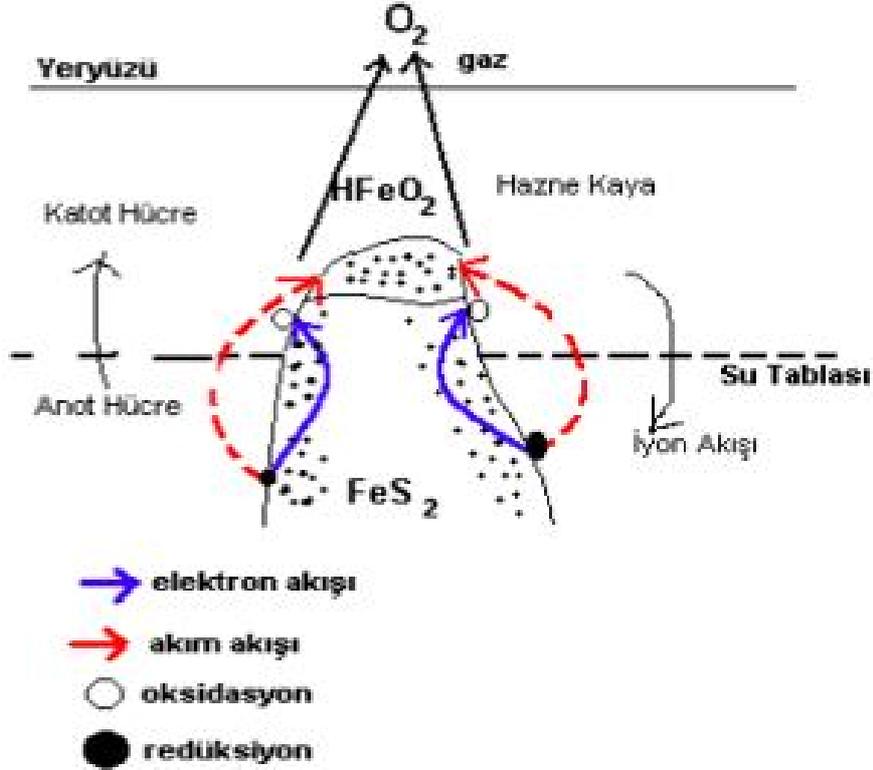


İmage 6, Self-Potential mechanism in prite (Sharma, 2002)

Self Potential creator other factors;

- Telluric currents
- The artificial current leakage the power of lines
- Underground pipelines

### 3.3.7. Doğal Uçlaşma Kaydırma Dizilimi/Ölçü Tekniği (Kurbağa Atlayışı veya Türev)

Along a direction, it measured that voltage difference of between a pair of electrodes are located as fixed spaced first and second points. After the electrodes of first point is moved towards second Potential difference ( $\Delta\phi$ ) is measured. Measurement values are assigned in the middle of the two measuring points (İmage 4). The distance between of measurements points are selected 10-15 m. depending on the research depth.

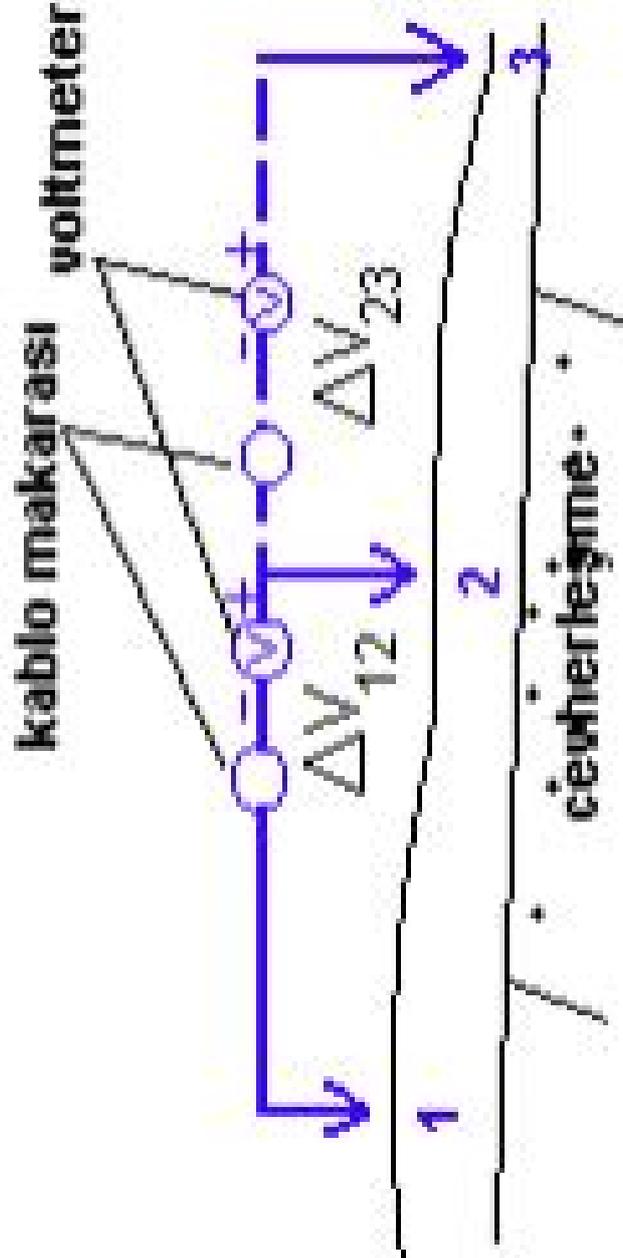


İmage 7, SP method the scroll measurement technique



### **3.4. Evaluation**

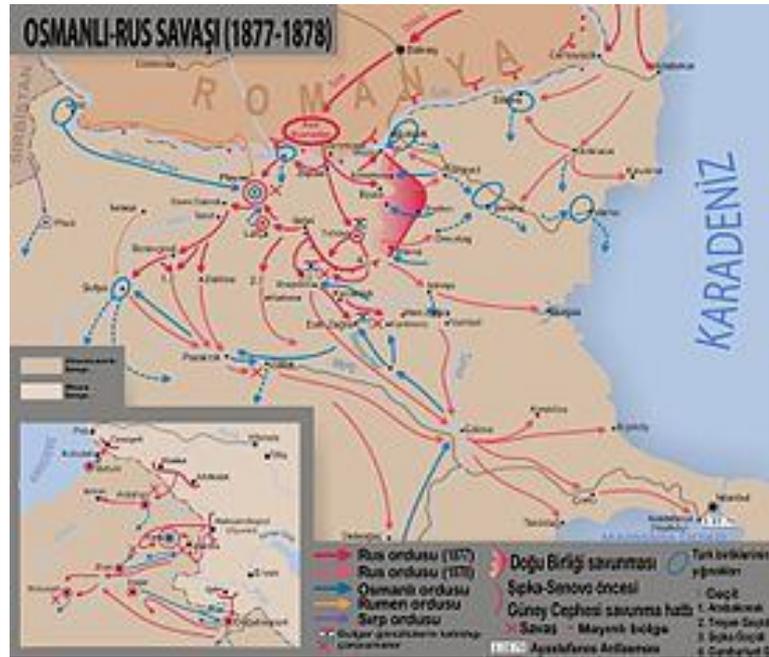
This study "İkitelli Integrated Health Campus Project Cultural Heritage Evaluation Report " entitled archaeological study hills of stone wall and kurgan looking archaeological remains is to research whether archeogeophysics work done as a result of more accurate and detailed in making decisions would help a lot is stated. With this aim, using methods of Geophysics (GPR, Geoelectric, Self-Potential), in the following regions is made to scan two and three dimensional underground.

#### **The evaluation of the region number 1 in the Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

In the region number 1 (in the area northwest-southeast extending 120 m length and 1 m width, in the direction perpendicular that cuted stone of sequential) , as a result of the GPR radar measurements from the depth of 1m., high amplitude anomalies can be seen (Image 9,10,11). İn the region number 1, as a result of the Multi-Electrode Resistivity Tomography measurements which took place in 1-12 profiles and analyzing 2D (two-dimensional) real – resistivity sections to in view of group (Figure 12-26) created from total of 12 tomography profiles, high resistivity structures have been seen in the middle region of profiles It is illustrated that measured this high resistivity values that linear trending row of stones and its external distinction. In the region number 1, SP measurements profiles taken place perpendicularly to the direction of the stone , showing polarization fields, geo-radar (GPR) and electrical tomography measurements yielded results consistent with and complementary with other geophysical studies. SP (Self Potential) anomalies in the presence of positive and negative anomalies is due to from excavated into ground and eventually fine-grained (clay, sand, and other) damp material filled environments and piles of stones distinction. It is seen that electrical tomography 2D geoelectric sections that stone cutting place represent high resistivity values and the adjacent the land fill place represent low resistivity values. Stone cutting places is given high amplitude anomalies in the GPR radargrams.İt should be controlled, in the region number 1 place of high amplitude, high resistivity and polarization fields is determined with GPR, electrical tomography and SP. measurements.



Research area "İkitelli Integrated Health Campus Project Cultural Heritage Evaluation Report " entitled archaeological report is stated that this wall was made for defense purposes and in the entire study area piece of dish-pot is not found. In light of this information, approximately 120 m in length and 1 m wide stone wall that was opened rampart and fortification structures can be in Ottoman-Russian War (1877-1878) period, it is thought (Map1).



Map 1. Ottoman-Russian War (1877-1878) Maps

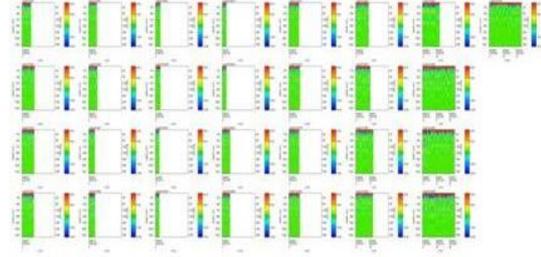




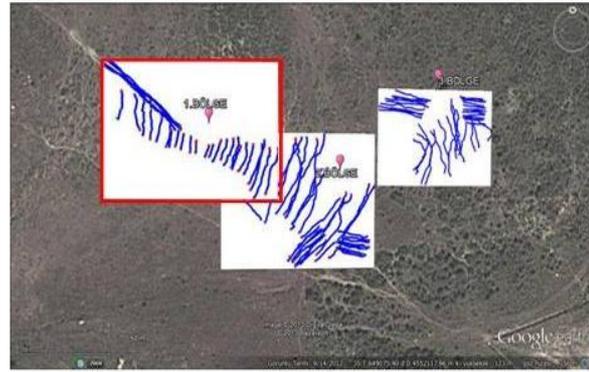
**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



(a)



(b)



(c)

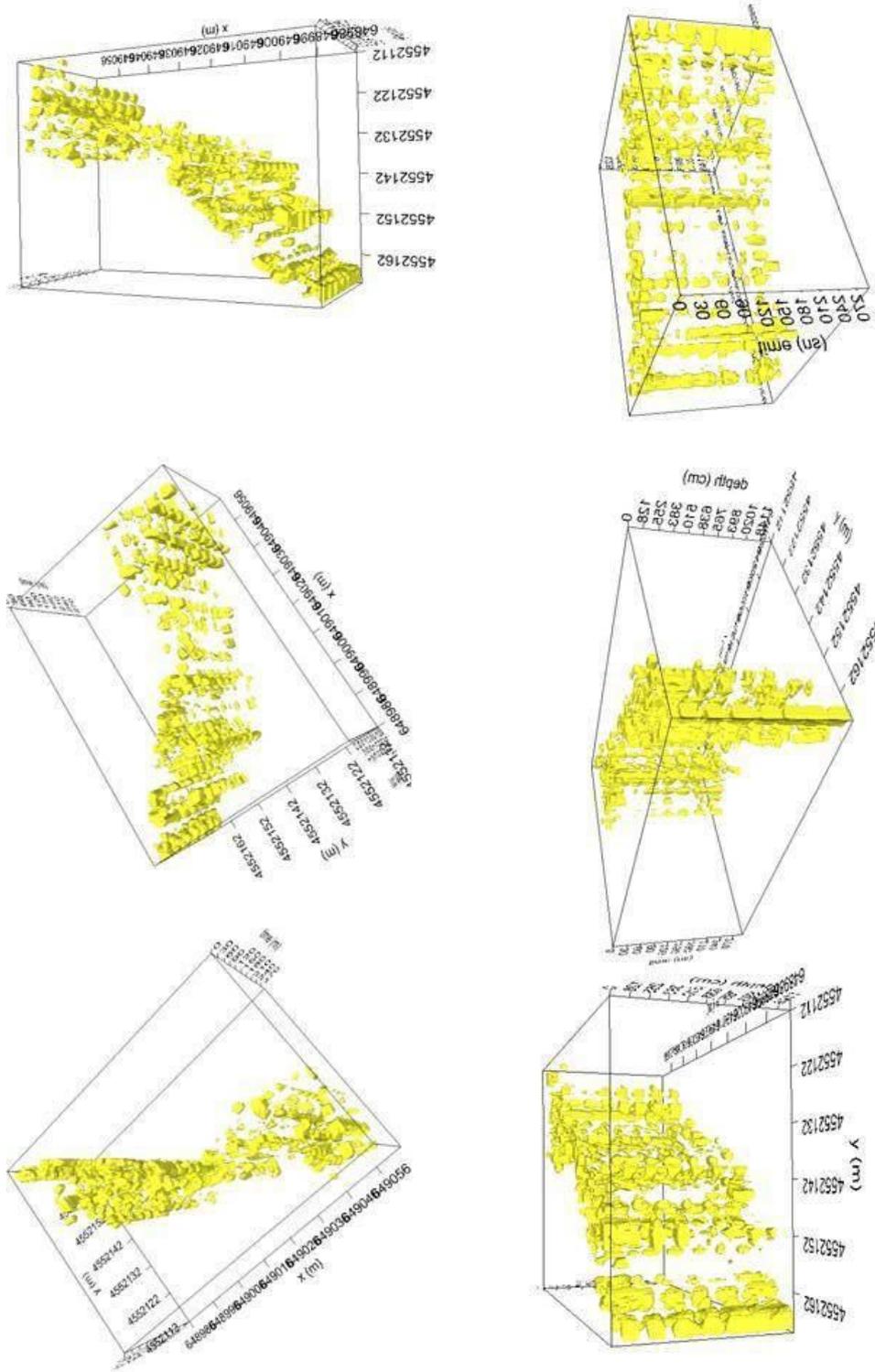


**İmage 8**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 1 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.

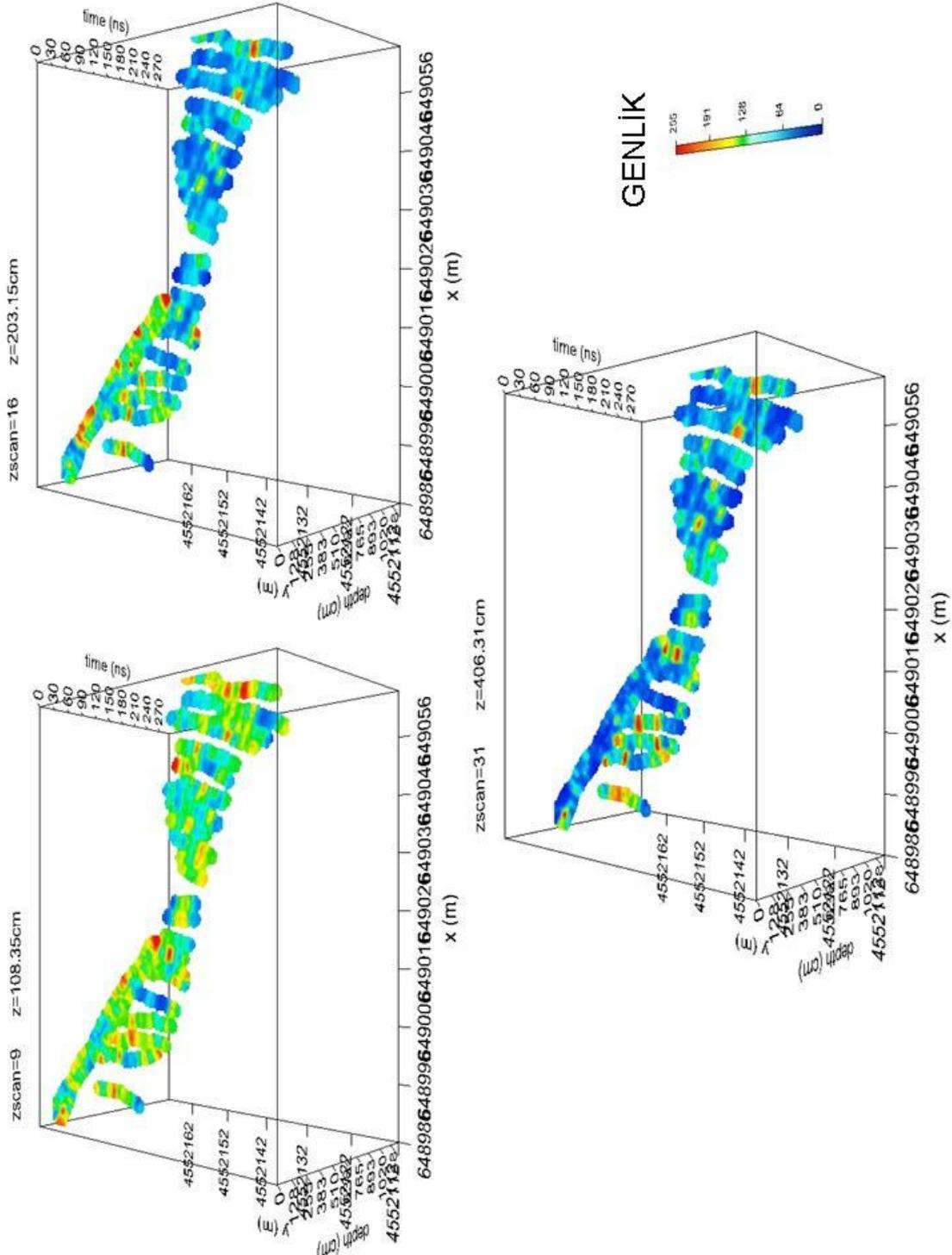


**Mühendislik Müşavirlik Yeraltı Araştırmaları**  
Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

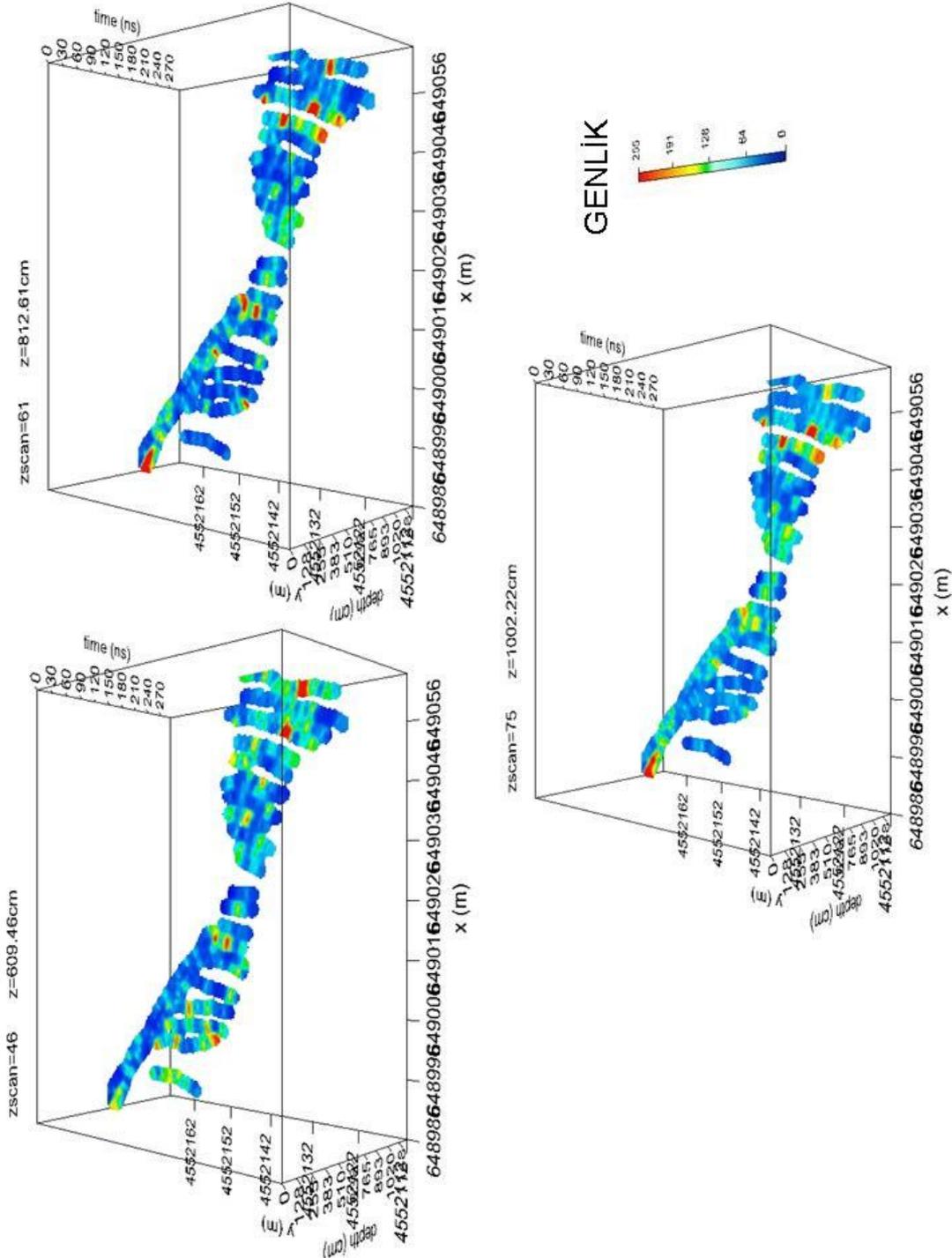
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



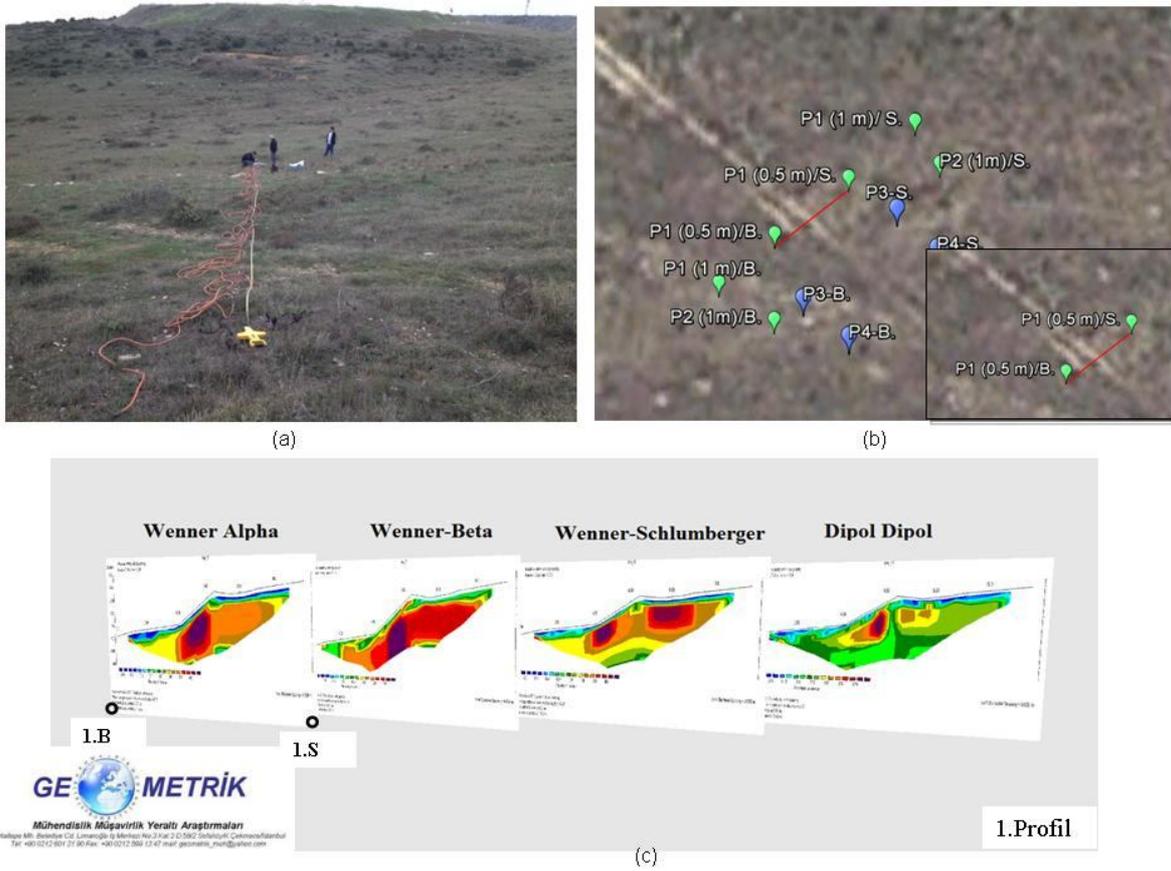
**İmage 9**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 1 work area.



**Image 10**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 1.



**İmage 11**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 1.



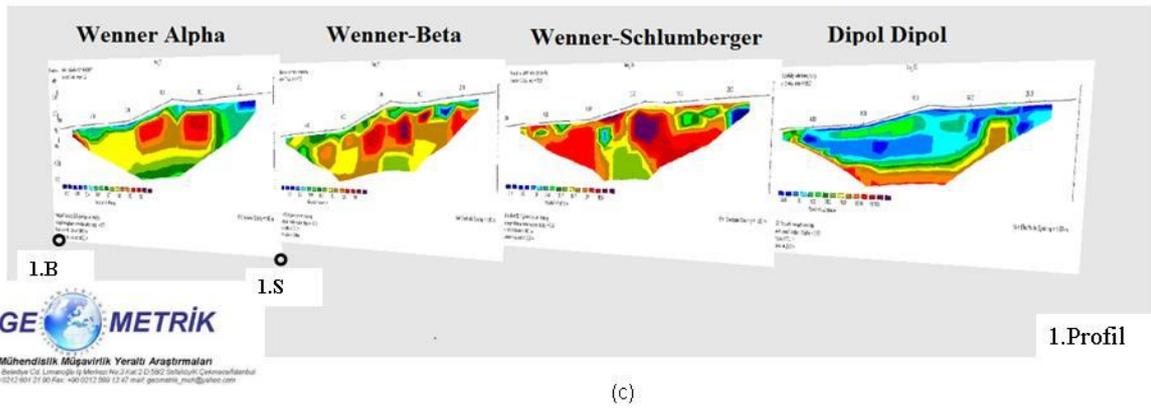
**Image 12**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET1 Electrical Tomography profile (electrode interval 0,5 m.); a) The picture of the measurements, b) The layout of ET1 profile in the layout plan, c) Real Resistivity sections calculated with different measurement types.



(a)

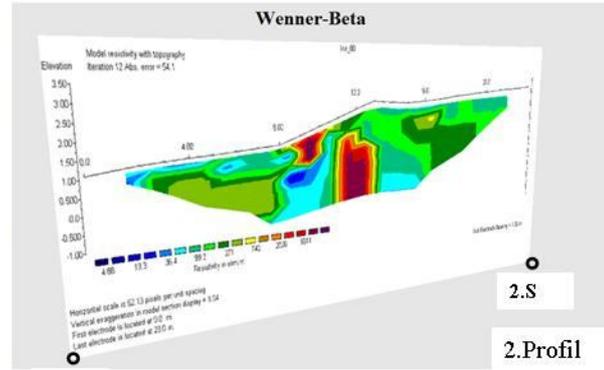


(b)



(c)

**İmage 13**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET1 Electrical Tomography profile (electrode interval 1,0 m.); a) The picture of the measurements, b) The layout of ET1 profile in the layout plan, c) Real Resistivity sections calculated with different measurement types.



(a)

(b)

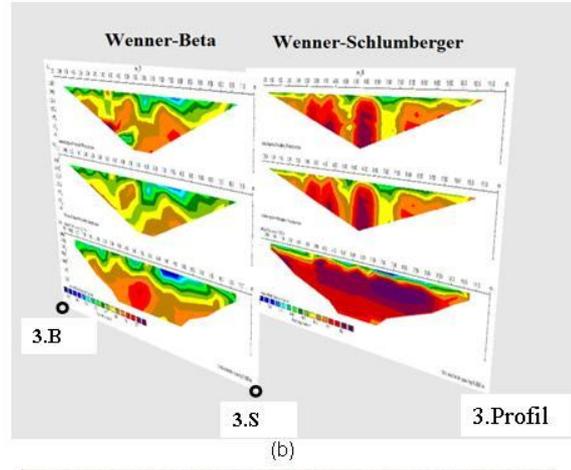


(c)

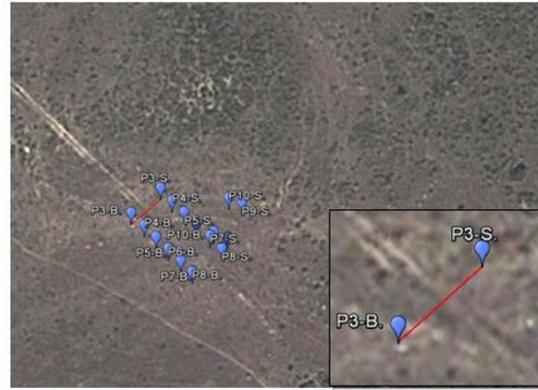
**İmage 14**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET2 Electrical Tomography profile (electrode interval 1,0 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta measurement type, c) The layout of ET2 profile in the layout plan.



(a)



(b)

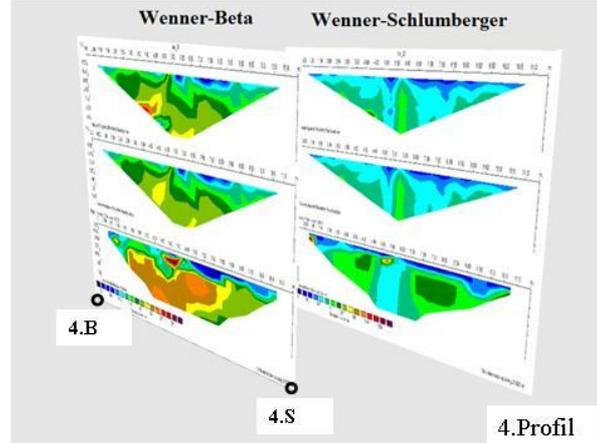


(c)

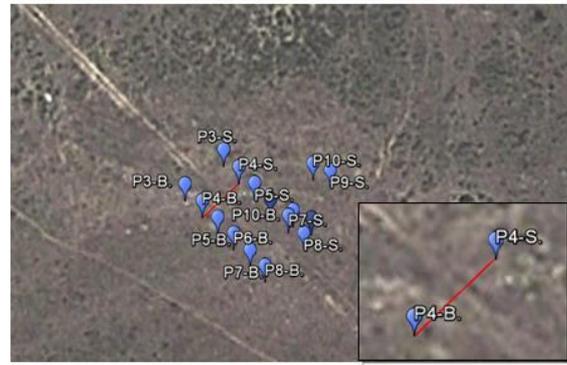
**İmage 15**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET3 Electrical Tomography profile (electrode interval 0,5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET3 profile in the layout plan.



(a)



(b)



(c)

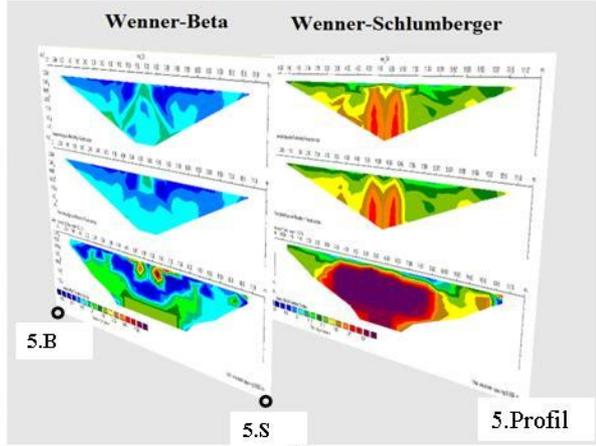
**İmage 16**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET4 Electrical Tomography profile (electrode interval 0,5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET4 profile in the layout plan.



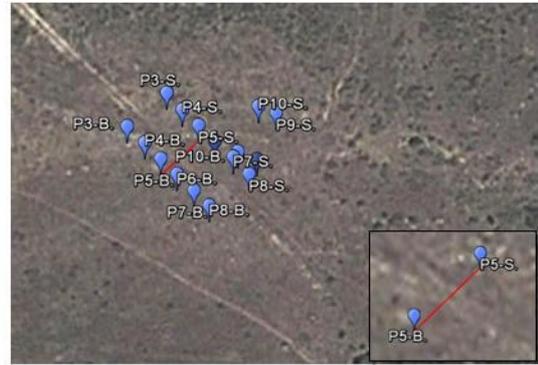
ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)



(b)



(c)

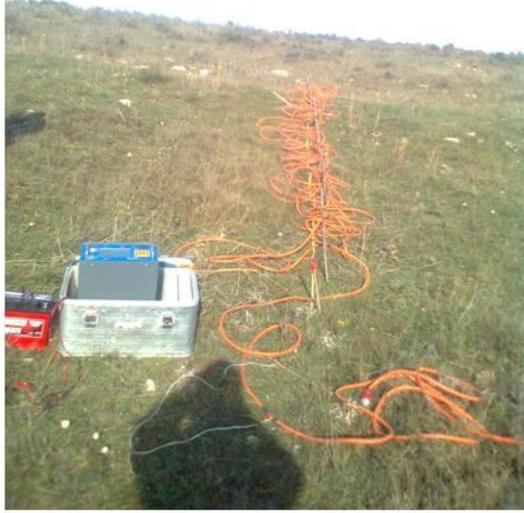


**İmage 17**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET5 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET5 profile in the layout plan.

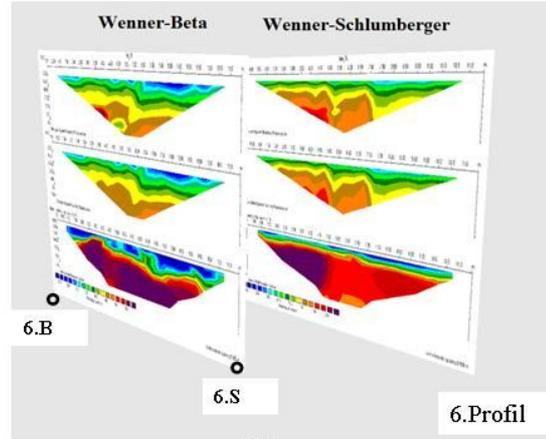


**Mühendislik Müşavirlik Yeraltı Araştırmaları**  
Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

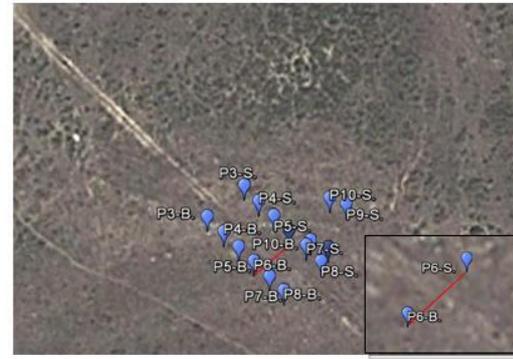
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



(a)



(b)

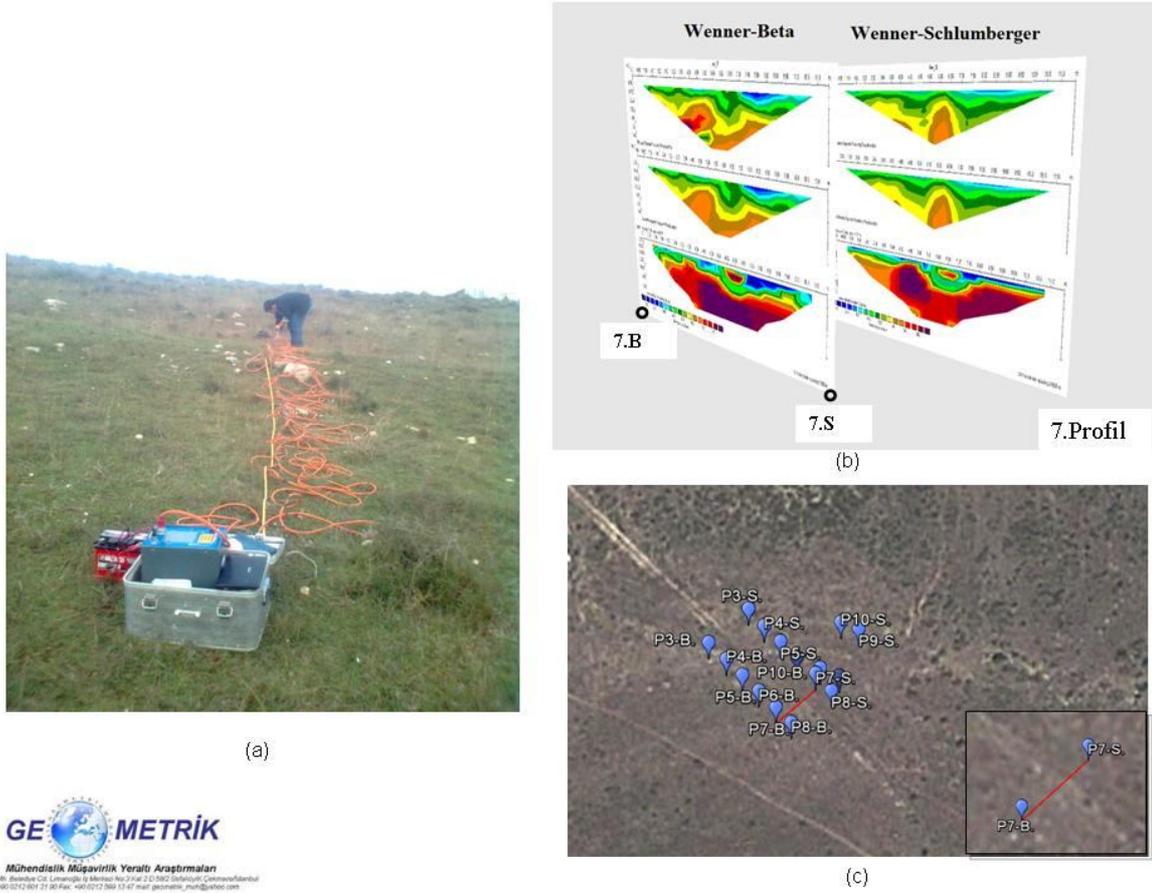


(c)

**Image 18**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET6 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET6 profile in the layout plan.



ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
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HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



**İmage 19**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET7 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET7 profile in the layout plan.



Mühendislik Müşavirlik Yeraltı Araştırmaları  
Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul  
Tel: +90 212 651 21 50 Fax: +90 212 788 11 47 mail: geometrik\_muh@yahoo.com



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

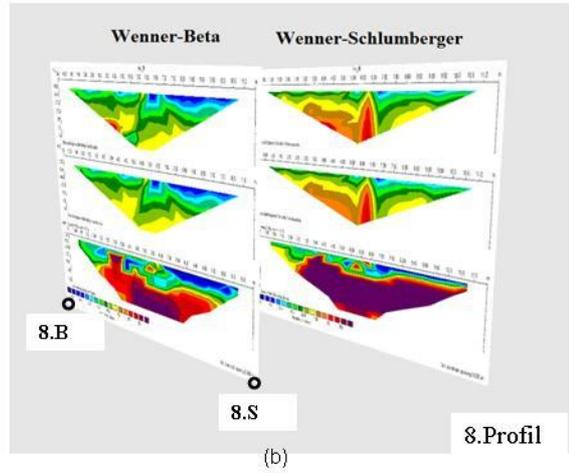
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



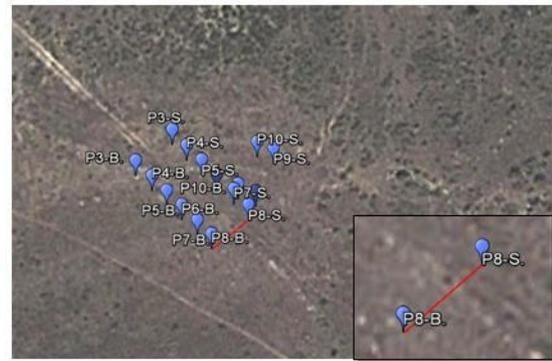
ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)



(b)



(c)

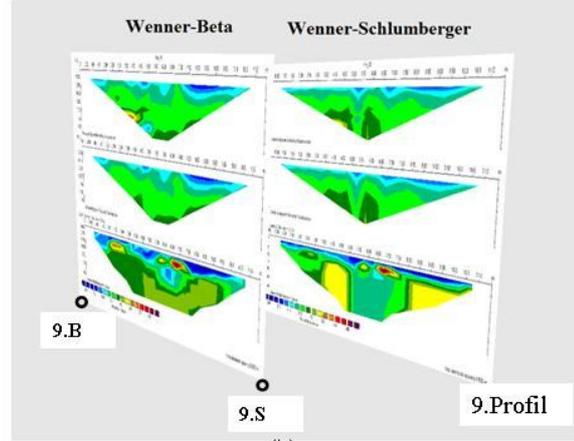


**İmage 20**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET8 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET8 profile in the layout plan.

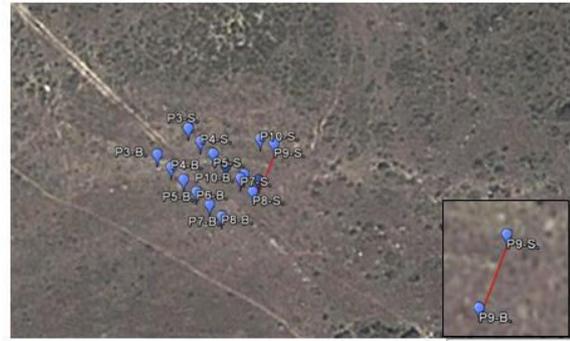




(a)

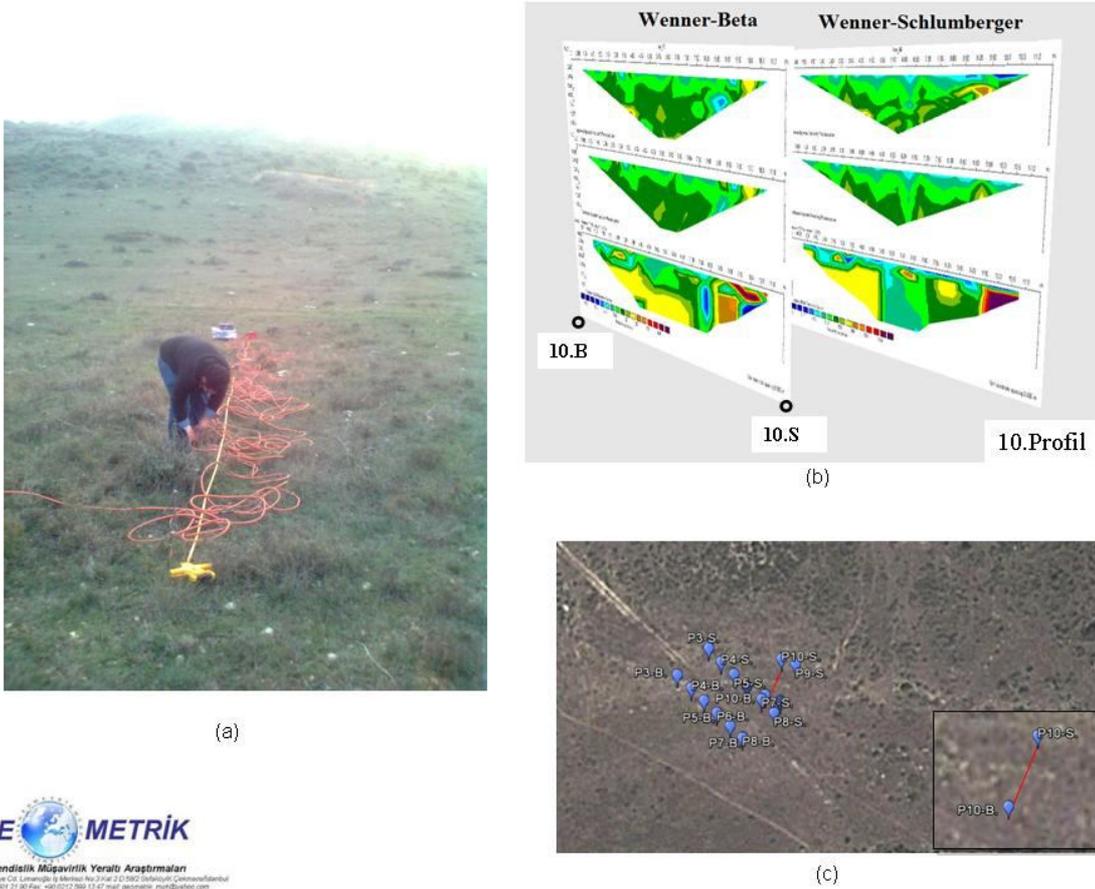


(b)

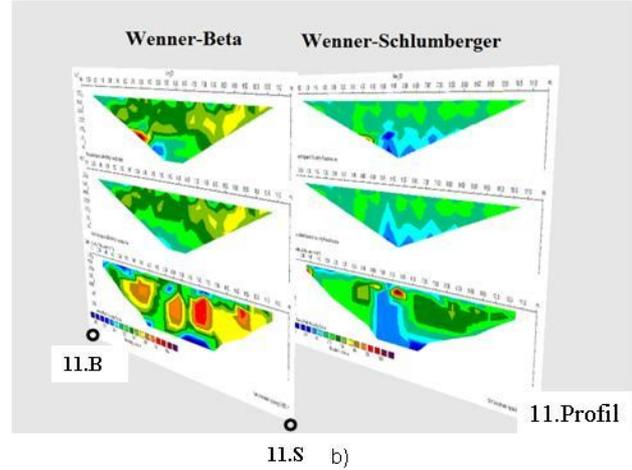
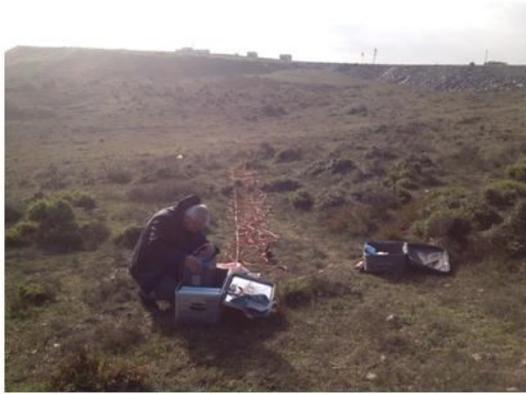


(c)

**İmage 21**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET9 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET9 profile in the layout plan.



**İmage 22**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET10 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET10 profile in the layout plan.



(a)

11.S b)

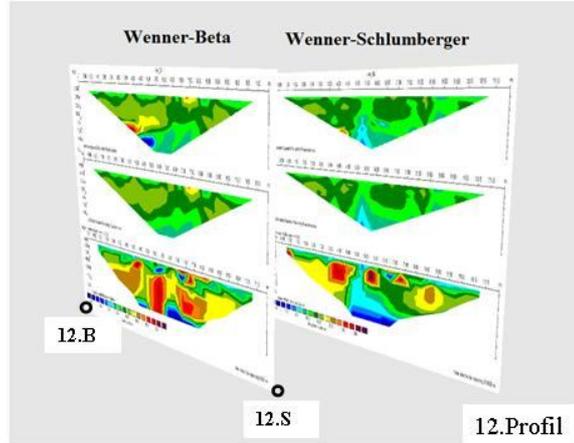


(c)

**İmage 23**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET11 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET11 profile in the layout plan.



(a)



(b)



(c)

**İmage 24**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET12 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET12 profile in the layout plan.

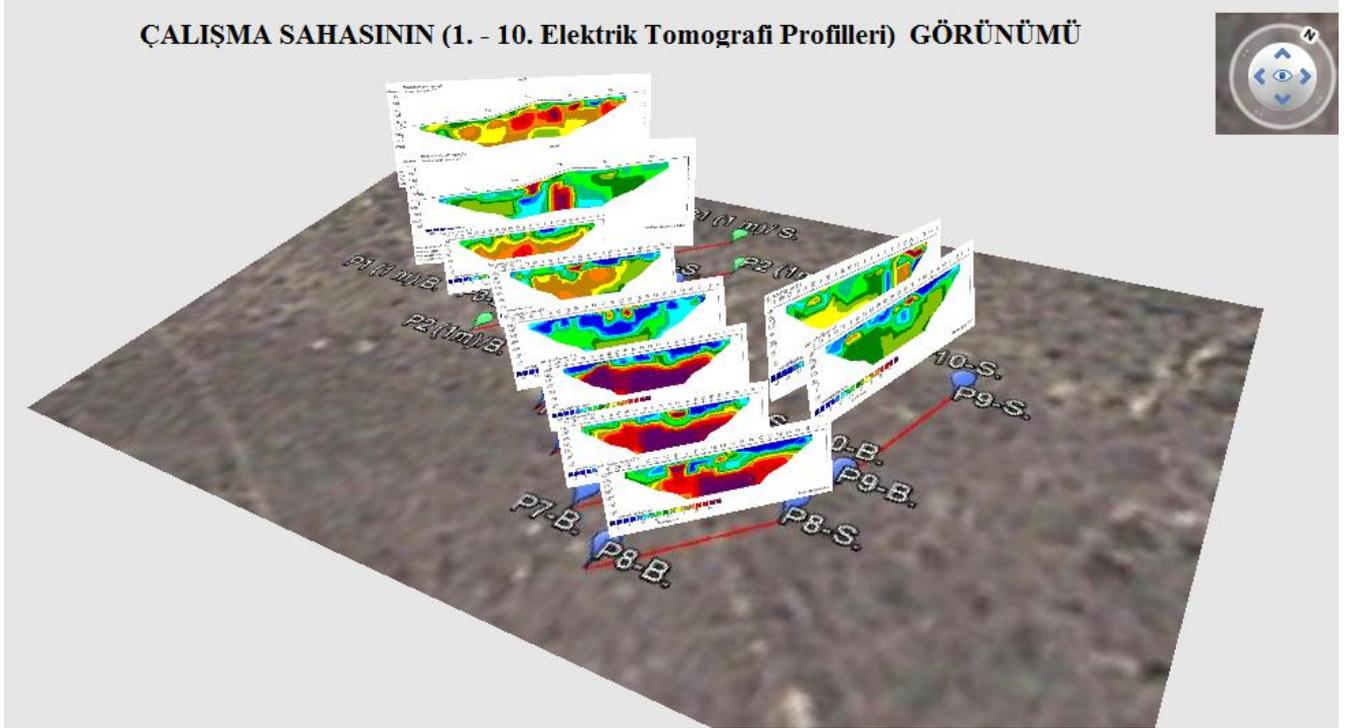


İmage 25, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, the region number 1, images of groups of ET 1-ET 10 Electrical Tomography profiles.

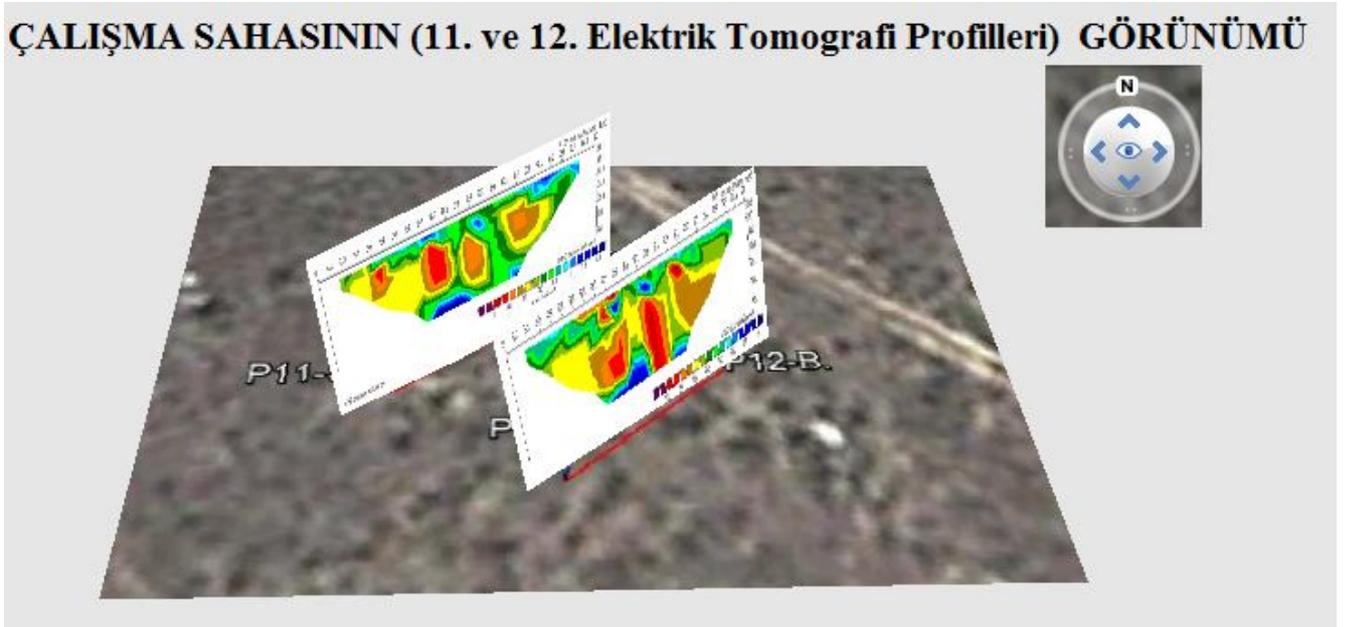
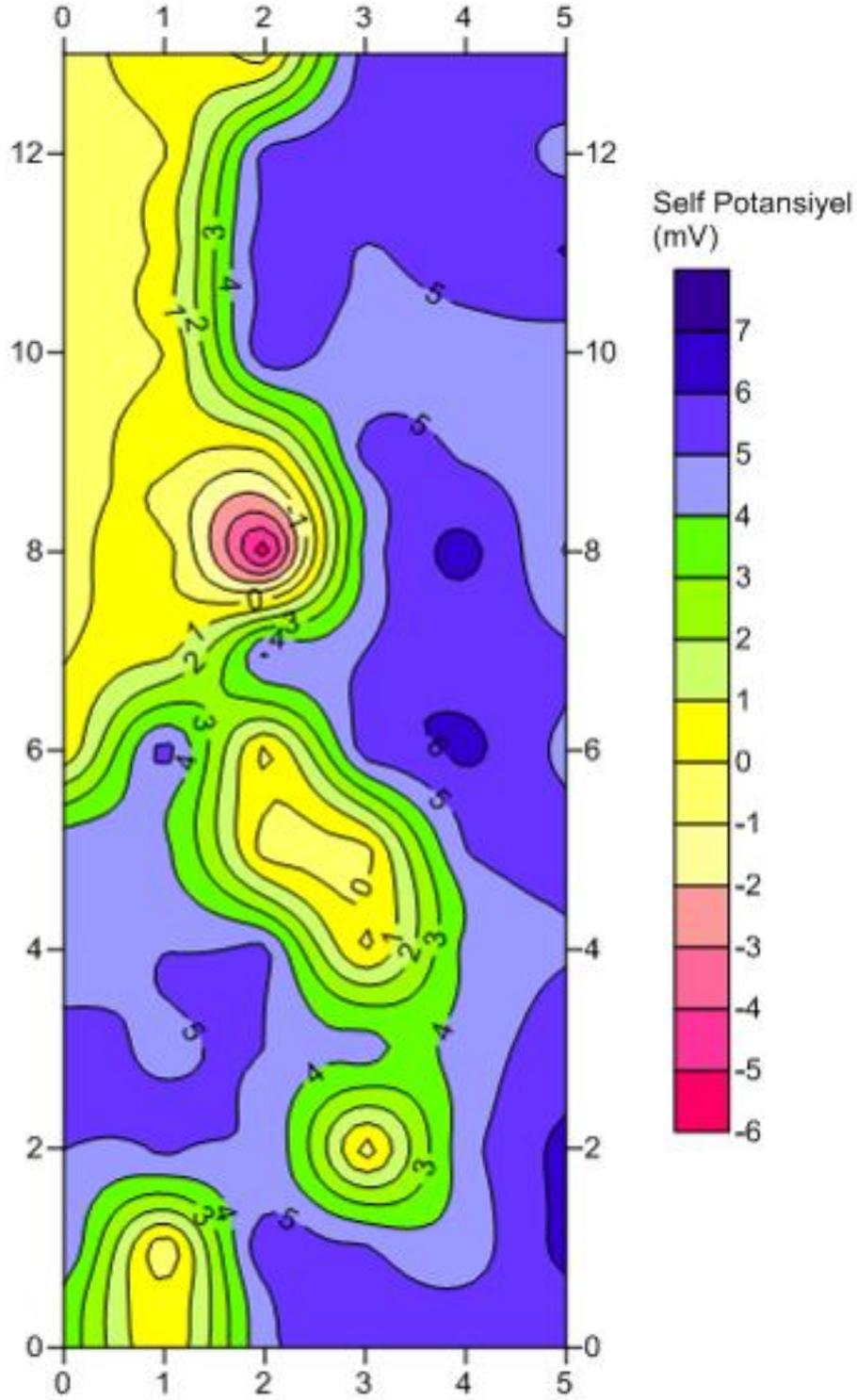


İmage 26, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, the region number 1, images of groups of ET 1-ET 10 Electrical Tomography profiles.



**İmage 27**, İstanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, SP-1 self potential anomaly distribution map in the natural potential measurement area.

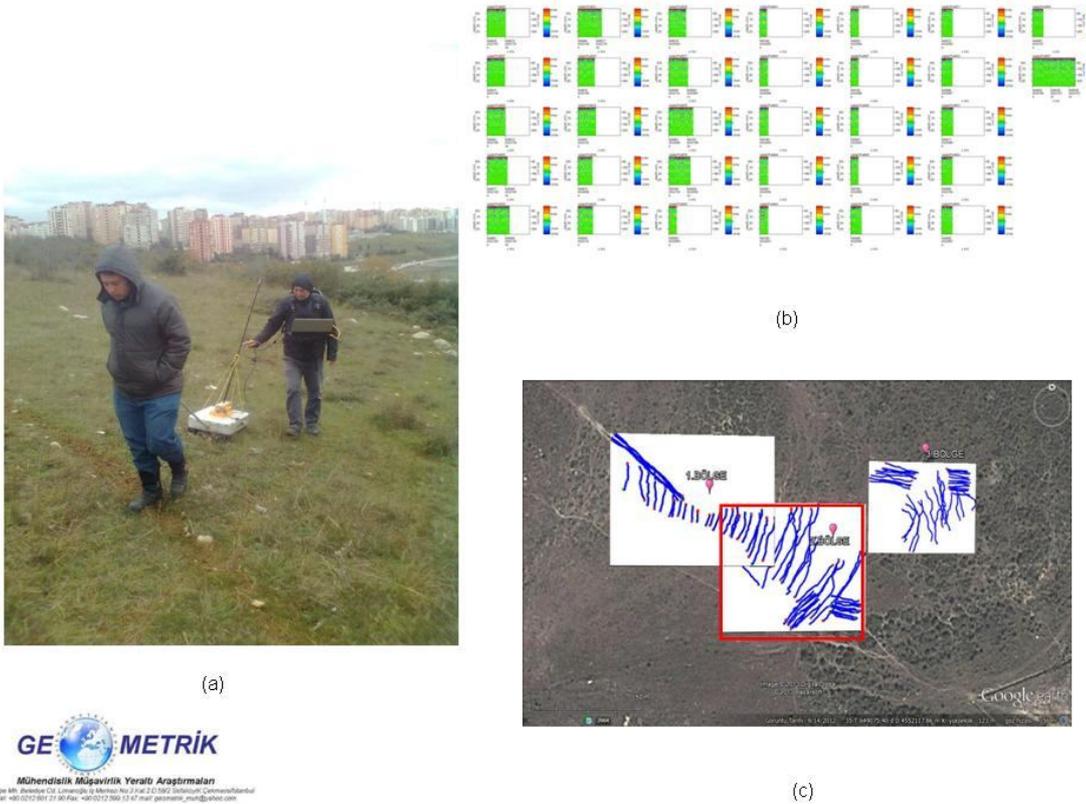


**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**The evaluation of the region number 2 in the Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

Region number 2 is located in southeast of region number 1. GPR radar measurements performed on and around sequential piled stones. As a result of the GPR radar measurements from the depth of 1m., high amplitude anomalies can be seen (İmage 29,30,31). These high amplitude anomalies should be controlled which is determined by GPR

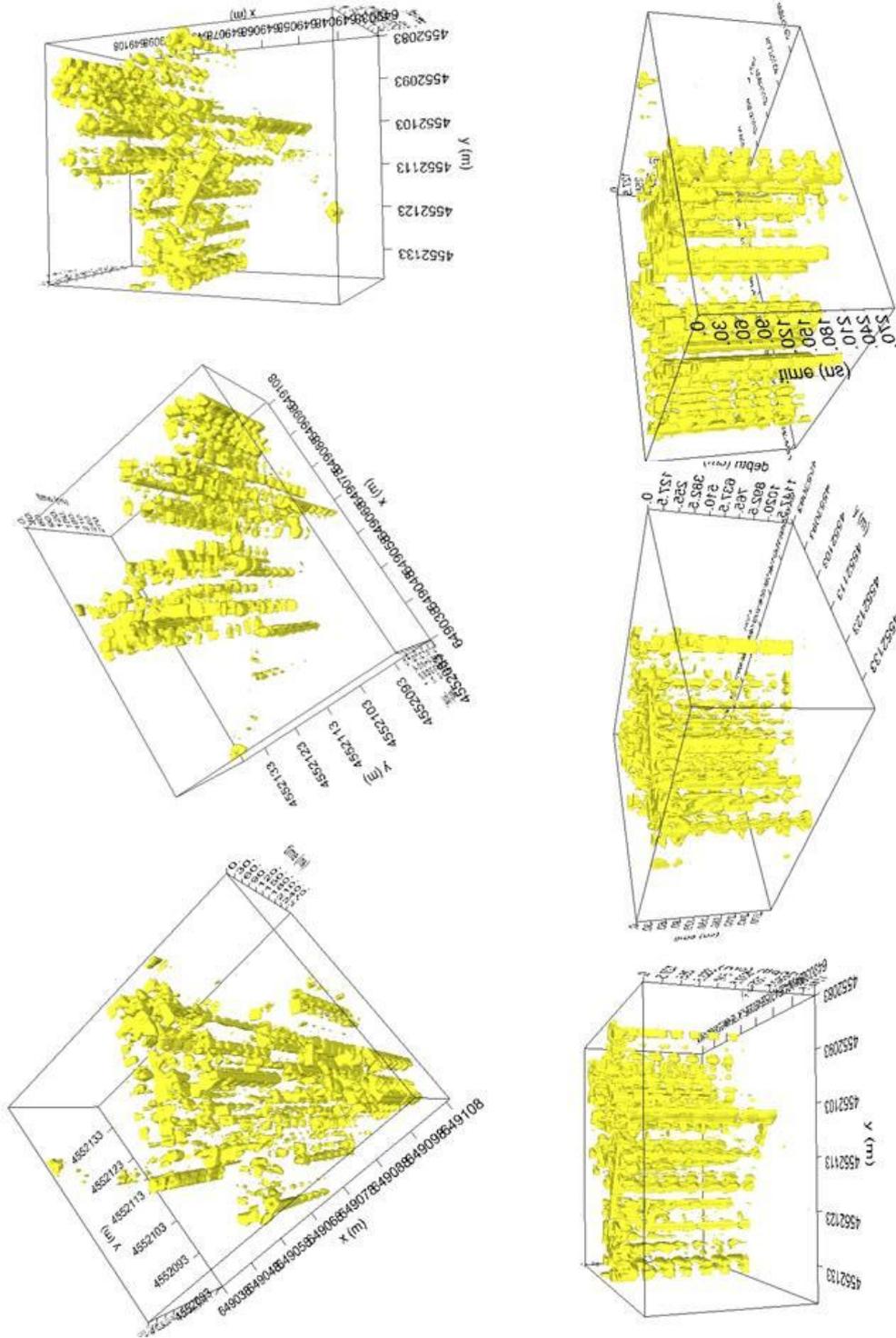


**İmage 28**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 2 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.

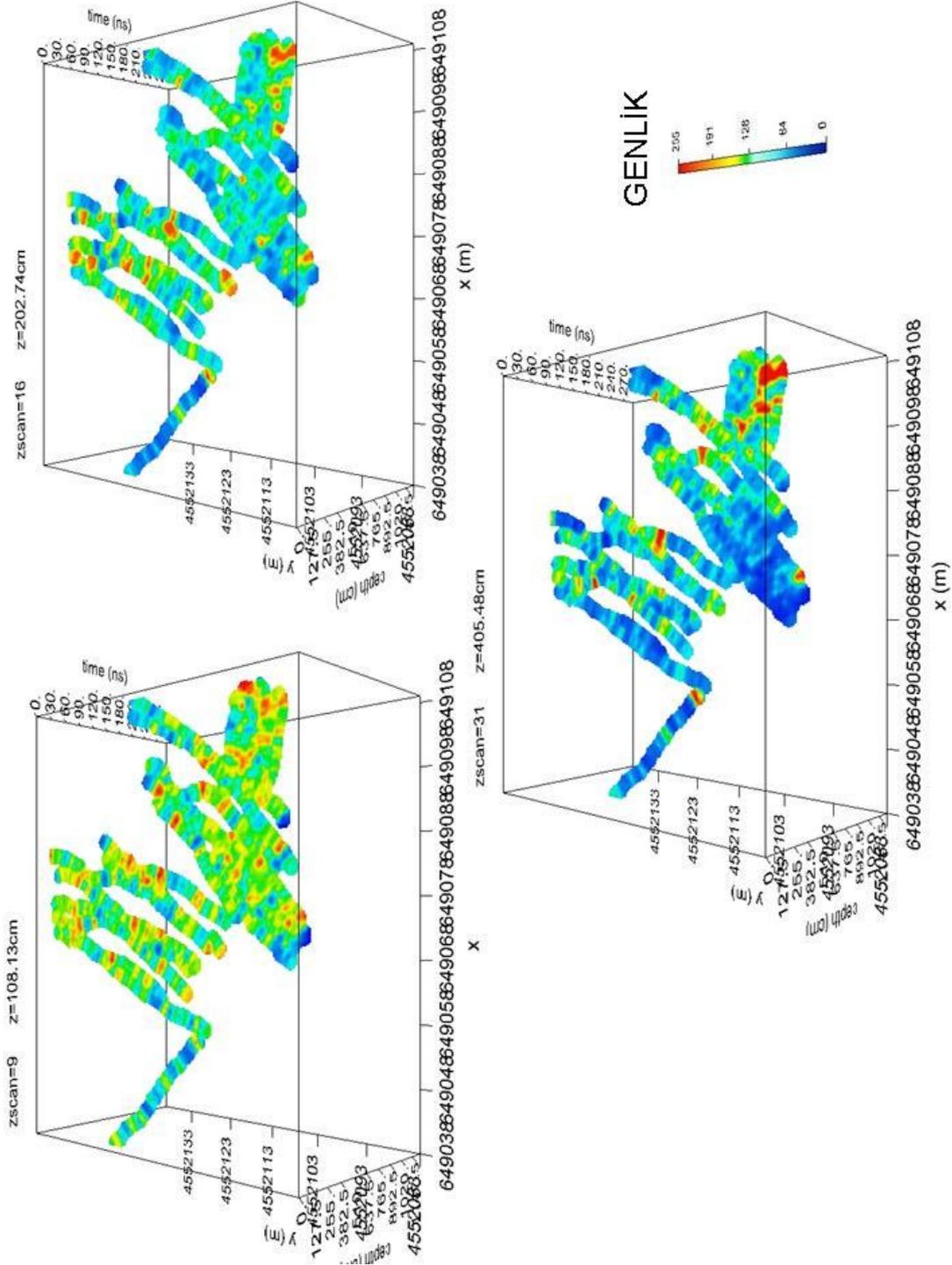


**Mühendislik Müşavirlik Yeraltı Araştırmaları**  
Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

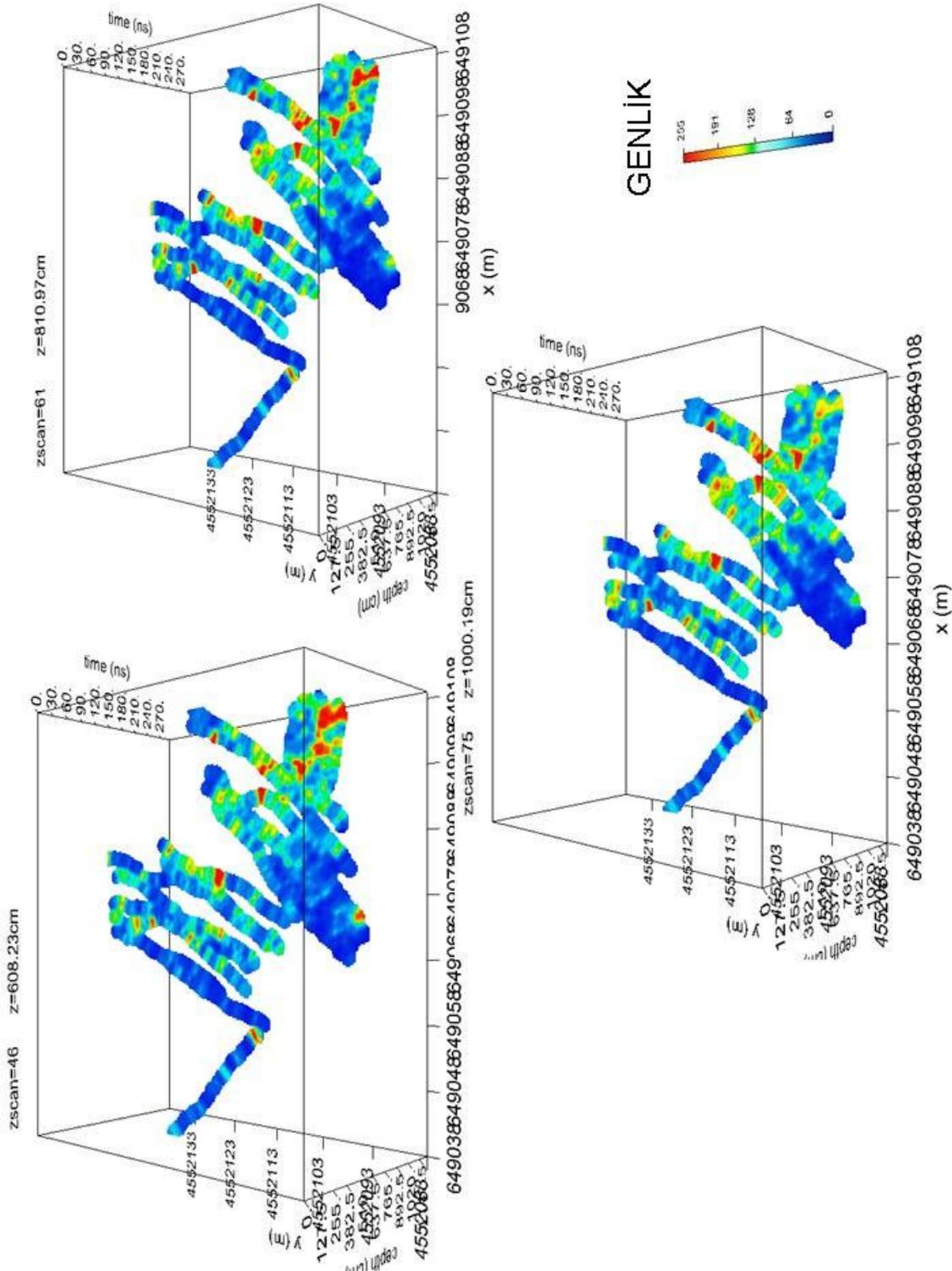
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



**İmage 29**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 2 work area.



**İmage 30**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 2.



**İmage 31**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 2.



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**

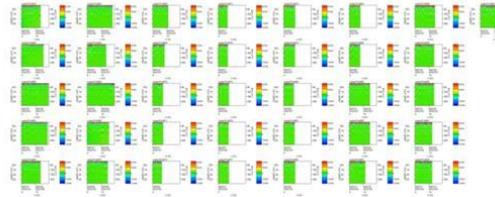


**The evaluation of the region number 3 in the Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

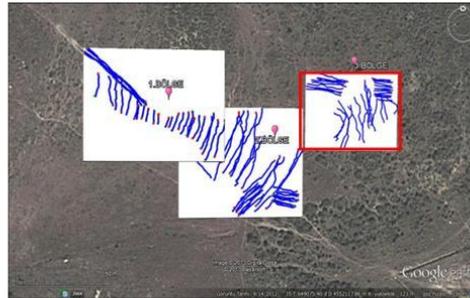
Region number 3 is located in northeast of region number 1. GPR radar measurements performed on and around sequential piled stones. As a result of the GPR radar measurements from the depth of 1m., high amplitude anomalies can be seen (Image 33,34,35). In the region number 3, SP measurements profiles taken place perpendicularly to the direction of the stone , showing polarization fields, geo-radar (GPR) data yielded results consistent with and complementary with other geophysical studies. SP (Self Potential) anomalies in the presence of very low anomalies is due to from excavated into ground and eventually fine-grained (clay, sand, and other) damp material filled environments and piles of stones distinction. These high amplitude anomalies should be controlled which are determined by GPR and S.P.



(a)



(b)



(c)



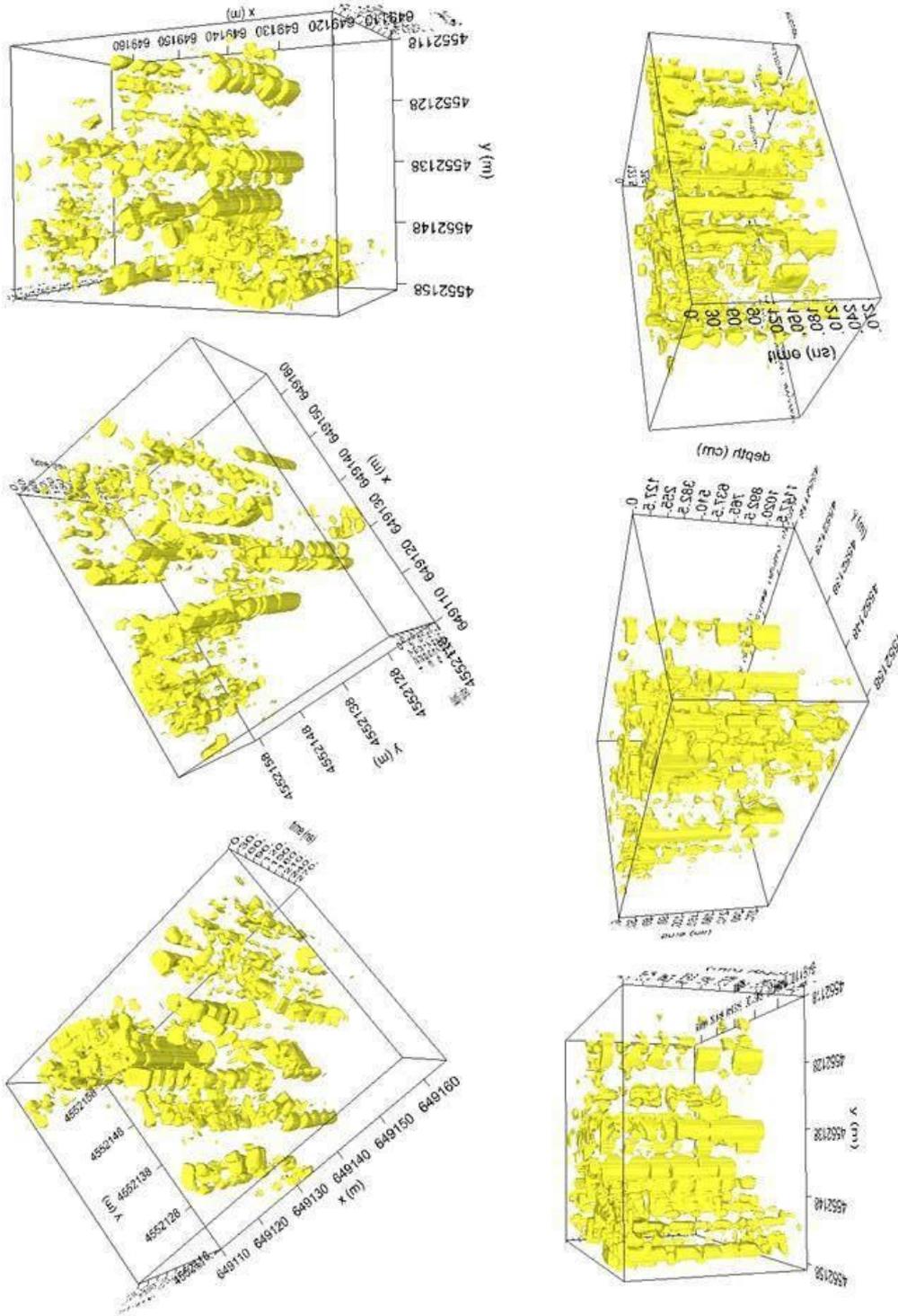
**İmage 32**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 3 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.



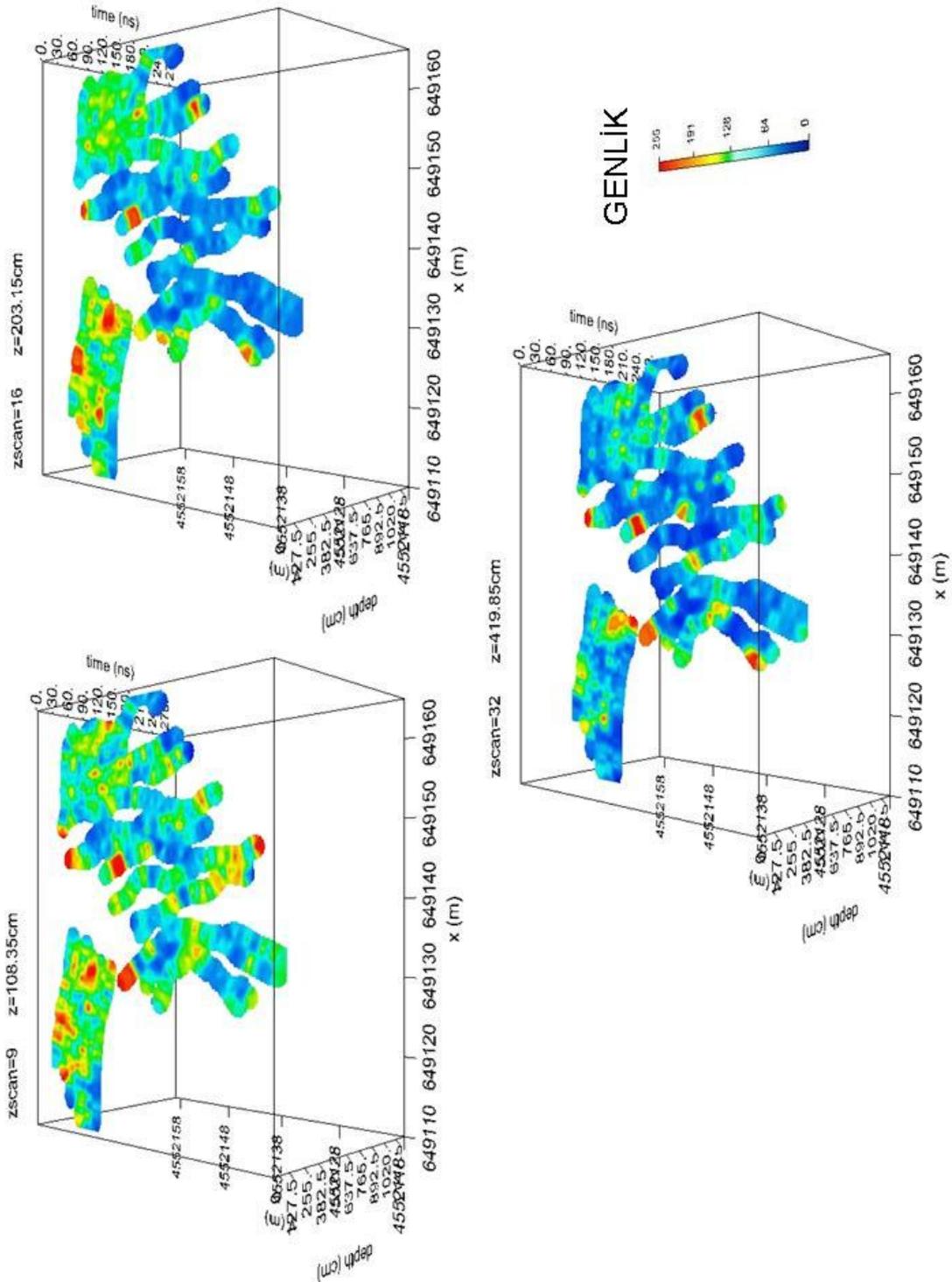
**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



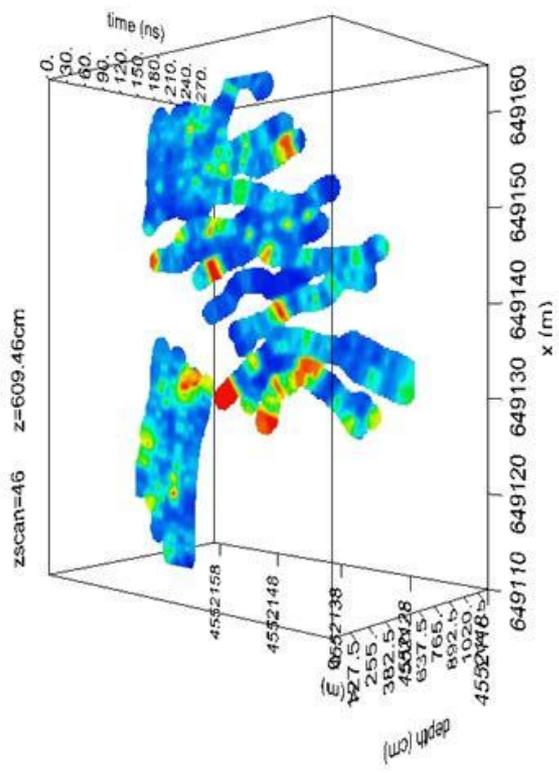
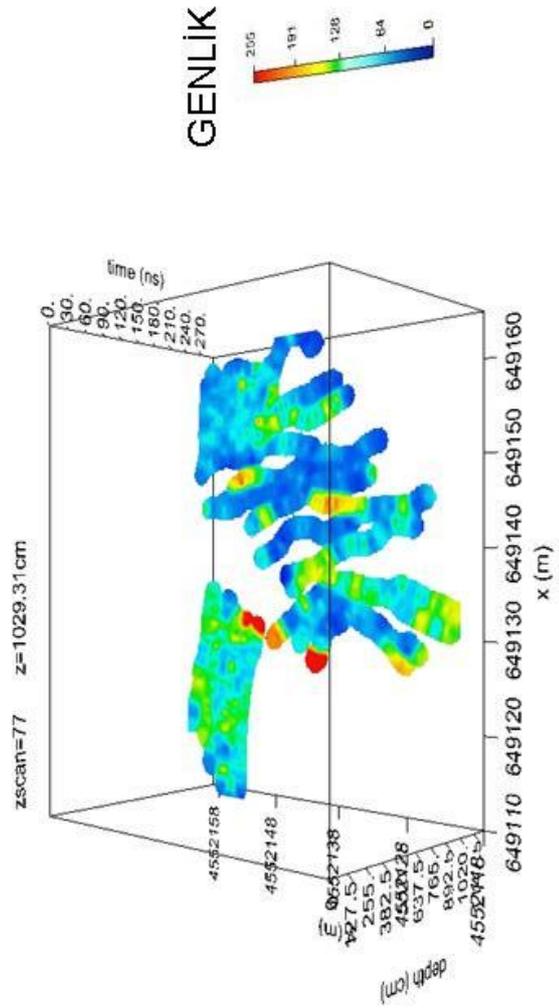
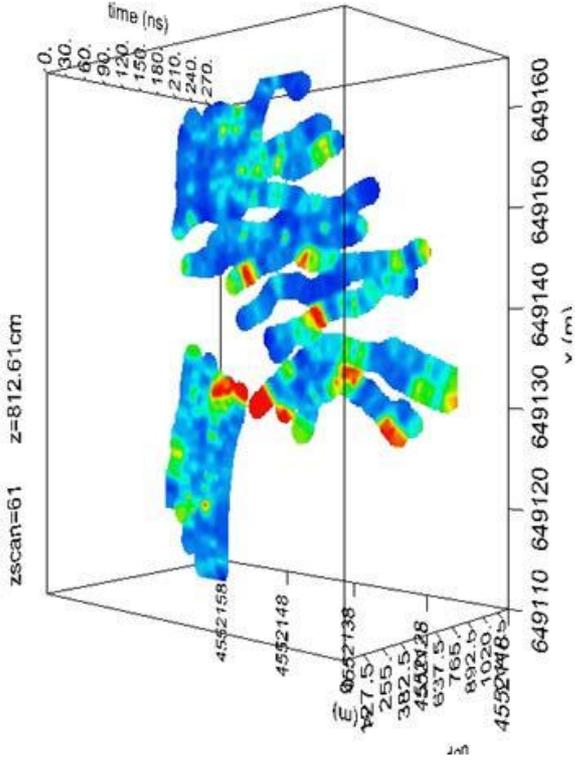
**İmage 33**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 3 work area.



**İmage 34**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 3.



ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



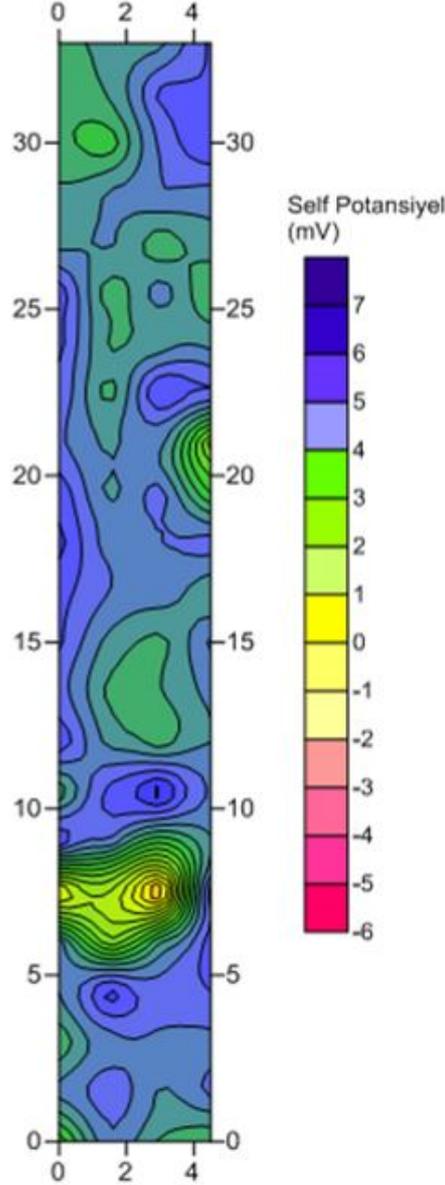
Mühendislik Müşavirlik Yeraltı Araştırmaları

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

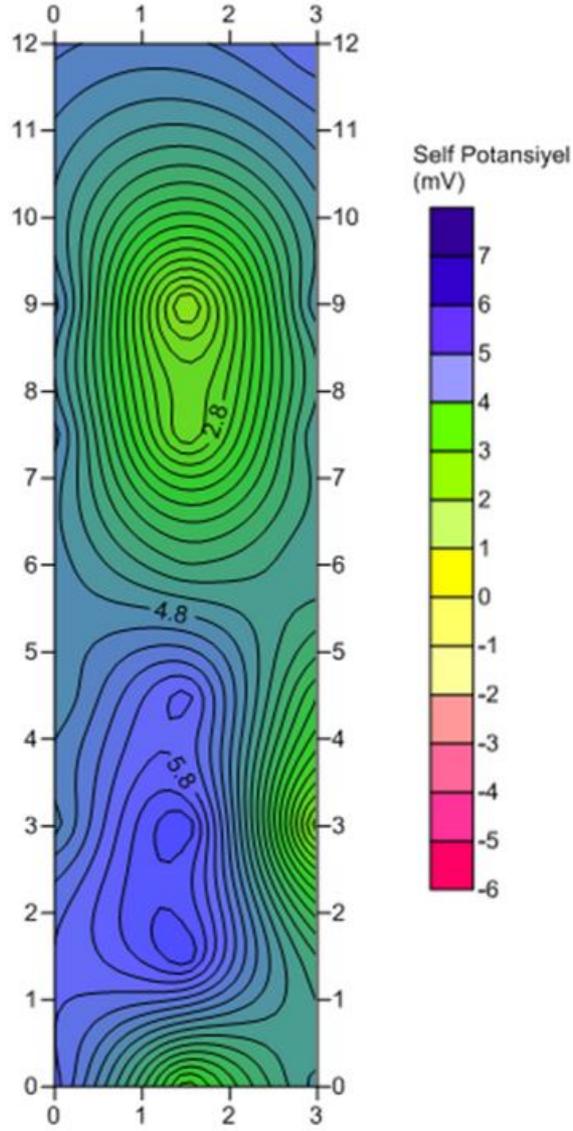
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



**İmage 35**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 3.



**İmage 36**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, SP-4 self potential anomaly distribution map in the natural potential measurement area.



**İmage 37**, İstanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, SP-5 self potential anomaly distribution map in the natural potential measurement area.





**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**

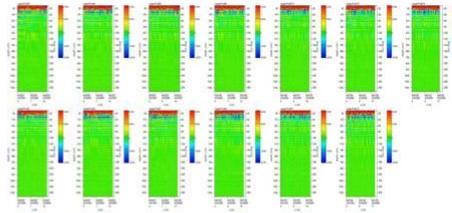


**The evaluation of the region number 4 in the Istanbul Province and District of Basaksehir, İkitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

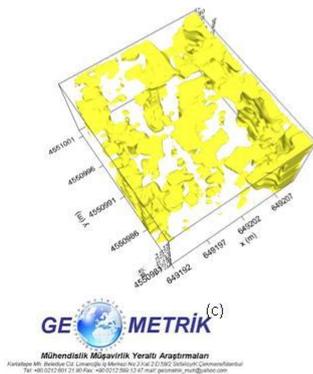
In the region number 4 (on and around sequential stones piled to on the border of southern of opened the road), GPR radar measurements performed from the depth of 1m., high amplitude anomalies can be seen (İmage 39, 40). In the region number 4, high resistivity structures have been seen in the central region and around of profiles after 2D (two dimensions) real resistivity sections obtained from Multi-Electrode Electrical Tomography measurements(İmage 41, 42, 43). Being measured high resistivity environments in the area haven't been appeared in geometry creating a certain architectural forms partly regular partly scattered. As individual anomalies have been seen. These high amplitude anomalies and high resistivity areas should be controlled which are determined by GPR and Electrical Tomography.



(a)



(b)



(c)



(d)

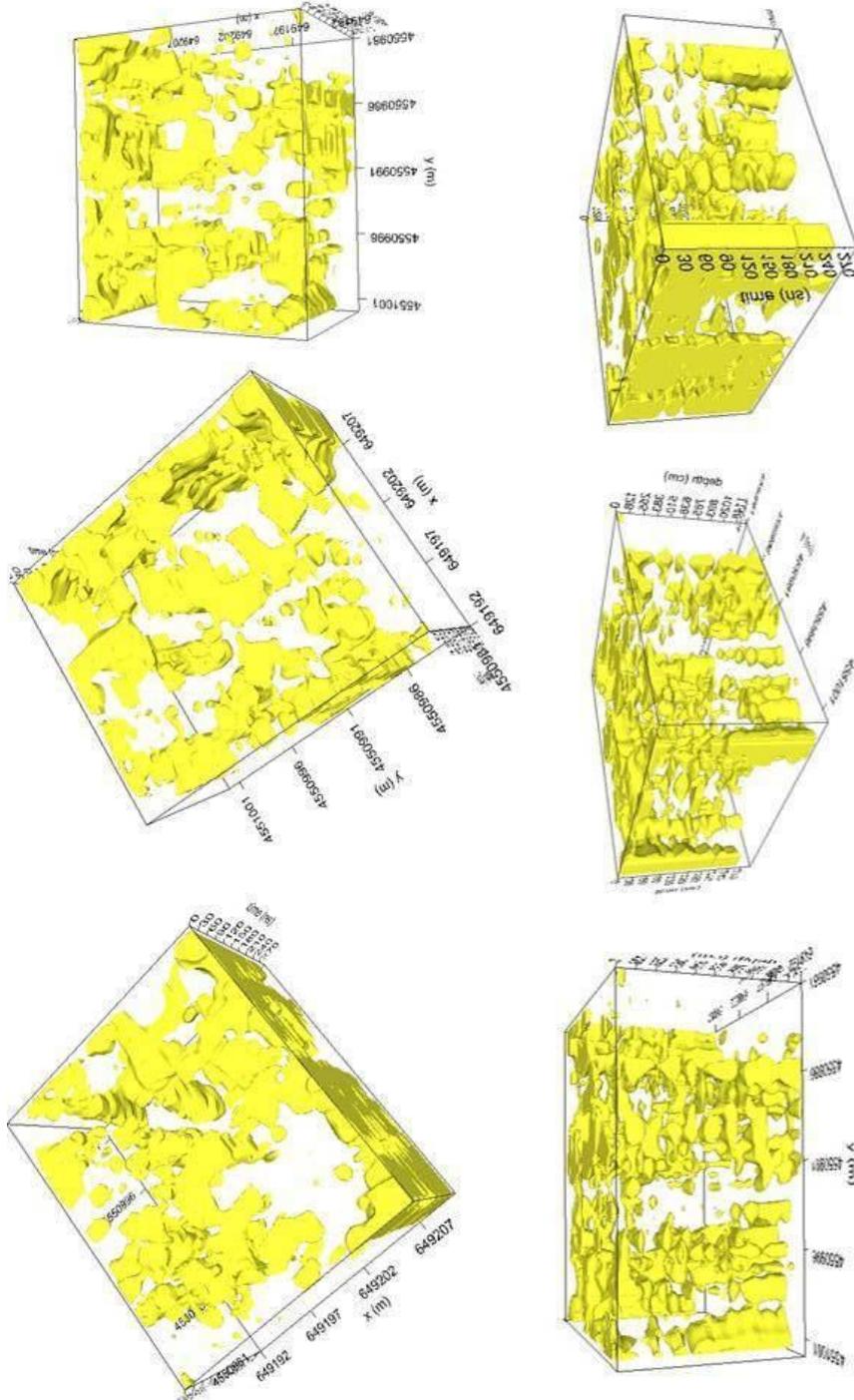
**İmage 38**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 4 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.



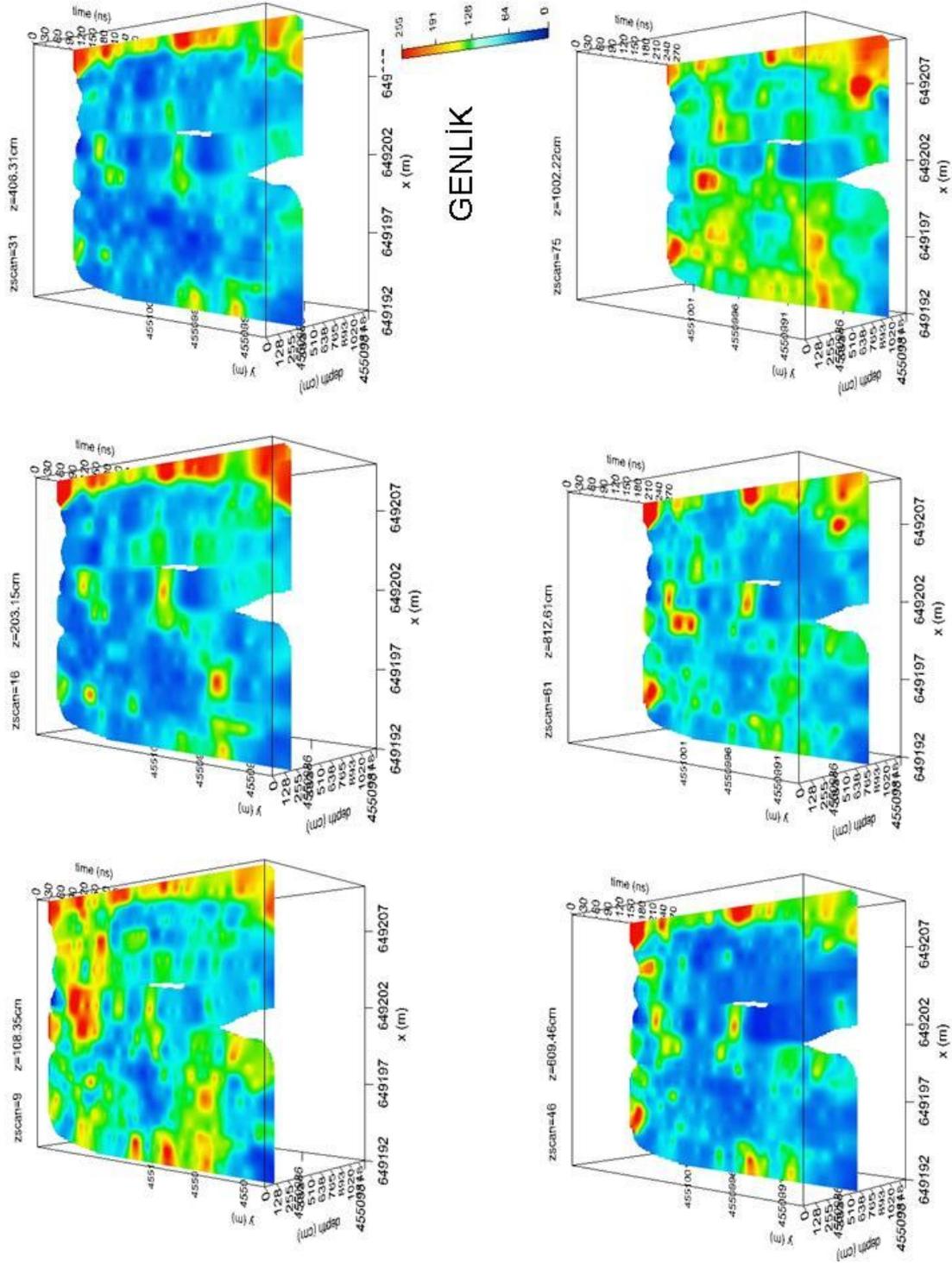
**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



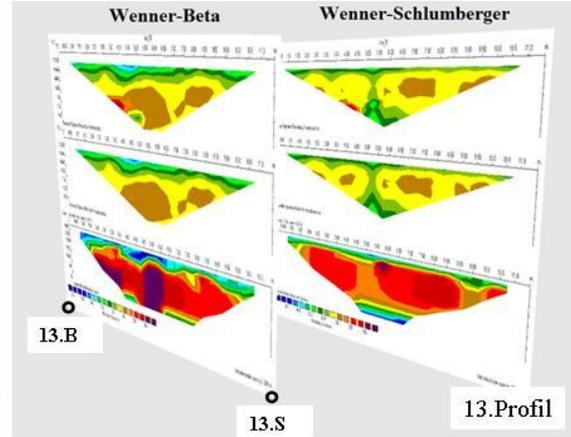
**İmage 39**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 4 work area.



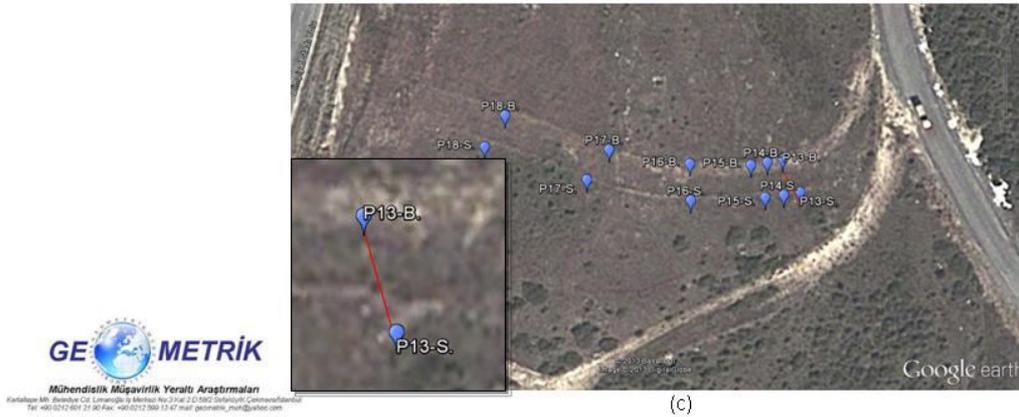
**Image 40**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 4.



(a)

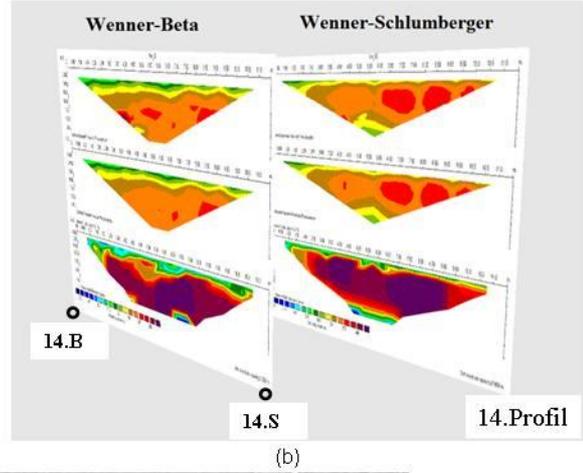


(b)



(c)

**İmage 41**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET13 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types c) The layout of ET13 profile in the layout plan.



(a)

(b)

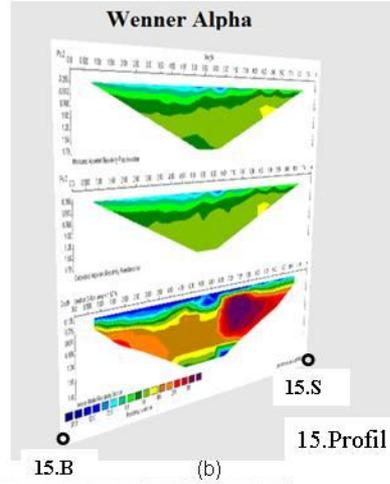


(c)

**İmage 42**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET14 Electrical Tomography profile (electrode interval 0.50 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET14 profile in the layout plan.



(a)

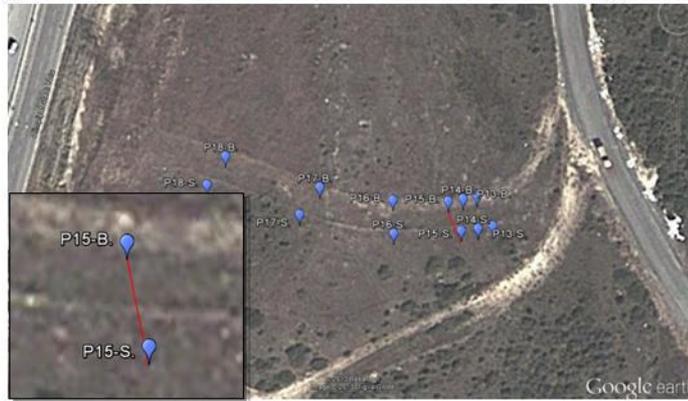


15.B

(b)

15.S

15.Profil



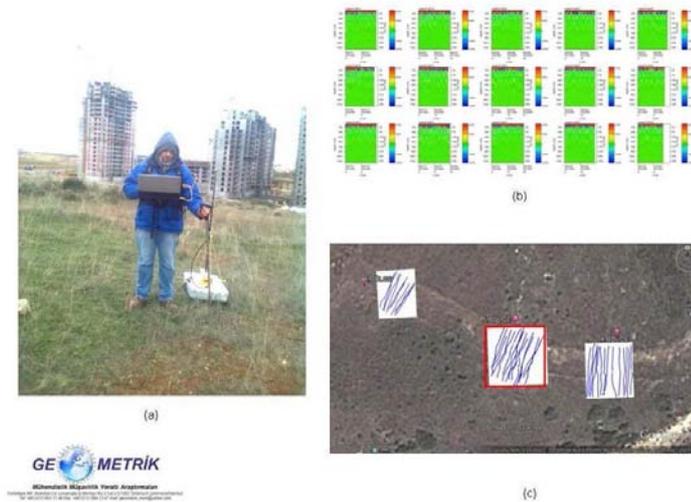
(c)

**İmage 43**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET15 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Alpha measurement type, c) The layout of ET15 profile in the layout plan.



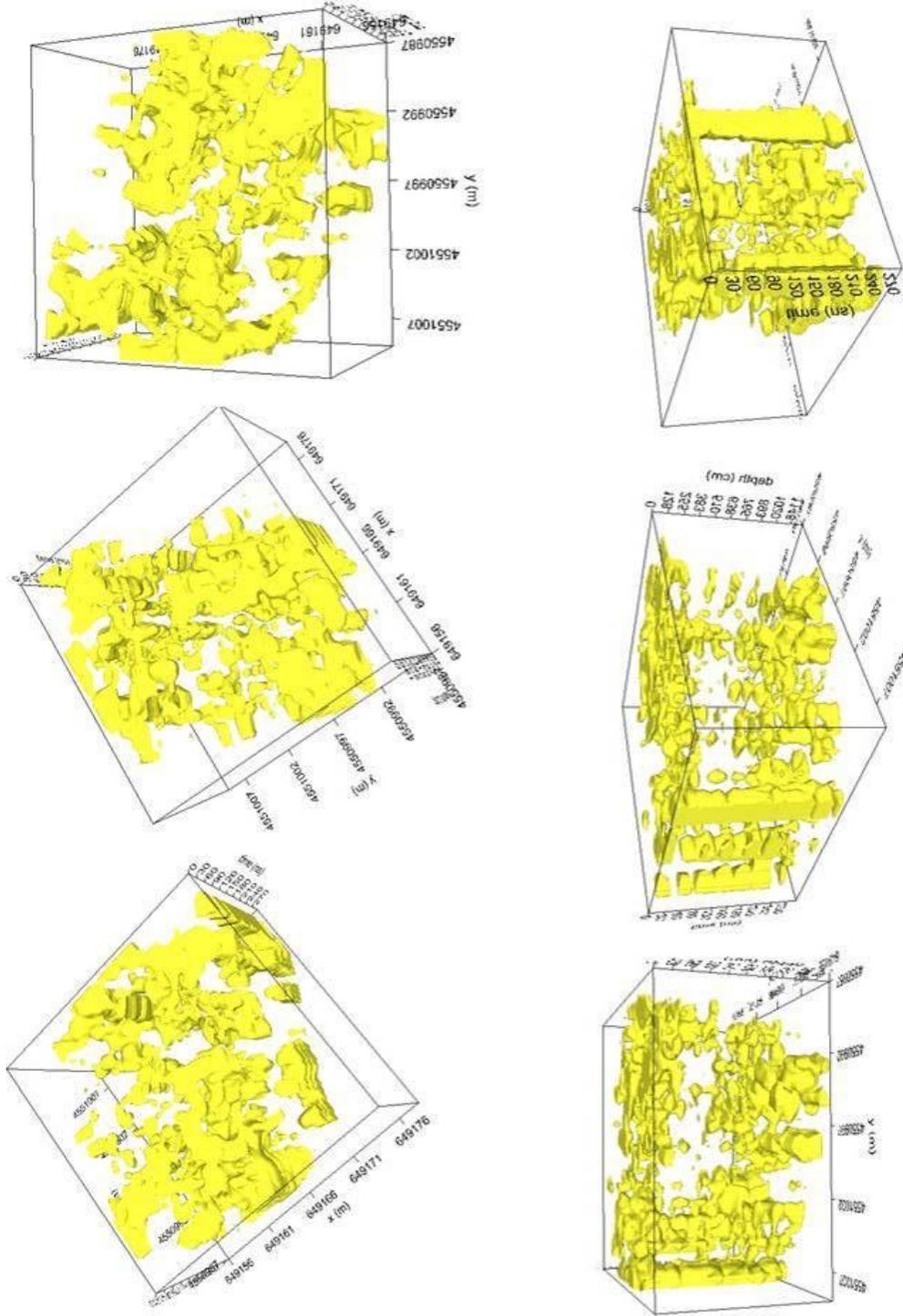
**The evaluation of the region number 5 in the Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

Region number 5 is located in northwest of region number 4. GPR radar measurements performed on and around sequential piled stones. As a result of the GPR radar measurements from the depth of 1m., high amplitude anomalies can be seen (İmage 45,46). These high amplitude anomalies should be controlled. In the region number 5, high resistivity structures have been seen in the central region of profiles after 2D (two dimensions) real resistivity sections obtained from Multi-Electrode Electrical Tomography measurements(İmage 47, 48). Being measured high resistivity environments in the area have been appeared in geometry without creating a certain architectural forms partly regular partly scattered. As individual anomalies have been seen. SP (Self Potential) measurements performed in the region number 5. Due to clumps created from without excavation underground, polarization values of positive anomalies have been observed. S.P. (Self Potential) measurement results is consistent with other geophysics studies. These high amplitude anomalie, high resistivity and indicates polarization areas should be controlled.



**İmage 44**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 5 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.





**İmage 45**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 5 work area.

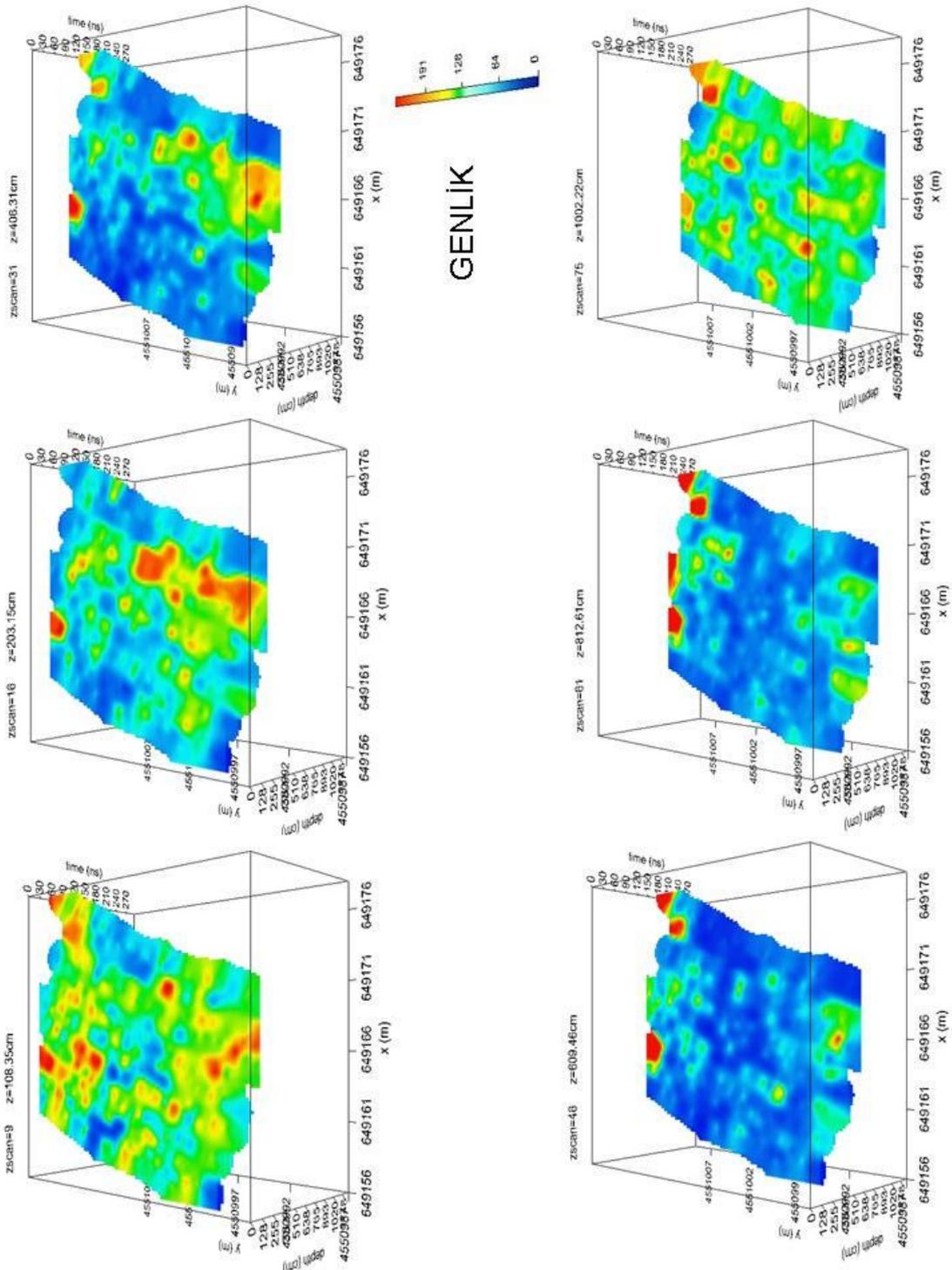
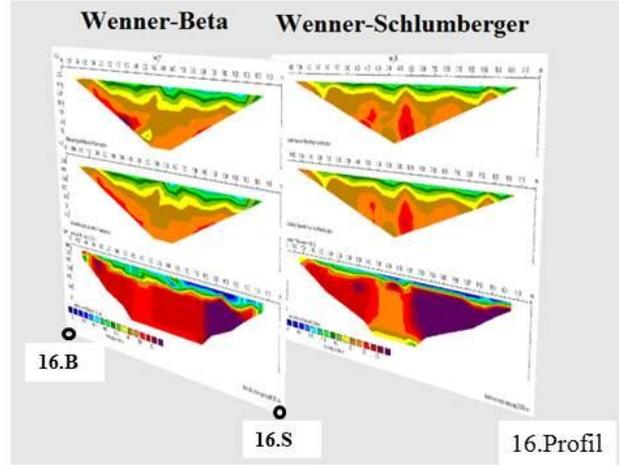


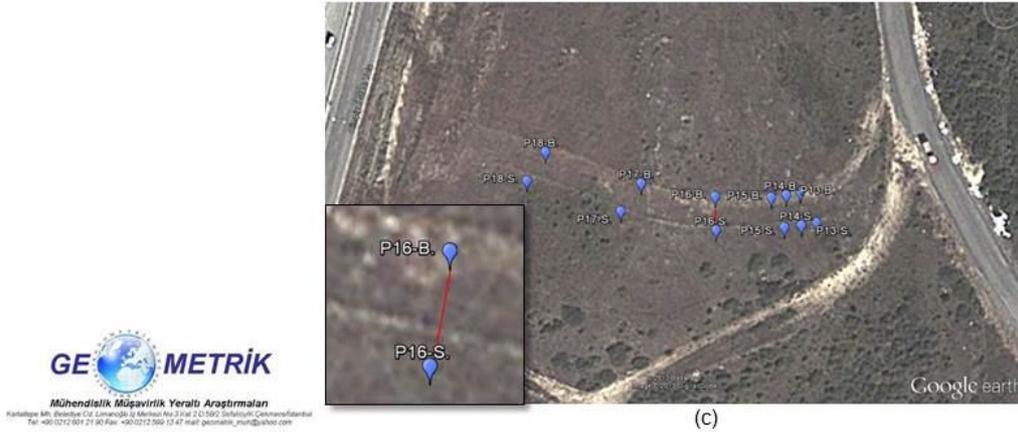
İmage 46, İstanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 5.



(a)

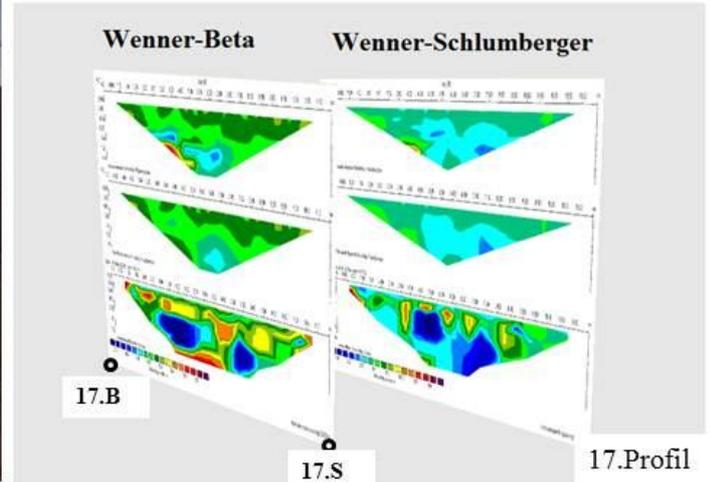


(b)



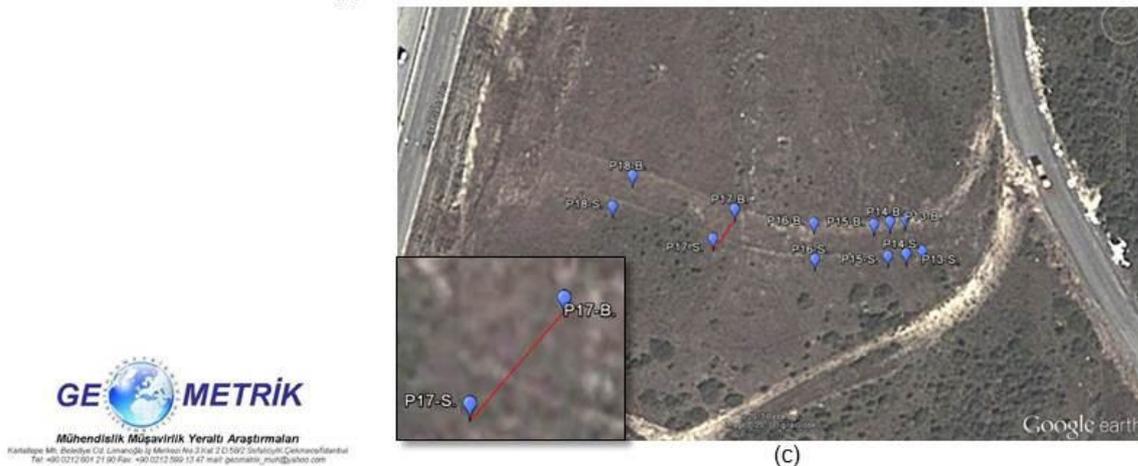
(c)

**İmage 47**, Istanbul Province, District Basakşehir, İkitelli Integrated Health Campus area, Belonging to ET16 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET16 profile in the layout plan.



(a)

(b)

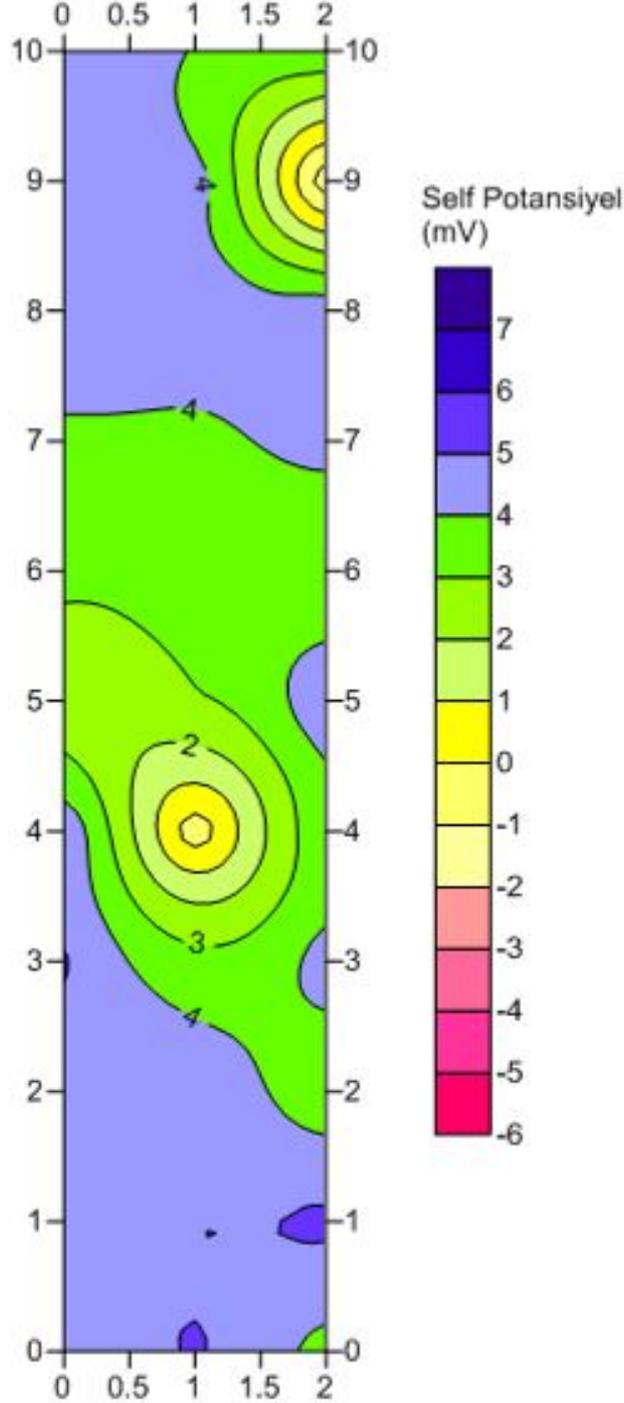


(c)

**İmage 48**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET17 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET17 profile in the layout plan.



ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



**İmage 49**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, SP-2 self potential anomaly distribution map in the natural potential measurement area.



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)

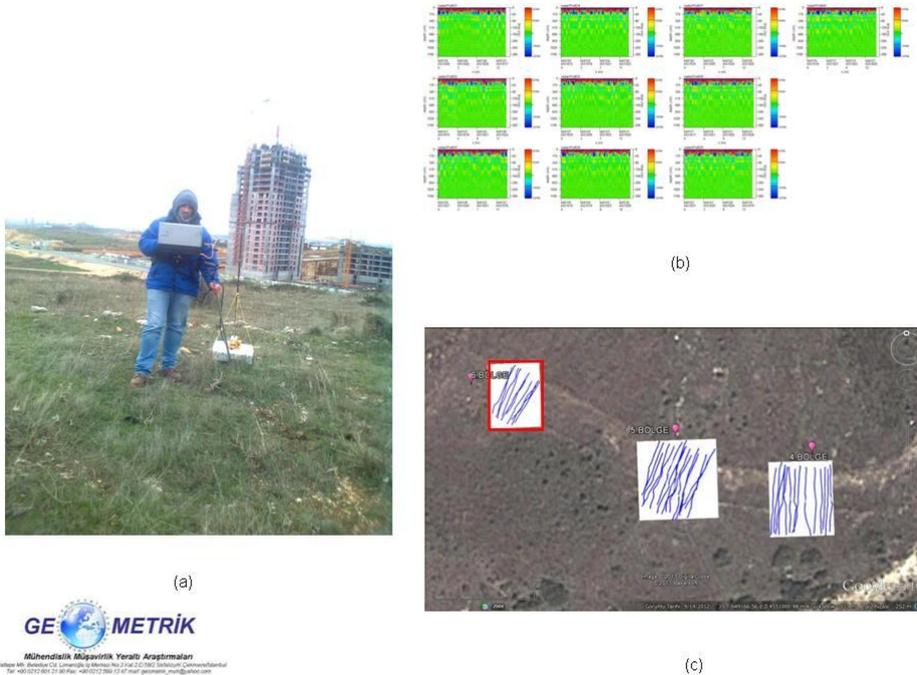


**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**The evaluation of the region number 6 in the Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

In the region number 6 (on and around sequential stones piled to on the border of southwest of area), GPR radar measurements performed from the depth of 1m., high amplitude anomalies can be seen (İmage 51, 52). In the region number 6, as a result of the Multi-Electrode Resistivity Tomography measurements and analyzing 2D (two-dimensional) real –resistivity sections to in view of group (İmage 53) created from total of 5 tomography profiles, high resistivity structures have been seen in the middle region and around of profiles. Being measured high resistivity environments in the area have been appeared in geometry without creating a certain architectural forms partly regular partly scattered. As individual anomalies have been seen. These high amplitude anomalies and high resistivity areas should be controlled which are determined by GPR and Electrical Tomography.



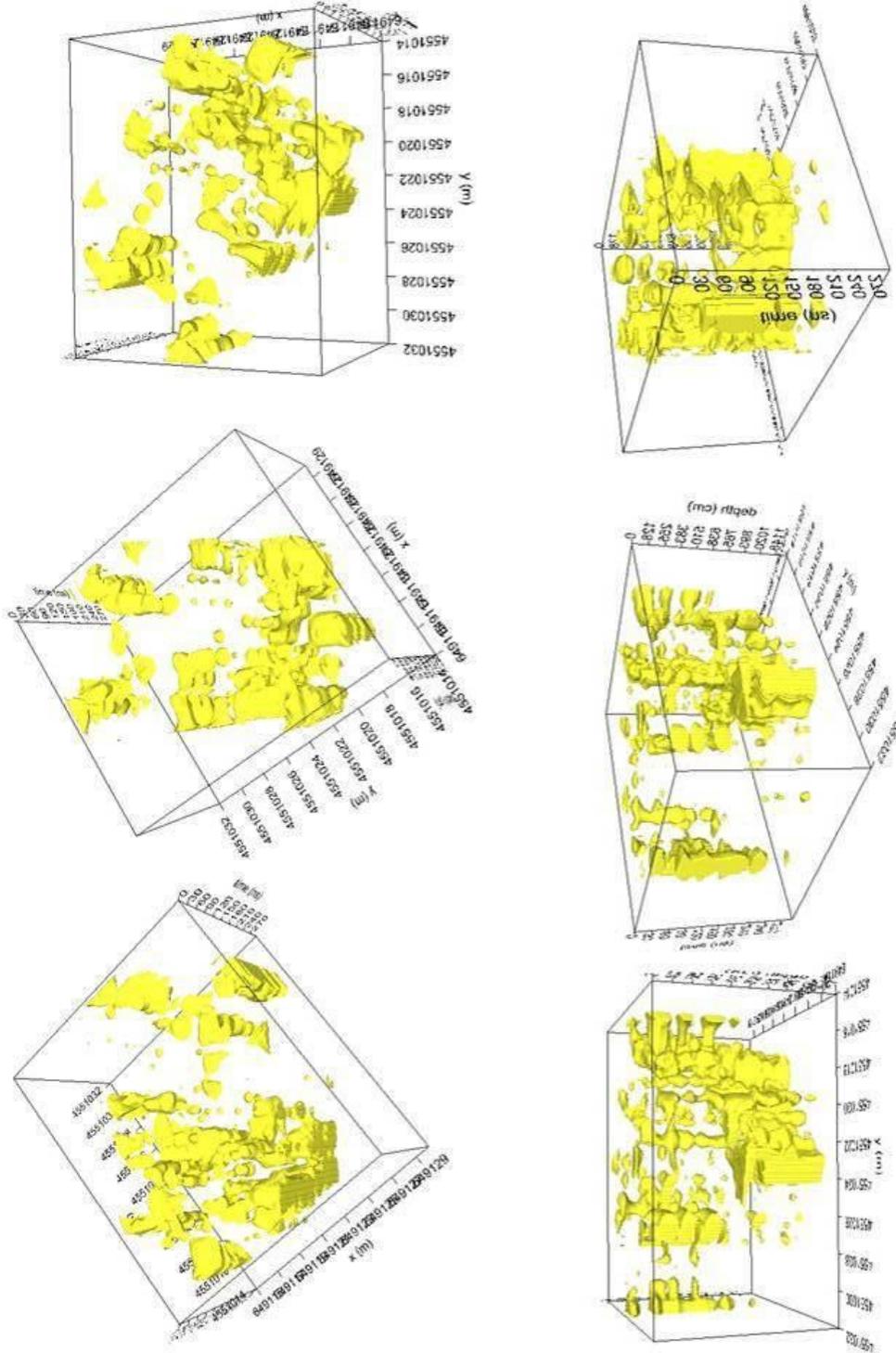
**İmage 50**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 6 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.



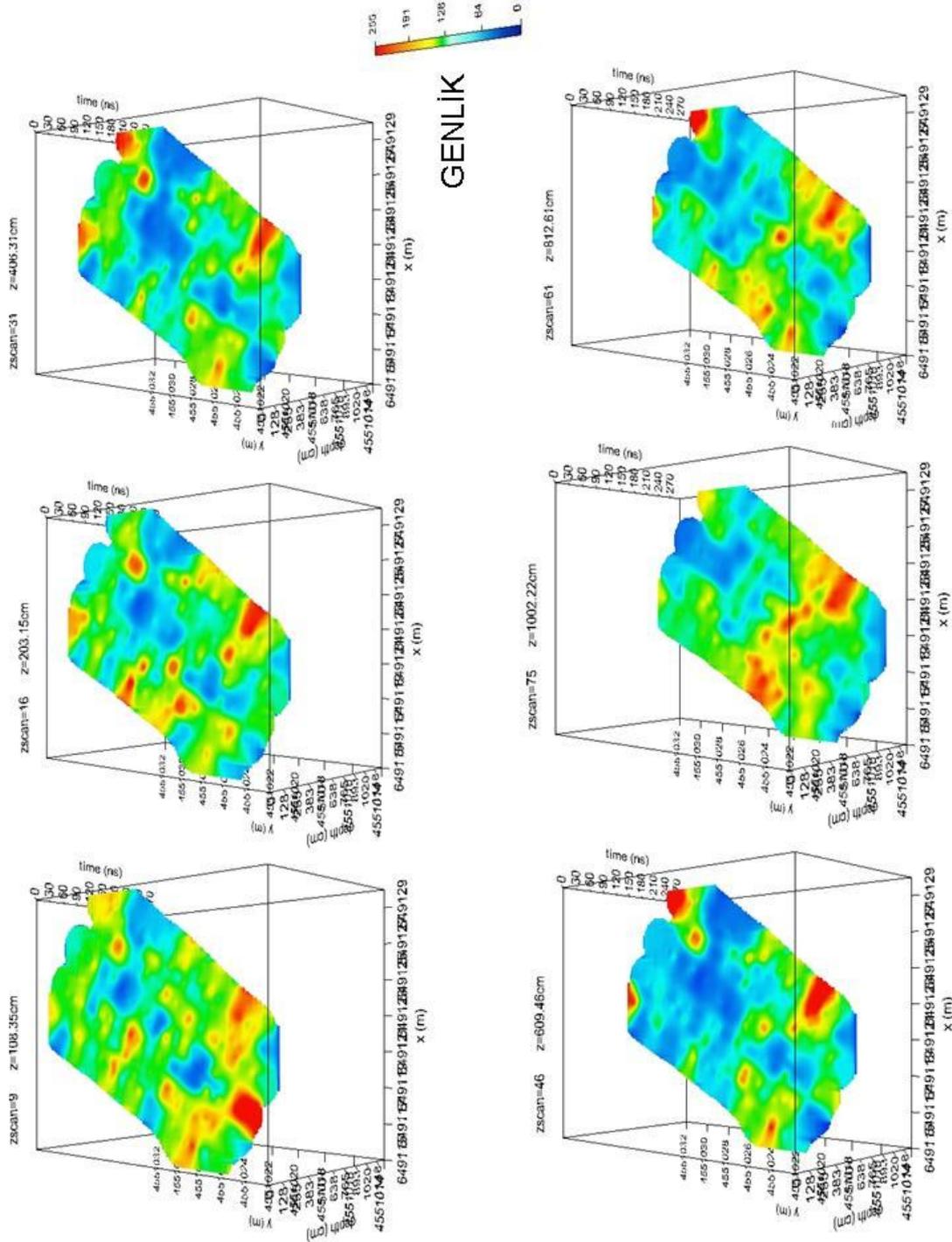
**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

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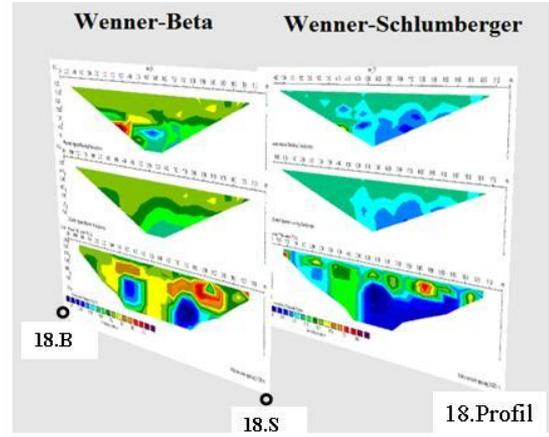
**İmage 51**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 6 work area.



**İmage 52**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 6.

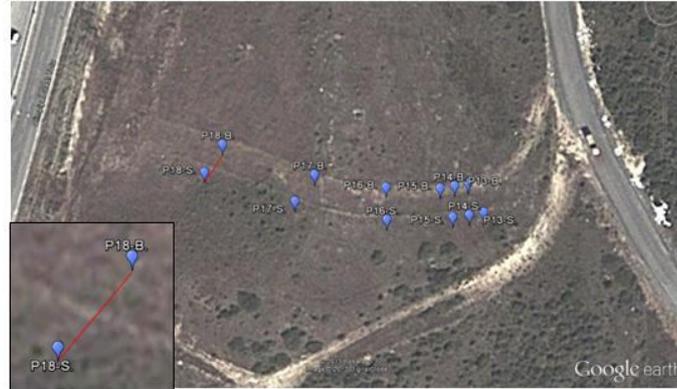


ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)

(b)



(c)



Mühendislik Müşavirlik Yeraltı Araştırmaları  
Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul  
Tel: +90 212 651 21 50 Fax: +90 212 788 11 47 mail: geometrik\_muh@yahoo.com

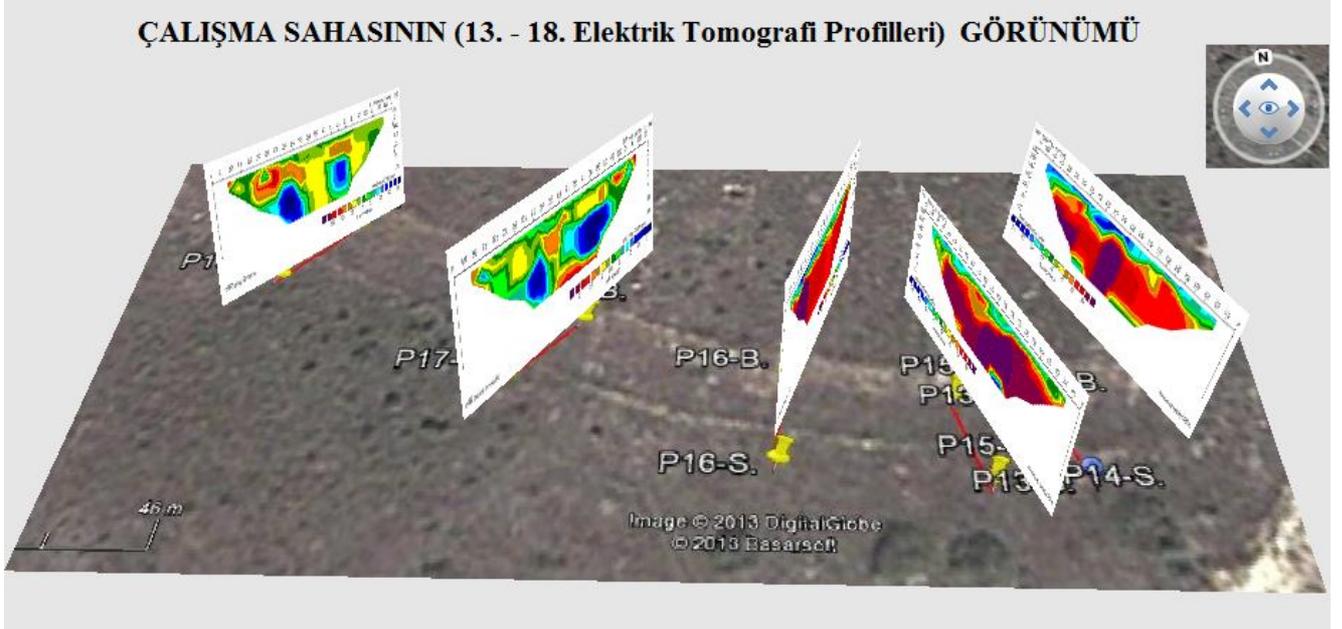
**İmage 53**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET18 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types c) The layout of ET18 profile in the layout plan.



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



**Image 54**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, the region number 4-5-6, images of groups of ET 13-ET 18 Electrical Tomography profiles.



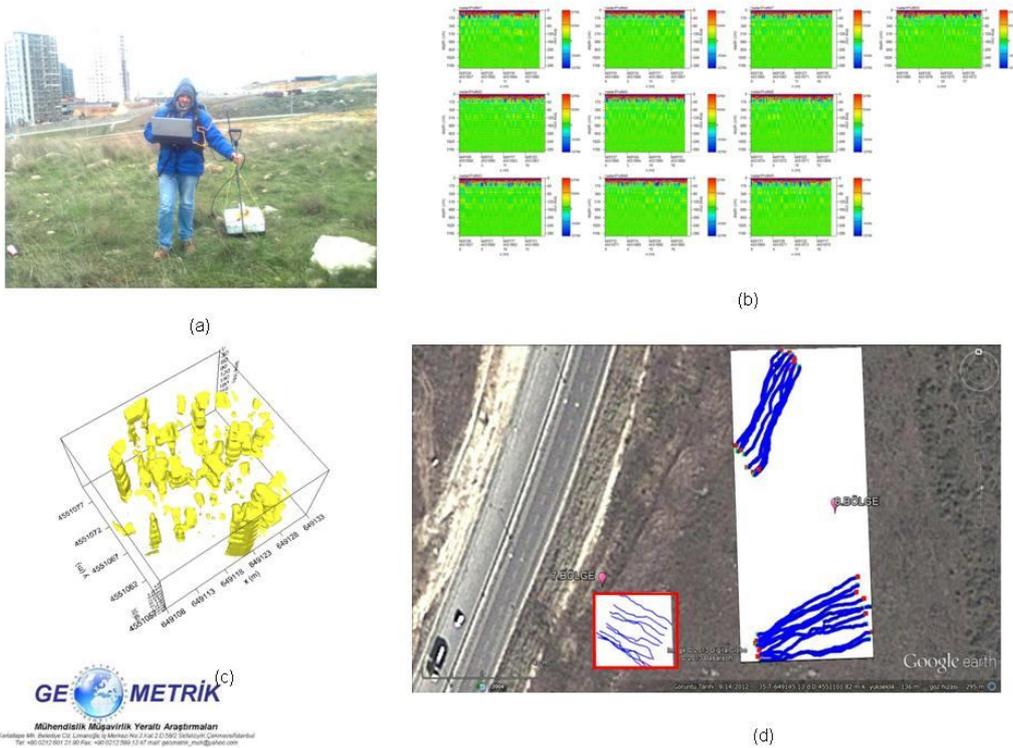


**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**The evaluation of the region number 7 in the Istanbul Province and District of Basaksehir, İkitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

In the region number 7 (on and around sequential stones piled to on the border of west of area), GPR radar measurements performed from the depth of 1m., high amplitude anomalies can be seen (İmage 56, 57). In the region number 7, as a result of the Multi-Electrode Resistivity Tomography measurements (İmage 58, 59), high resistivity structures have been seen in the middle region and around of profiles, when was analyzed 2D (two-dimensional) the real resistivity sections. Being measured high resistivity environments in the area have been appeared in geometry without creating a certain architectural forms partly regular partly scattered. These high amplitude anomalies and high resistivity areas should be controlled which are determined by GPR and Electrical Tomography.



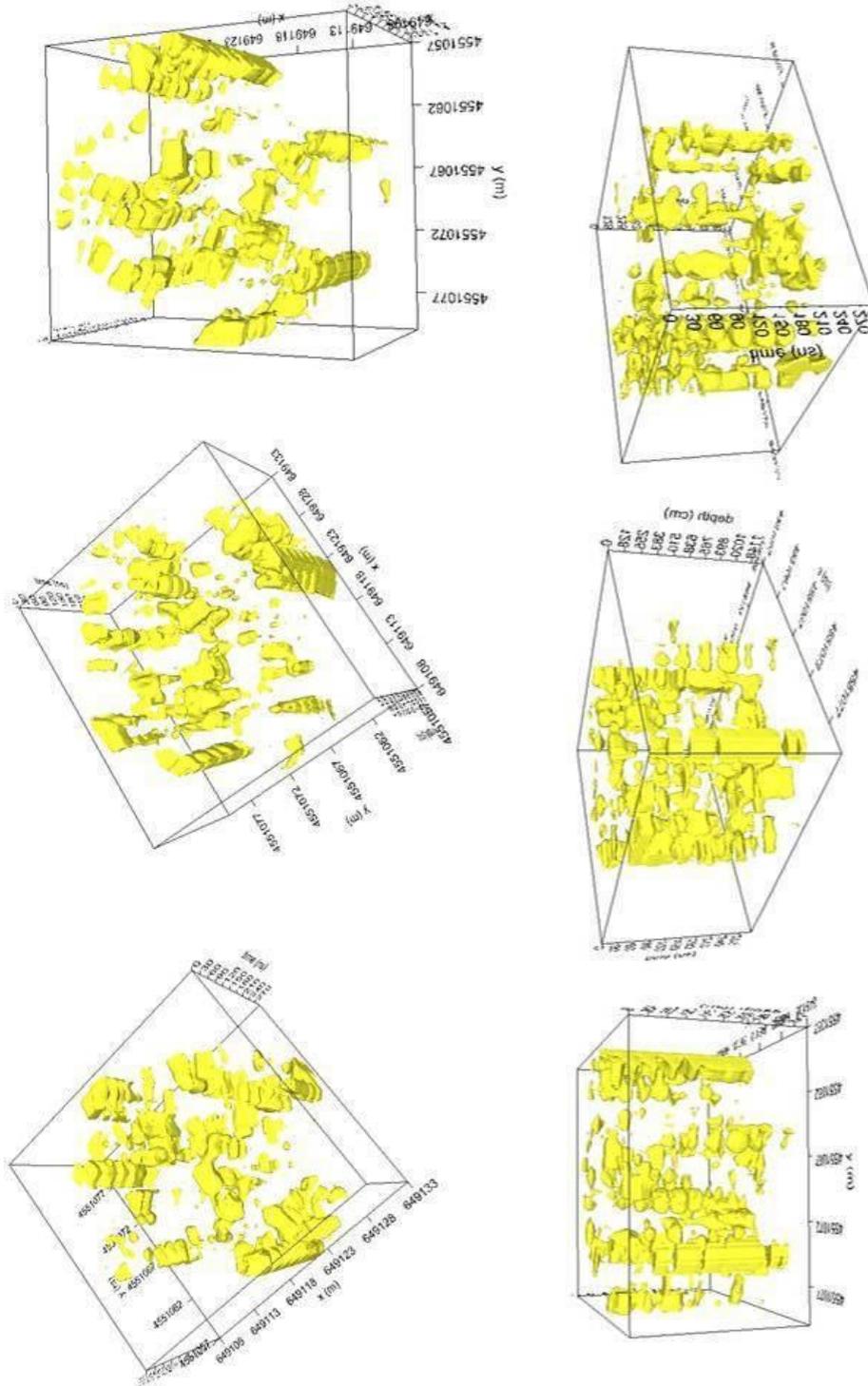
**İmage 55**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 7 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.



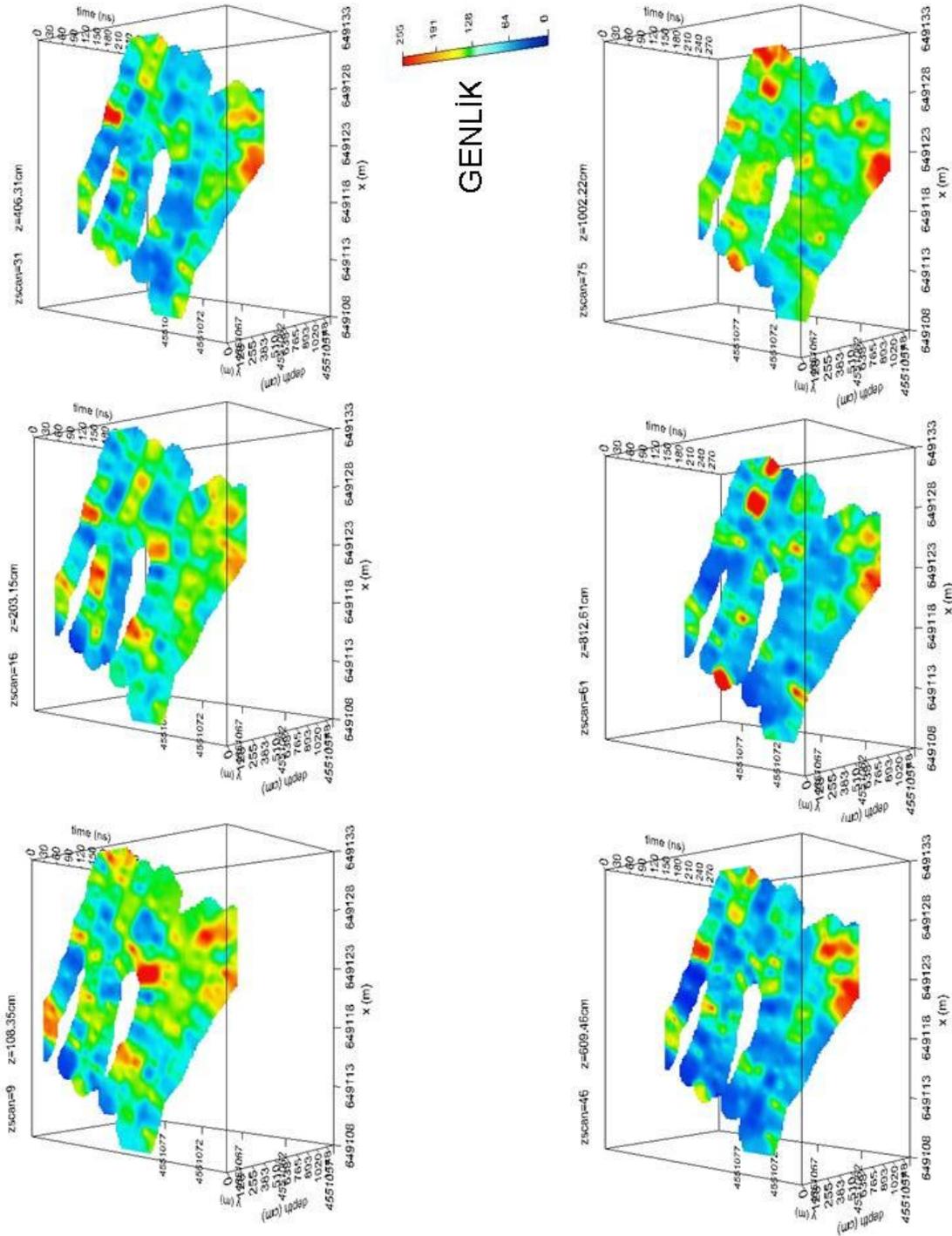
**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

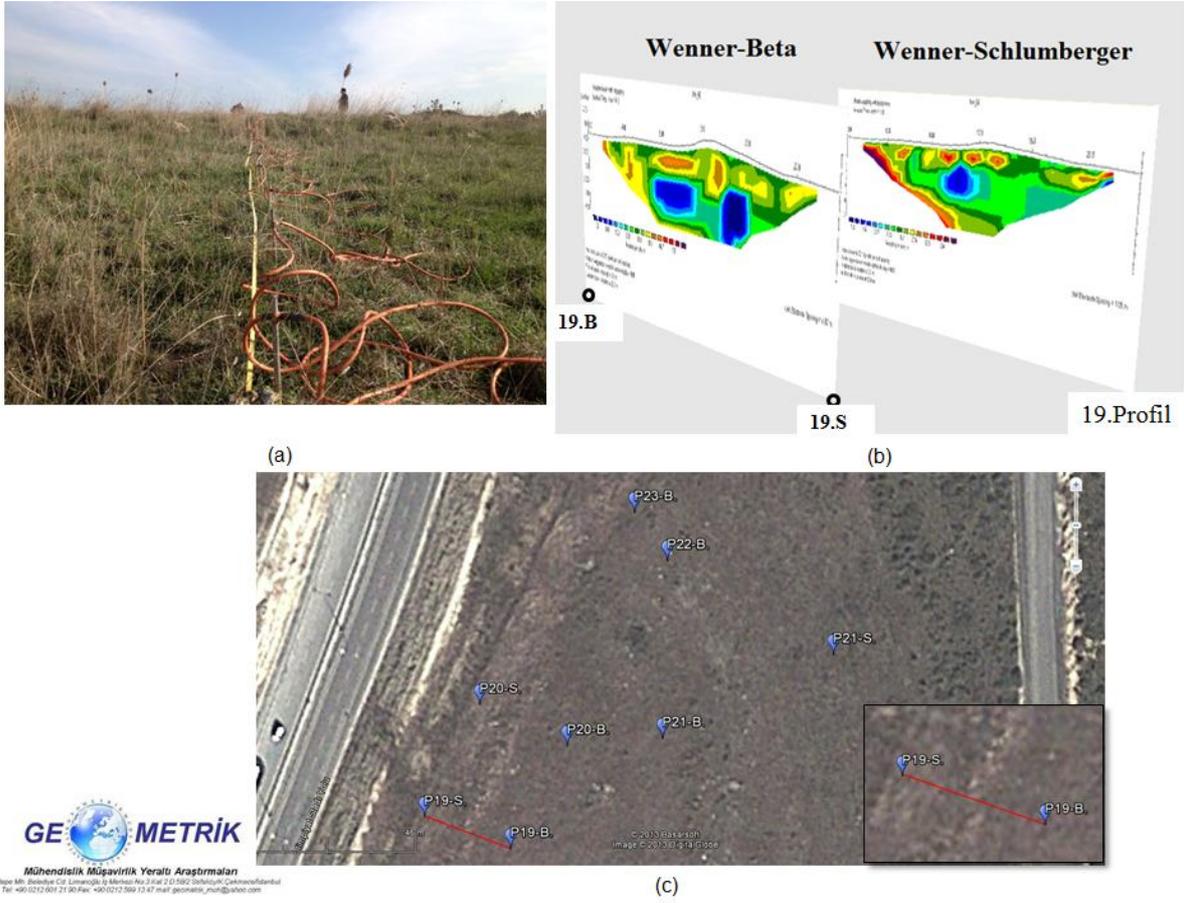
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



**İmage 56**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 7 work area.



İmge 57, İstanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 7.



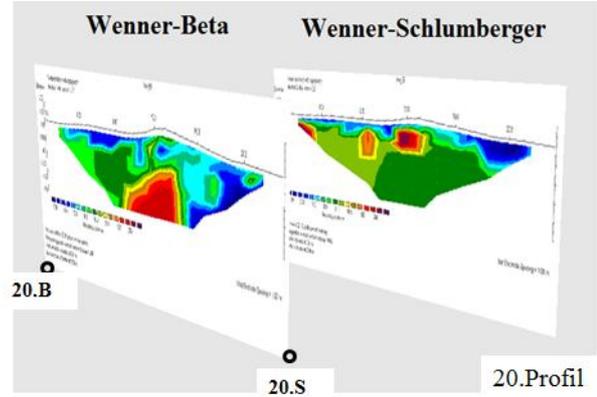
**İmage 58**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET19 Electrical Tomography profile (electrode interval 1.0 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types c) The layout of ET19 profile in the layout plan.



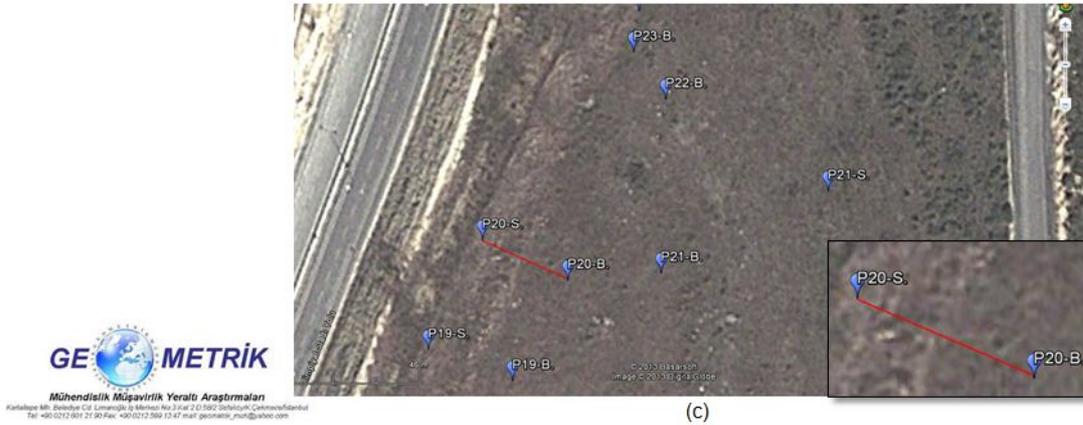
ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)



(b)



(c)

**İmage 59**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET20 Electrical Tomography profile (electrode interval 1.0 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types c) The layout of ET20 profile in the layout plan.



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**The evaluation of the region number 8 in the Istanbul Province and District of Basaksehir, Ikitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

In the region number 8 was carried in located to middle portion of area how broadly north-south trending ridge-shaped on clumps (GPR data sub-region and ET21). And other measurements (GPR data top-region, ET 22-23-24 and SP-3) is located in the North of area how circle-shaped on 3 clumps. As a result of the GPR radar measurements from the depth of 1m., high amplitude anomalies can be seen (Image 61, 62). In the region number 8, as a result of the Multi-Electrode Resistivity Tomography measurements and analyzing 2D (two-dimensional) real –resistivity sections to created in view of group with this profiles, high resistivity structures have been seen in different regions of profiles. Being measured high resistivity environments in the area have been appeared in geometry without creating a certain architectural forms usually regular partly scattered. In the region number 8, S.P. (Self-Potential) measurements were performed. The reason of always positive values measured in contrast to negative values, in the above ground is localized piled hills. If these hills could construct the stack so as to form pits, negative anomalies were obtained. S.P. (Self Potential) measurement results is consistent with other geophysics studies. These high amplitude anomalie, high resistivity and indicates polarization areas should be controlled which are determined by GPR, Electrical Tomography and S.P.



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

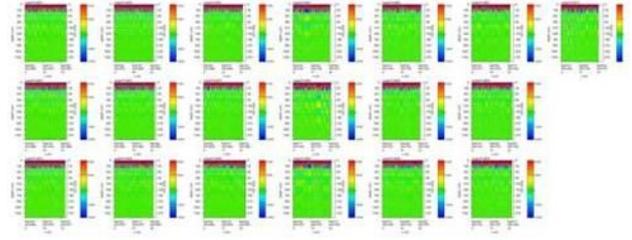
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



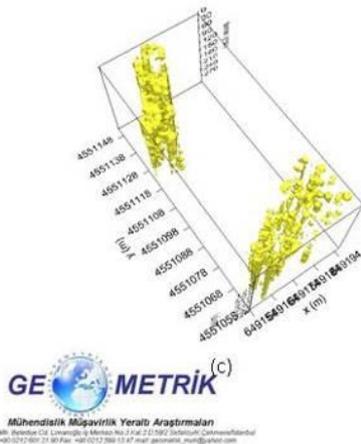
**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



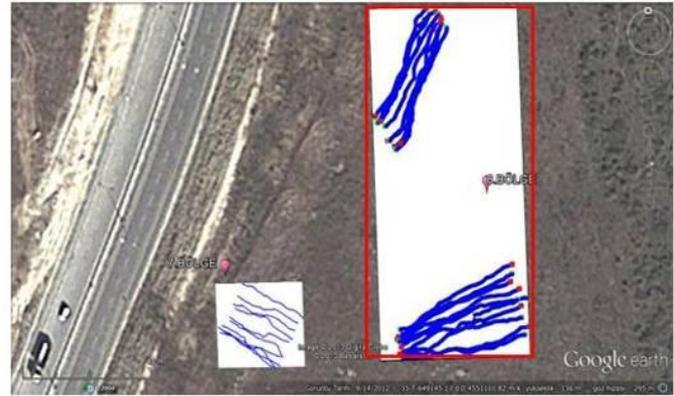
(a)



(b)



(c)



(d)

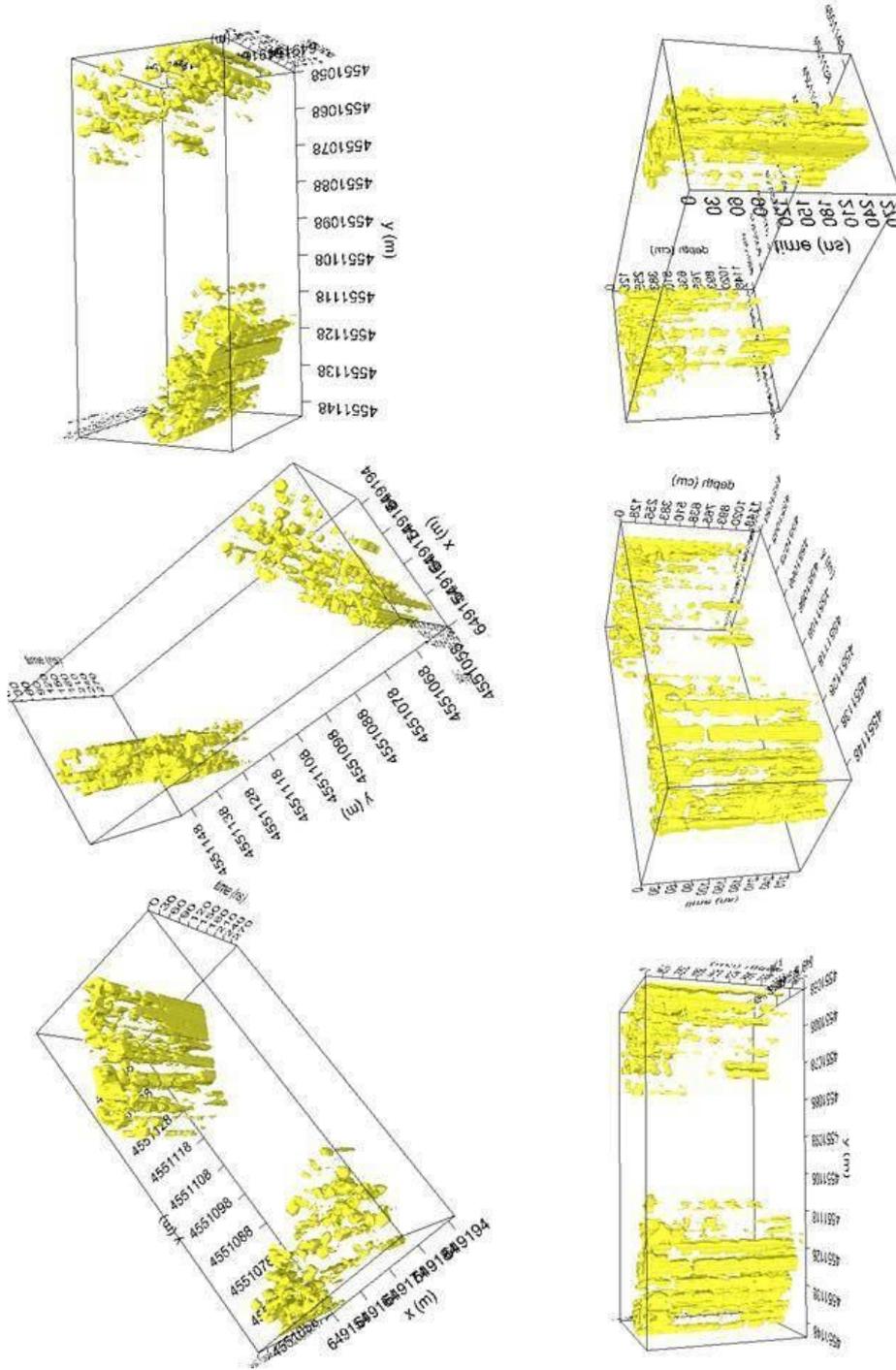
**İmage 60**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 8 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

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**İmage 61**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 8 work area.



ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH

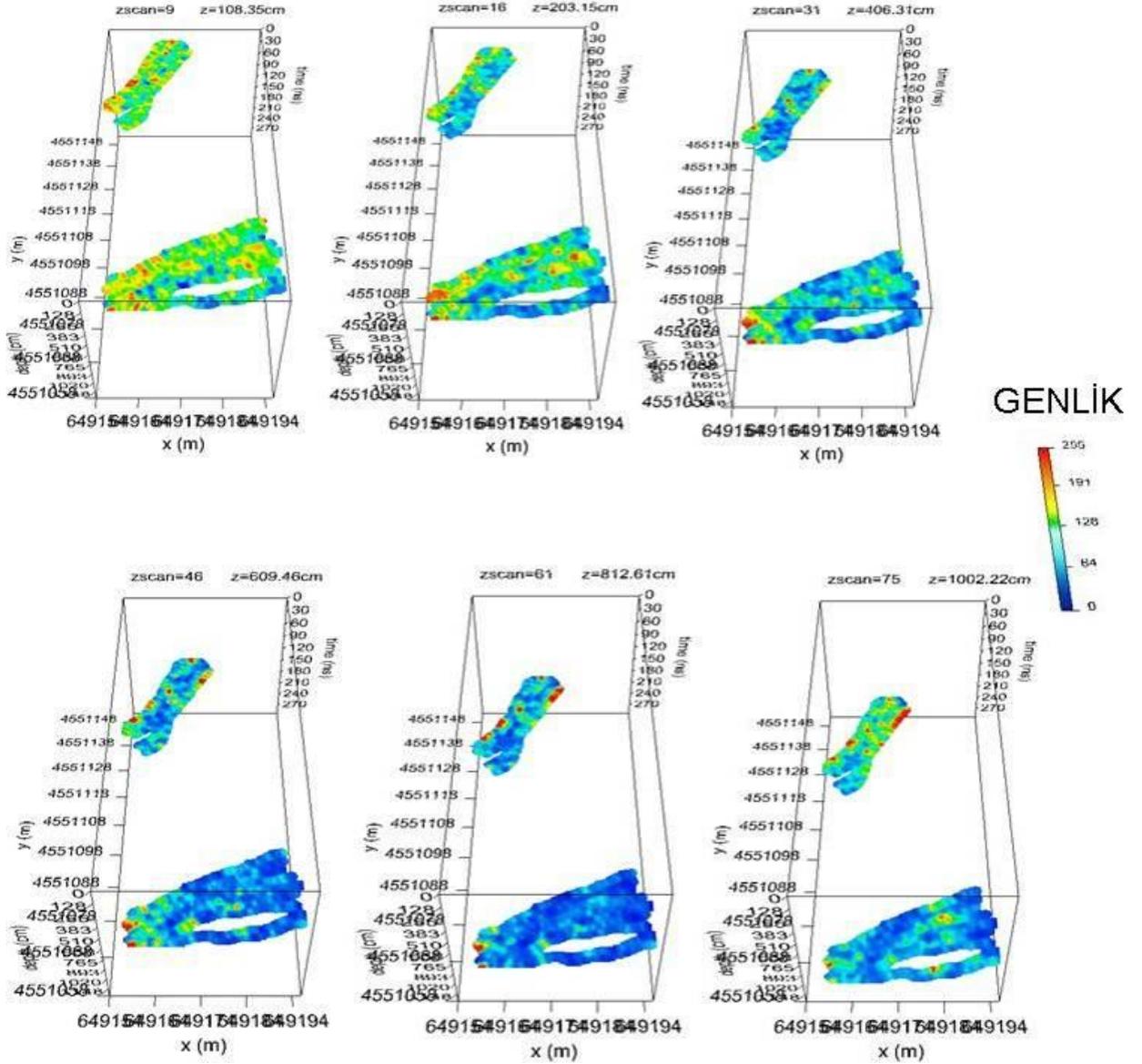
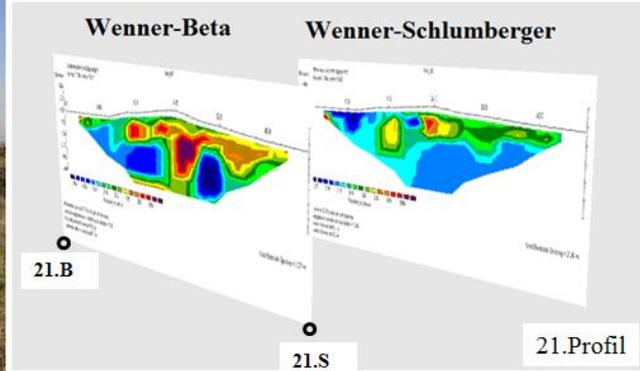


İmage 62, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 8.



(a)



(b)

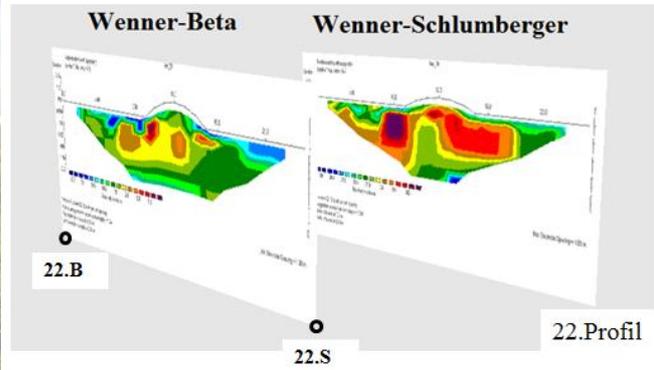


(c)

**İmage 63**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET21 Electrical Tomography profile (electrode interval 2.0 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET21 profile in the layout plan.



ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)

(b)



(c)



**İmage 64**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET22 Electrical Tomography profile (electrode interval 1.0 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET22 profile in the layout plan.



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

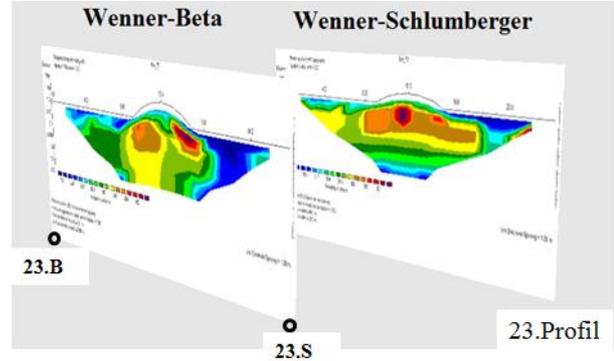
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



(a)



(b)



(c)



**İmage 65**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET23 Electrical Tomography profile (electrode interval 1.0 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET23 profile in the layout plan.



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Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

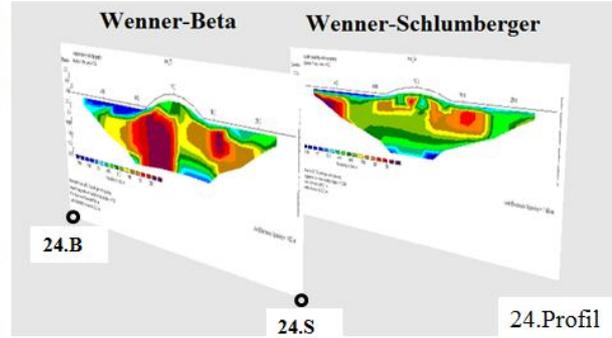
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1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)



(b)



(c)



**İmage 66**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET24 Electrical Tomography profile (electrode interval 1.0 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types, c) The layout of ET24 profile in the layout plan.



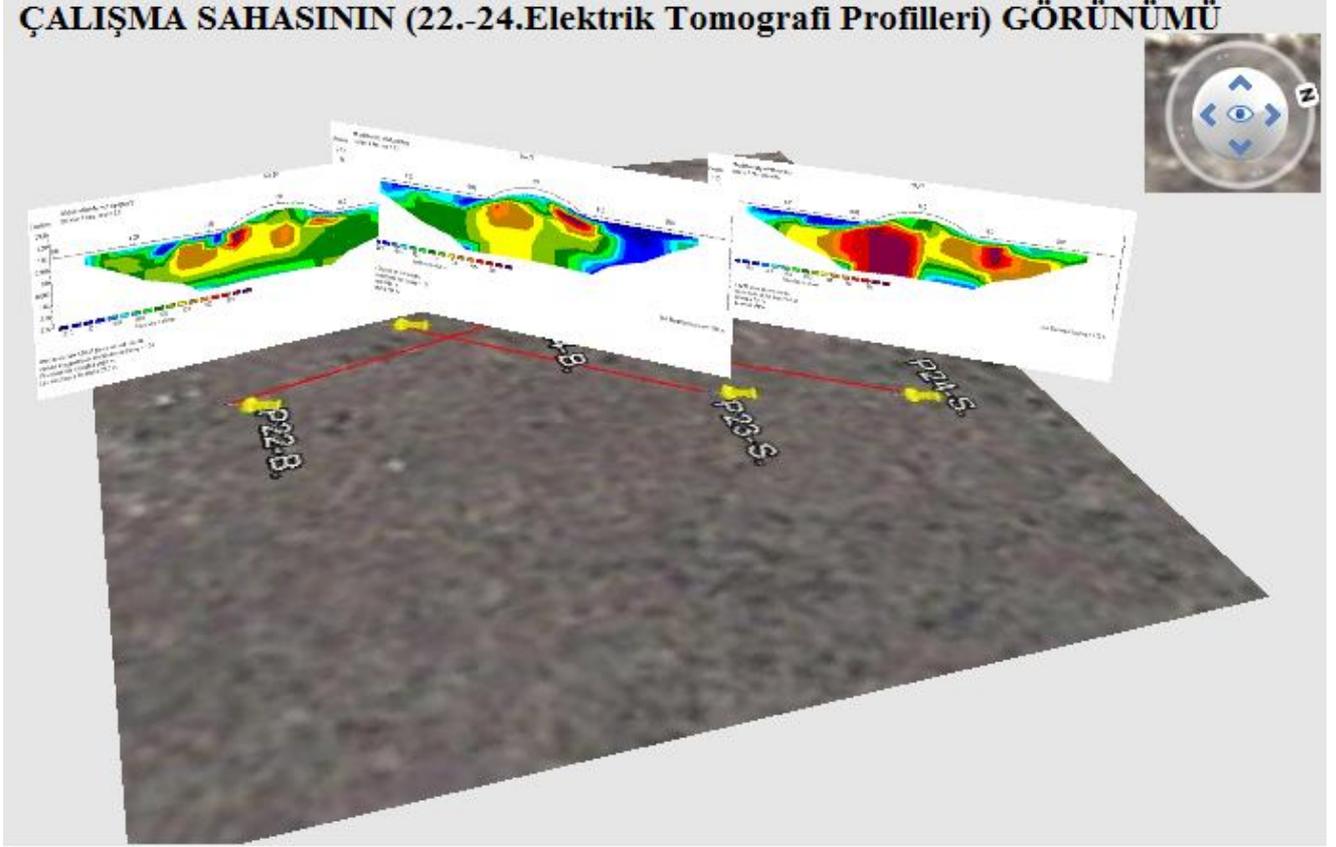
**Mühendislik Müşavirlik Yeraltı Araştırmaları**

Kartaltepe Mh. Belediye Cd. Limanoğlu İş Merkezi No:3 Kat:2 D:58/2, Sefaköy, Küçükçekmece, İstanbul

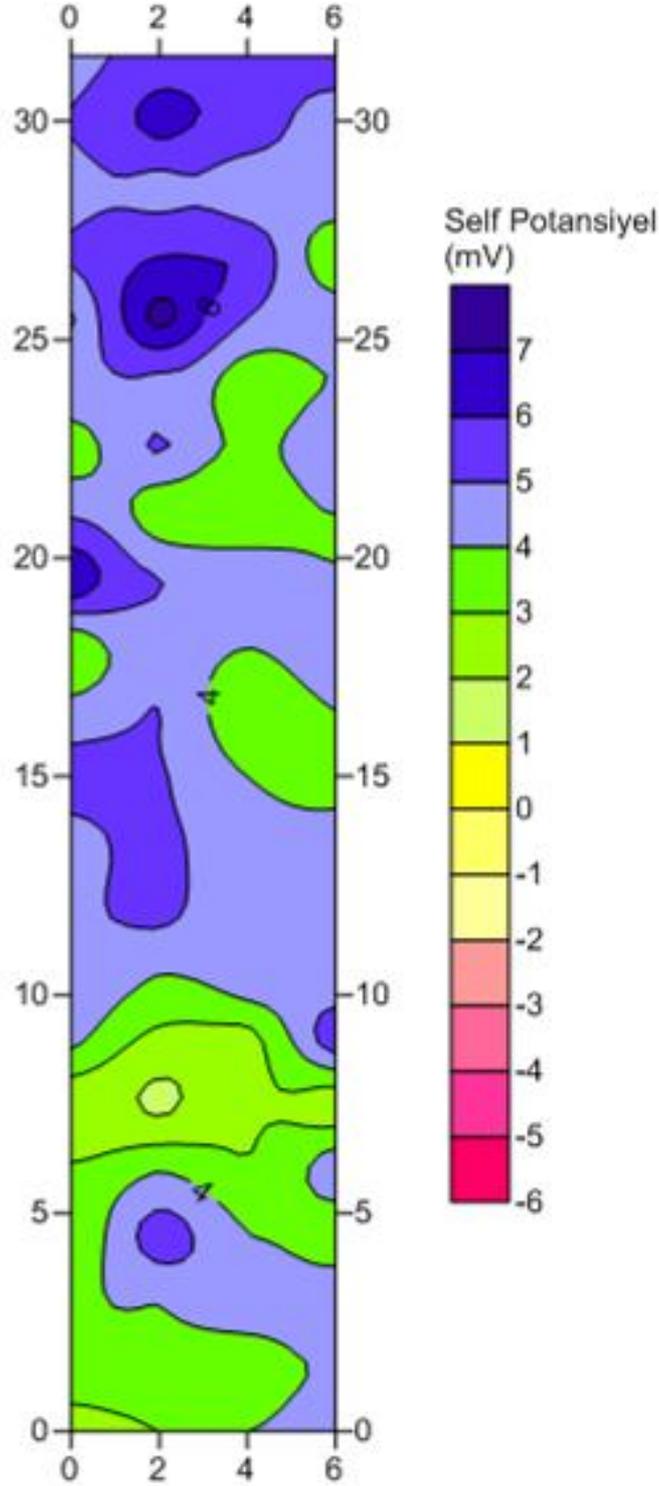
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



## ÇALIŞMA SAHASININ (22.-24.Elektrik Tomografi Profilleri) GÖRÜNÜMÜ



**İmage 67**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, the region number 8, images of groups of ET 22-23-24 Electrical Tomography profiles.



**İmage 68**, İstanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, SP-3 self potential anomaly distribution map in the natural potential measurement area.

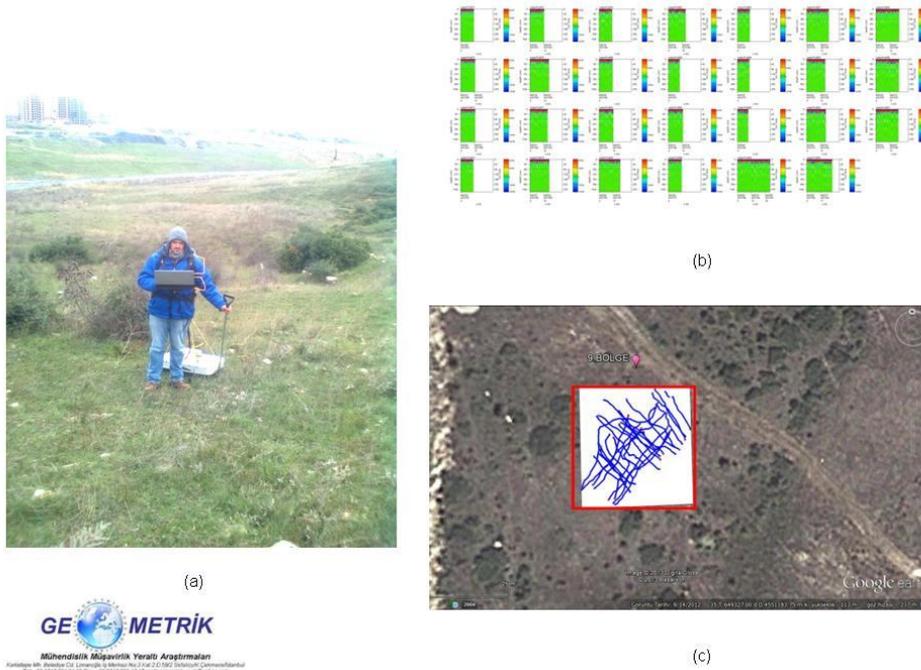


**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**The evaluation of the region number 9 in the Istanbul Province and District of Basaksehir, İkitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus:**

In the region number 9, As a result of the GPR radar measurements from the depth of 1m., high amplitude anomalies can be seen (İmage 70, 71). In the region number 9, as a result of the Multi-Electrode Resistivity Tomography measurements and analyzing 2D (two-dimensional) real –resistivity sections to created in view of group with this profiles, high resistivity structures have been seen in middle region and around of profiles. Being measured high resistivity environments in the area have been appeared in geometry without creating a certain architectural forms related ground, non-regular ve partly scattered. These high amplitude anomalie and high resistivity areas should be controlled which are determined by GPR and Electrical Tomography.



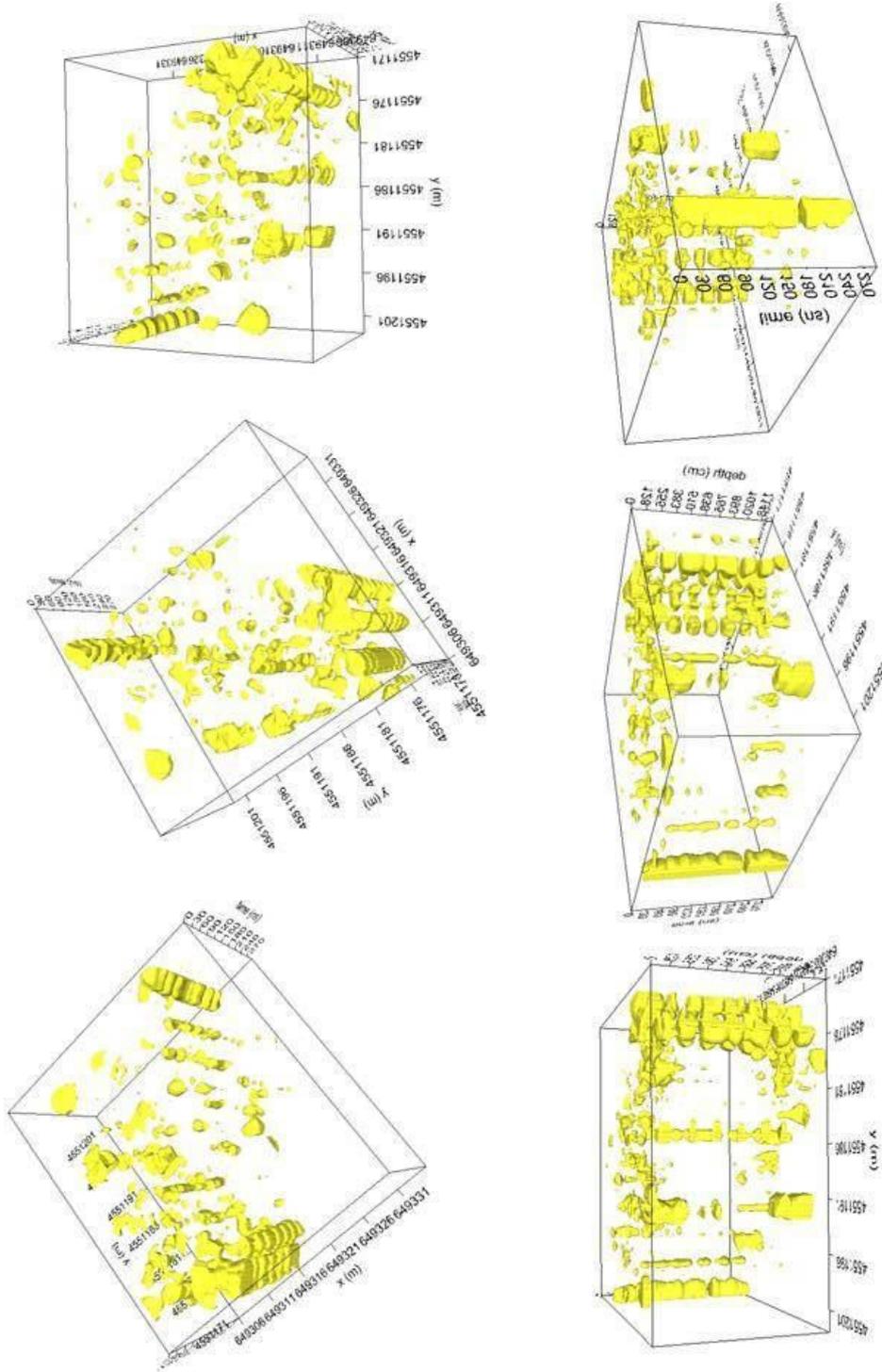
**İmage 69**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus, belonging to number 9 working area; a) the picture of the region, b) radargrams which belong to GPR radar profiles, c) underground cubic model of three-dimensional of radargrams, d) the layout of the region in the layout plan.



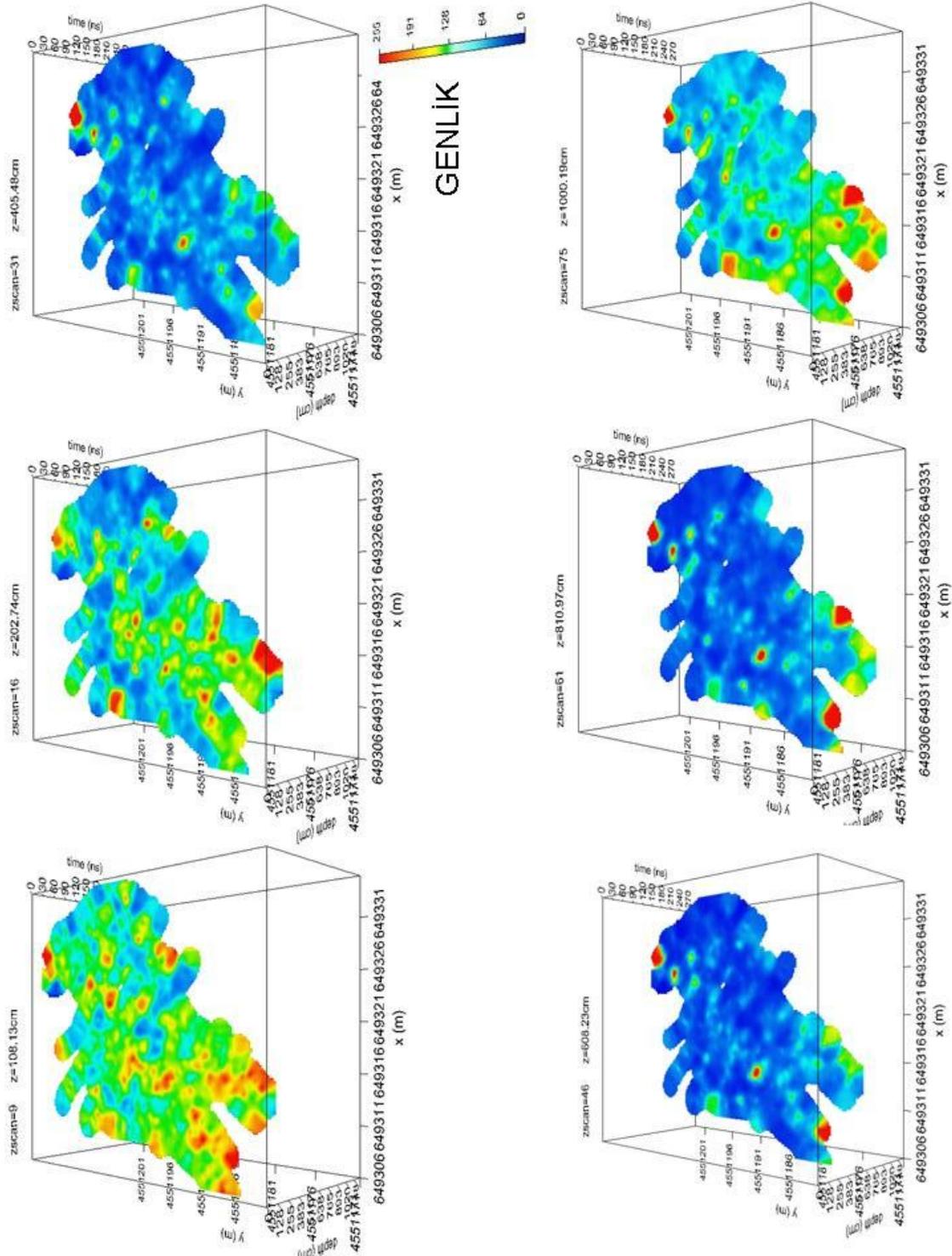
**Mühendislik Müşavirlik Yeraltı Araştırmaları**

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**İmage 70**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, three dimensional cubic model geo-radar images (from different angles) of number 9 work area.



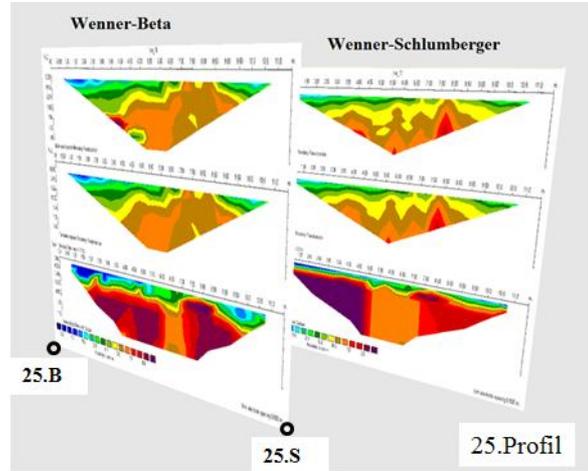
**İmage 71**, İstanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, layer maps which belong to levels of different depths in the work area of number 9.



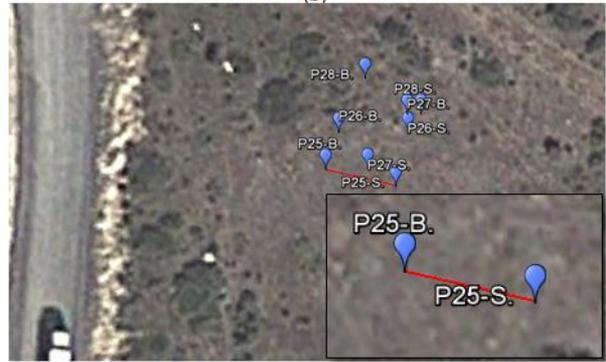
ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)



(b)



(c)

**İmage 72**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET25 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types c) The layout of ET25 profile in the layout plan.



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

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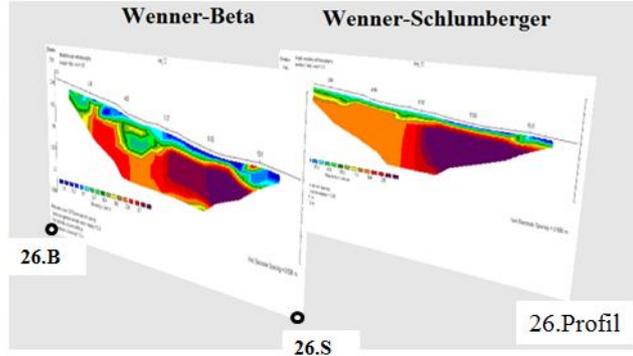
[geometrik\\_muh@yahoo.com](mailto:geometrik_muh@yahoo.com)



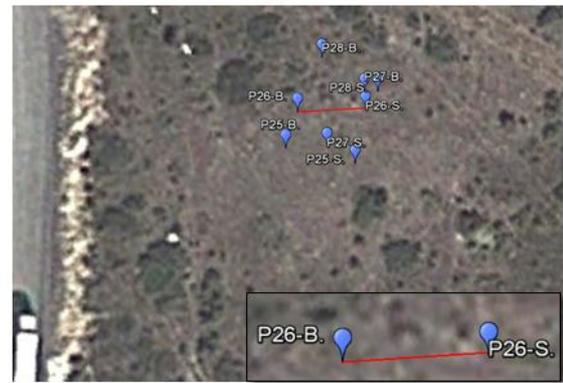
**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



(a)



(b)



(c)

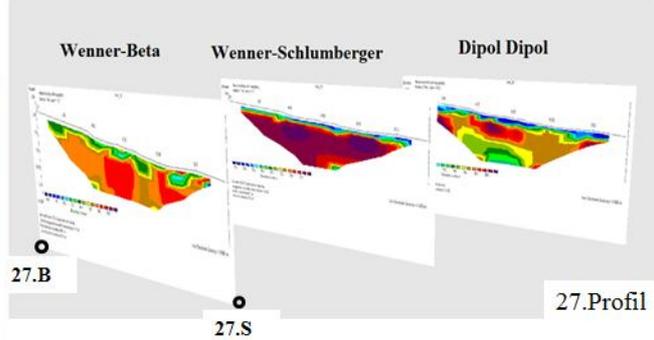
**İmage 73**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET26 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types c) The layout of ET26 profile in the layout plan.



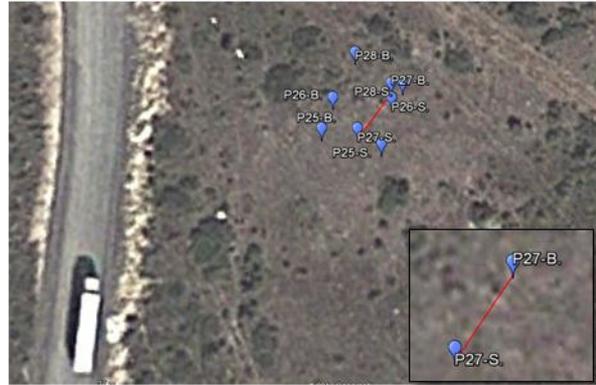
ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH



(a)



(b)

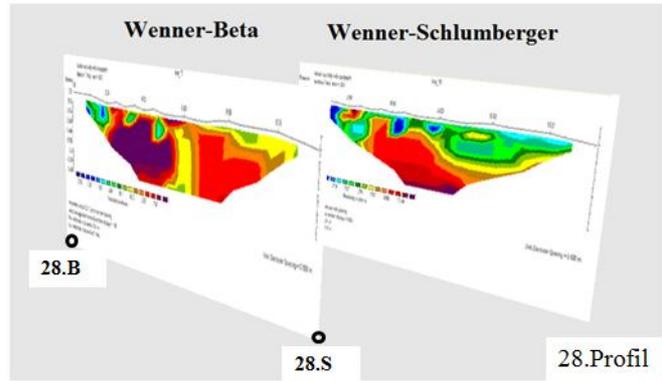


(c)

**İmage 74**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET27 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Dipol Dipol and Wenner-Schlumberger measurement types c) The layout of ET27 profile in the layout plan.



(a)



(b)

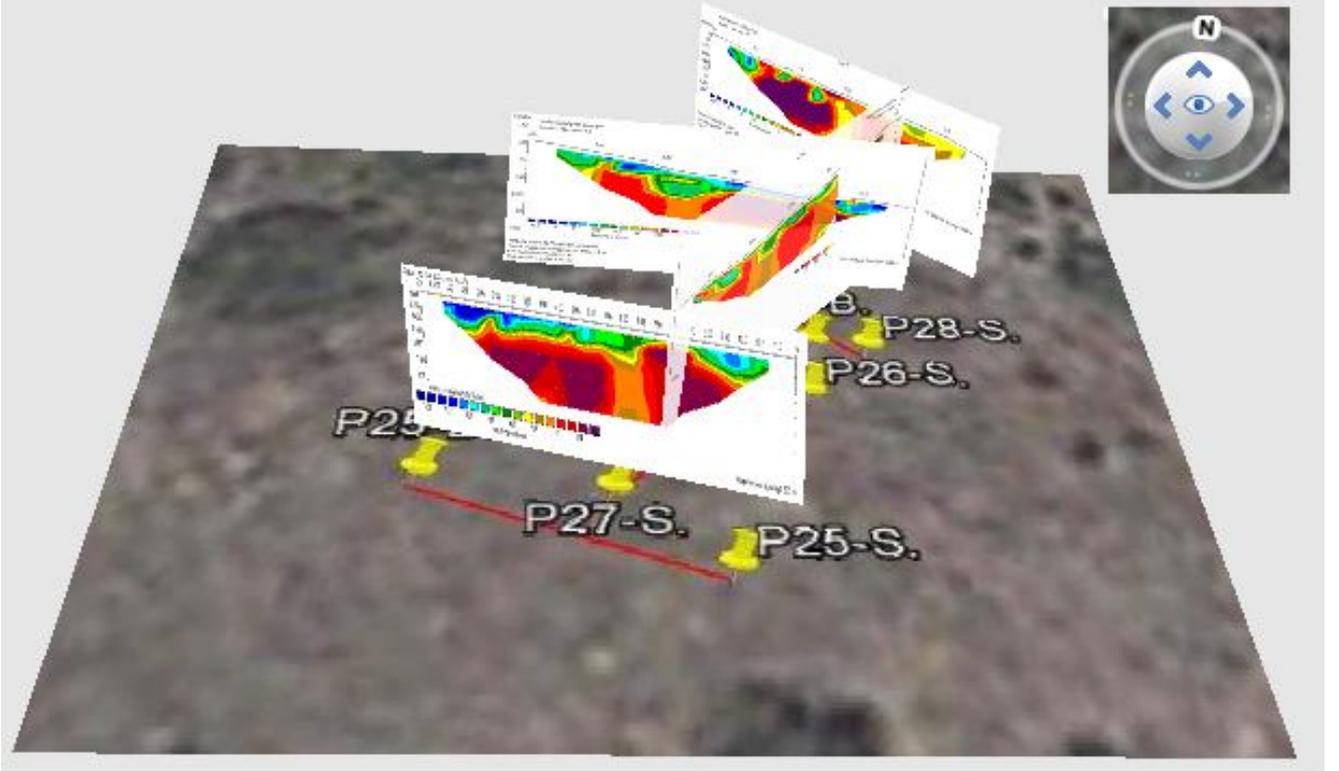


(c)

**İmage 75**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, Belonging to ET28 Electrical Tomography profile (electrode interval 0.5 m.); a) The picture of the measurements, b) Real Resistivity sections calculated with Wenner-Beta and Wenner-Schlumberger measurement types c) The layout of ET28 profile in the layout plan.



## ÇALIŞMA SAHASININ (25.-28. Elektrik Tomografi Profilleri) GÖRÜNÜMÜ



**İmage 76**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area, the region number 9, images of groups of ET 25-ET 28 Electrical Tomography profiles.



#### **4. SONUÇ VE ÖNERİLER**

This work has been carried out in the area of Istanbul Province and District of Basaksehir, İkitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus. This aim of the work is to reasearch whether the remains of belonging ancient times in the İkitelli Integrated Health Campus exist or not. With the purpose, Geo-radar (Ground Penetrating -GPR), Multi-Electrode Electrical Tomography (2D) and Self Potential (SP) methods of Geophysics has been used.

1- This work has been carried out in the area of Istanbul Province and District of Basaksehir, İkitelli Neighborhood, 1356 Block, 1-2 Plot (previous 1305 Block, 1-2 Plot) , İkitelli Integrated Health Campus, which are also shown in the layout plan, Geo-radar measures (in total of 9 the region, 1.0 m interval, in a total of 190 profiles), Multi-Electrode Electrical Tomography measurements (in a total of 28 profiles) and S.P. (Self Potential) measurements (in total of 5 the region). As a result of geophysical studies carried out, two and three dimensional underground images (Geo-radar, Electrical Tomography, Self-Potential (S.P.) have been gained. This study, measuring devices and equipment of Mala GPR brand (ProEx ünite, 250 Mhz antenna, notebook, DGPS antenna) were used. GPR data (radargram) is interpreted, using Reflex 2D ve three dimensional graphics software (Slice 3D) and measuring Multi-Electrode Electrical Tomography and also Self-Potential (S.P.) were used Metz Sas503brand (for resistivity) and other equipment.





**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
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2- In the place of research, 2D and 3D geo-radar section which of geo-radar measurement and cubic model, electrical tomography (2D) two-dimensional underground section and also Self Potential (SP) anomalies distribution based on maps with archeogeophysics purposes; in the area of Istanbul Province and District of Basaksehir İkitelli Integrated Health Campus has been determined anomalies of regular geometric distribution as 1.-2. in regions can be considered as a particular architectural form. In the other regions, anomalies of regular geometric distribution has not been determined. Immediately after interpretation and observation of GPR measurements with via 2D and 3D blog diagrams, these anomalies identified and 2D electrical tomography and S: P. anomaly distribution maps have been added to layout plan.

3- İn the area of Istanbul Province and District of Basaksehir İkitelli Integrated Health Campus, when 1-9 region's anomalies, three dimensional cubic model geo-radar images (from different angles) and layer maps which belong to levels of different depths, two-dimensional (2D) electrical tomography cross-sections, S. P. Self potential anomalies distribution maps is analyzing, high amplitude anomalies, high resistivity and indicates polarization areas have been seen. This archaeological study “İkitelli Integrated Health Campus Project Cultural Heritage Assessment Report” entitled, stone wall and kurgan-looking hills reasearch whether archaeological remains exist or not. The work is to reasearch whether the remains of belonging ancient times in the İkitelli Integrated Health Campus exist or not. İt is pointed, by the results of this archeogeophysics studies will be very helpful in making decisions more precise and detailed. This aim of the work, in the area of Istanbul Province and District of Basaksehir İkitelli Integrated Health Campus, as a result of the work done in a total of 9 the region, analyzing anomalies of distribution layer maps; anomalies of usually without creating a regular geometric distributions and high amplitude should be tested whether archaeological remains exist or not. Negative values were obtained as a result of the S.P. measurements (120 m. long and 1 m. wide NE-SW direction perpendicular to the row of stones in profiles). But S.P. anomalies's values were not obtained as negative values, in case of bump-sequential localized on clumps. On stone wall Electrical Tomography measurements



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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of taken periodically, high resistivity values giving anomalies is located middle of profiles and follow each other in the same direction. Belonging to other regions, resistivity values isn't given anomaly distribution to form a certain geometry. In the study area, piece of dish-pot is not found and when you think of the Ottoman - Russian War period is estimated to be used as protection of stone wall structure, in the area of Istanbul Province and District of Basaksehir İkitelli Integrated Health Campus, identified a total of 9 in the region where the locations of these high amplitude anomalies (GPR), high resistivity anomalies (2D electrical tomography sections) and S.P. anomalies (Appendix-1 Layout Plan and Anomalies Distribution Layer Maps) in the measurement should be tested with archaeological soundings.

Best regards.



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**  
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## 5. KAYNAKLAR

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**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



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**Mühendislik Müşavirlik Yeraltı Araştırmaları**

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**ARCHAEOGEOPHYSICS PROJECTS COMPLETED GEOMETRİK  
ENGINEERING UNDERGROUND RESEARCHES CONSULTING COMPANY**

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- 2. Kayseri Interior Castle Archaeogeophysics Research Report, 2012. Kayseri.** Geometrik Engineering Underground Researches Consulting Company
- 3. Enez Archeological Excavation Site Archaeogeophysics Research, 2012. Çanakkale.** Geometrik Engineering Underground Researches Consulting Company
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- 10. Istanbul, Beyoğlu Tomtom Street 317 Block, 64-65-66 Plot Sites Archaeogeophysics Research, 2012. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 11. Istanbul, Fatih Ali Kuscı Street, 36 Plot Archaeogeophysics Research, 2012. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 12. Van Province, Van Castle and City of the Old Van Archaeogeophysics Research, 2012. Van.** Geometrik Engineering Underground Researches Consulting Company.





- 13. Istanbul, Fatih, Cankurtaran Street 60 Layout, 76 Block, 32 Plot Sites Archaeogeophysics Research, 2012. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 14. Istanbul, Beyoğlu, Bereketzade Street 106 Layout, 150 Block, 22 Plot Sites Archaeogeophysics Research, 2012. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 15. Istanbul, Bakırköy, Sakızgacı Street Doga Sehircilik 5 Layout, 1 Block, 18 Plot Sites Archaeogeophysics Research, 2012. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 16. Istanbul, Fatih, Sultanahmet Street, Mustafapasa İmpasse 26 Plot Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 17. Istanbul, Fatih, Binbirdirek Street, Dizdariye Fountain Street 15 Plot Ferman Sultan Hotel Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 18. Istanbul, Fatih, Cankurtaran Street, Akbyk Street 233 Layout, 66 Block, 96 Plot Sydney Otel Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 19. Istanbul, Fatih, Süleymaniye Street, T.C. Istanbul University Central (Beyazıt) Kampus Outdoor Parking Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 20. Istanbul, Fatih, Beyazıt Street, 133 Layout, 255 Block, 35 Plot Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 21. Istanbul, Fatih, Sultanahmet Street, Oyuncu İmpasse 62 Layout, 86 Block, 21-22 Plot Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 22. Istanbul, Fatih, Katip Kasım Street, 144 Layout, 782 Block, 5-6 Plot Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.
- 23. Istanbul, Fatih, Süleymaniye Street, T.C. Istanbul University Central Library Area and Environment Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company.





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1356 BLOCK, 1-2 PLOT (PREVİOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



- 24. Istanbul, Fatih, Cankurtaran Street, Cetinkaya Street 159 Layout, 70 Block, 84 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 25. Istanbul, Fatih, Cankurtaran Street, Mimar Mehmet Aga Street 60 Layout, 74 Block, 18 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 26. Istanbul, Fatih, Sultanahmet, Kapı Agası Street 146 Layout, 715 Block, 39 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 27. Istanbul, Fatih, Sultanahmet, Kapı Agası Street 147 Layout, 105 Block, 3 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 28. Istanbul, Fatih, Cankurtaran, Mimar Mehmet Aga Street 233 Layout, 66 Block, 79 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 29. Istanbul, Fatih, Sultanahmet, Cayiroglu Street 147 Layout, 105 Block, 42-55 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 30. Istanbul, Fatih, Alemdar, Catalçeşme Street 50 Layout, 41 Block, 24 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 31. Istanbul, Fatih, Sultanahmet, Kadıkcıkmazı Street 61 Layout, 80 Block, 24 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 32. Istanbul, Fatih, Cankurtaran, T. C. the Ministry of Culture and Tourism Istanbul Directorate of Surveying and Monuments Topkapi Palace Cuisines Department of Foreign Courtyard behind the Retaining Wall of Arenas Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 33. Istanbul, Fatih, Sultanahmet, Akbıyık Street, 61 Layout, 83 Block, 1 Plot Sites Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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- 34. Istanbul, Fatih, Arpaemini Street, Bezmi Alem Vakıf University Outdoor Parking Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 35. Istanbul, Fatih, Istanbul University Mediko Social Central Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 36. Istanbul, Fatih, Cankurtaran Street, 159 Layout, 70 Block, 73 Plot Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 37. Istanbul, Fatih, Sultanahmet Street, Istanbul UniversityAvrasya Institute Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 38. Istanbul, Fatih, Mimar Kemalettin Street, 139 Layout, 685 Block, 3 Plot Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 39. Kastamonu, Arac, Irmak Energy Eren HES Project Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 40. Ordu, Kabadüz District, Yokusdibi, Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 41. Istanbul, Fatih, Kabadüz District, Hocapaşa Street 10 Layout, 4 Block, 1 Plot Sites Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 42. Kırklareli, Demirköy, Demirköy Fatih At the Iron Foundry Excavations Archaeogeophysics Research, 2013. Istanbul.** Geometrik Engineering Underground Researches Consulting Company
- 43. Kusadası Kadıkalesi Anaia Excavation Site Archaeogeophysics Research, 2013. Aydın.** Geometrik Engineering Underground Researches Consulting Company
- 44. Letoon Ancient City Excavation Site, Archaeogeophysics Research, 2013. Antalya.** Geometrik Engineering Underground Researches Consulting Company
- 45. Tlos Ancient City Excavation Site Archaeogeophysics Research, 2013. Muğla.** Geometrik Engineering Underground Researches Consulting Company





- 46. Daday Kadir Corporal Hill Tumulus Excavation Site Archaeogeophysics Research, 2013. Kastamonu. Geometrik Engineering Underground Researches Consulting Company**
- 47. Safranbolu, Gumus, Great Goztepe Tumulus Archaeogeophysics Research, 2013. Karabük. Geometrik Engineering Underground Researches Consulting Company**
- 48. Akhisar Thyateira Hospital Höyüğü Excavation Site Archaeogeophysics Research, 2013. Manisa. Geometrik Engineering Underground Researches Consulting Company.**
- 49. Istanbul, Fatih, Sultanahmet, 79 Layout, 98 Block, 1-22-32-33 Plot Ortör Real Estate Investment & Tourism Construction Trade. Inc. belonging to the field Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 50. Edirne, Central, Area of Kaleici Archaeogeophysics Research Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company.**
- 51. Istanbul, Fatih, Hagia Sophia Museum Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company**
- 52. Kazakistan, Astana Kumay Region, VI. VII. Century Oguz-Kipchak Settlements Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company**
- 53. Eski Castle in the Old Van ve Tumulus Excavation Site Archaeogeophysics Research, 2013. Karabük. Geometrik Engineering Underground Researches Consulting Company**
- 54. Istanbul, Fatih, Sultanahmet, Turkish and Islamic Arts Museum (Ibrahim Pasa Palace) Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground Researches Consulting Company**
- 55. Safranbolu Gumus Senti Buyuk Goztepe Tumulusu Archaeogeophysics Research In Addition the Electrical Romography and GPR Radar Studies, 2013. Karabuk. Geometrik Engineering Underground Researches Consulting Company**



**ISTANBUL PROVINCE AND DİSTRİCT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**56. Istanbul, Fatih, Cankurtaran Street, 60 Layout, 76 Block, 21 Plot Sites  
Archaeogeophysics Research, 2013. Istanbul. Geometrik Engineering Underground  
Researches Consulting Company**

### ***Continuing Projects***

- 1. Sinop Balatlar Church Archaeogeophysics Research, 2013. Sinop. Geometrik  
Engineering Underground Researches Consulting Company**
- 2. Amasya Harsena Castle, Girls Palace and Oluz Tumulus Excavation Site  
Archaeogeophysics Research, 2013. Amasya. Geometrik Engineering Underground  
Researches Consulting Company**
- 3. Artvin, Excavation Site Archaeogeophysics Research, 2013. Edirne. Geometrik  
Engineering Underground Researches Consulting Company**
- 4. Zonguldak, Fire Brick of Zonguldak Machinery Mining Energy Investment  
Filyos sec. Tic. A.Ş. Filyos Area of the field Archaeogeophysics Research, 2013.  
Amasya. Geometrik Engineering Underground Researches Consulting Company**



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVİOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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# APPENDIX



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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## **APPENDİX-1 MEASURING POINT LOCATION PLAN AND ANOMALIES DİSTRİBUTİON LAYER MAPS**



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVİOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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## **APPENDİX-2. ARCHAEOGEOPHYSICS SECTIONS AND MAPS (CD is given)**



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVİOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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## **APPENDIX - 3 PHOTOS**



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**1.BÖLGE**

**Picture 2.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 1



**1.PROFİL**

**Picture 3,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-1. Profile



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**2.PROFİL**

**Picture 4,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-2. Profile



**3.PROFİL**

**Picture 5,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-3. Profile



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**Picture 6,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-4. Profile



**Picture 7,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-5. Profile



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**6.PROFİL**

**Picture 8**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-6. Profile



**7.PROFİL**

**Picture 9**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-7. Profile



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**Picture 10**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-8. Profile



**Picture 11**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-9. Profile



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**10.PROFİL**

**Picture 12**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-10. Profile



**11.PROFİL**

**Picture 13**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-11. Profile



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**Picture 14,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 1-12. Profile



**Picture 15.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 2



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**Picture 16.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 3



**Picture 17.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 4



**GEOMETRİK MÜHENDİSLİK MÜŞAVİRLİK YERALTI ARAŞTIRMALARI**

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**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**13.PROFİL**

**Picture 18**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 4-13. Profile



**14.PROFİL**

**Picture 19**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 4-14. Profile



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**15.PROFİL**

**Picture 20,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 4-15. Profile



**5.BÖLGE**

**Picture 21.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 5



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

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**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**16.PROFİL**

**Picture 22**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 5-16. Profile



**17.PROFİL**

**Picture 23**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 5-17. Profile



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**6.BÖLGE**

**Picture 24.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 6



**18.PROFİL**

**Picture 25,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 6-18. Profile



**GEOMETRİK MÜHENDİSLİK MÜŞAVİRLİK YERALTI ARAŞTIRMALARI**

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**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**Picture 26.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 7



**Picture 27,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 7-19. Profile



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
HEALTH CAMPUS ARCHAEOGEOPHYSICS RESEARCH**



**Picture 28,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 7-20. Profile



**Picture 29.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 8



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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**Picture 30**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area  
Electrical Tomography measurement of the region number 8-21. Profile



**Picture 31**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area  
Electrical Tomography measurement of the region number 8-22. Profile



**23.PROFİL**

**Picture 32**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 8-23. Profile



**24.PROFİL**

**Picture 33**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 8-24. Profile





**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
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**9.BÖLGE**

**Picture 34.** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area GPR measurement of the region number 9



**25.PROFİL**

**Picture 35,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 9-25. Profile



**Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**Picture 36**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 9-26. Profile



**Picture 37**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 9-27. Profile



**GEOMETRİK Mühendislik Müşavirlik Yeraltı Araştırmaları**

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1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**Picture 38,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area Electrical Tomography measurement of the region number 9-28. Profile



**Picture 39,** Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area SP measurement



**ISTANBUL PROVINCE AND DISTRICT OF BASAKSEHİR, İKİTELLİ NEİGHBORHOOD,  
1356 BLOCK, 1-2 PLOT (PREVIOUS 1305 BLOCK, 1-2 PLOT), İKİTELLİ INTEGRATED  
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**Picture 40**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area SP measurement



**Picture 41**, Istanbul Province, District Basaksehir, İkitelli Integrated Health Campus area SP measurement



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## **ANNEX M**

### **Socio-Economy Supporting Information**

#### **(Hospital planning by the MoH in Istanbul Province)**

Hospital planning by the MoH in Istanbul Province, 03.07.2013<sup>1</sup>

NAME of THE HEALTH REGION	DISTRICT	HOSPITAL NAME	NUMBER OF CURRENT BEDS	NUMBER OF FINAL PLANNED BEDS <sup>2</sup>
ISTANBUL ANATOLIA SOUTH REGION	KARTAL	ISTANBUL KARTAL DR.LUTFI KIRDAR EDUCATION AND RESEARCH HOSPITAL (ERH)	706	822
ISTANBUL ANATOLIA SOUTH REGION	KARTAL	ISTANBUL KARTAL KOSUYOLU HIGH SPECIALTY ERH	465	622
ISTANBUL ANATOLIA SOUTH REGION	KARTAL	ISTANBUL KARTAL YAVUZ SELIM STATE HOSPITAL	256	0
ISTANBUL ANATOLIA SOUTH REGION	KARTAL	NEW HOSPITAL (KARTAL)		200
ISTANBUL ANATOLIA SOUTH REGION	KARTAL	ISTANBUL YAKACIK MATERNITY AND CHILDREN'S HOSPITAL	100	0
ISTANBUL ANATOLIA SOUTH REGION	MALTEPE	ISTANBUL OCCUPATIONAL DISEASES HOSPITAL	52	52
ISTANBUL ANATOLIA SOUTH REGION	MALTEPE	ISTANBUL SUREYYAPASA THORACIC DISEASES AND THORACIC SURGERY ERH	605	650
ISTANBUL ANATOLIA SOUTH REGION	MALTEPE	ISTANBUL MALTEPE STATE HOSPITAL	50	50
ISTANBUL ANATOLIA SOUTH REGION	MALTEPE	ISTANBUL MALTEPE PENAL INSTITUTION STATE HOSPITAL	30	30
ISTANBUL ANATOLIA SOUTH REGION	PENDIK	ISTANBUL PENDIK STATE HOSPITAL	100	100
ISTANBUL ANATOLIA SOUTH REGION	PENDIK	ISTANBUL THE MINISTRY OF HEALTH (MOH) MARMARA UNIVERSITY PENDIK ERH	568	550
ISTANBUL ANATOLIA SOUTH REGION	SULTANBEYLI	ISTANBUL SULTANBEYLI TACIRLER EGITIM VAKFI STATE HOSPITAL	100	100
ISTANBUL ANATOLIA SOUTH REGION	TUZLA	ISTANBUL TUZLA STATE HOSPITAL	38	0
ISTANBUL ANATOLIA SOUTH REGION	TUZLA	NEW HOSPITAL (TUZLA)		400
ISTANBUL ANATOLIA SOUTH REGION		TOTAL	<b>3.070</b>	<b>3.576</b>
ISTANBUL ANATOLIA NORTH REGION	ATASEHIR	ISTANBUL FATIH SULTAN MEHMET ERH	300	400
ISTANBUL ANATOLIA NORTH REGION	ATASEHIR	FATIH SULTAN MEHMET PHYSICAL THERAPY AND REHABILITATION HOSPITAL		200
ISTANBUL ANATOLIA NORTH REGION	KADIKOY	ISTANBUL ERENKOY PHYSICAL THERAPY AND REHABILITATION HOSPITAL	101	0
ISTANBUL ANATOLIA NORTH REGION	KADIKOY	ISTANBUL ERENKOY PSYCHIATRY ERH	250	300
ISTANBUL ANATOLIA NORTH REGION	KADIKOY	ISTANBUL THE MOH ISTANBUL MEDENIYET UNIVERSITY GOZTEPE ERH	682	920
ISTANBUL ANATOLIA NORTH REGION	BEYKOZ	ISTANBUL BEYKOZ STATE HOSPITAL	300	350
ISTANBUL ANATOLIA NORTH REGION	SILE	ISTANBUL SILE STATE HOSPITAL	25	30
ISTANBUL ANATOLIA NORTH REGION	UMRANIYE	ISTANBUL UMRANIYE ERH	326	700
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (GENERAL HOSPITAL)		400
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (HEMATO ONCOLOGY)		200
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (GYNECOLOGY, GYNECOLOGIC ONCOLOGY)		200

NAME of THE HEALTH REGION	DISTRICT	HOSPITAL NAME	NUMBER OF CURRENT BEDS	NUMBER OF FINAL PLANNED BEDS <sup>2</sup>
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (CARDIOLOGY, CARDIOVASCULAR SURGERY)		200
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (ORTHOPEDICS AND TRAUMATOLOGY HOSPITAL)		200
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (NEUROLOGICAL SCIENCES AND STROKE HOSPITAL)		250
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (HEAD AND NECK SURGERY HOSPITAL)		100
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (CHEST DISEASES AND THORACIC SURGERY)		150
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (OPHTHALMIC HOSPITAL)		100
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (GERIATRICS)		50
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (OCCUPATIONAL DISEASES)		75
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (TRANSPLANTATION CENTER)		75
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (PHYSICAL THERAPY AND REHABILITATION)		150
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (MENTAL HEALTH)		100
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (HIGH SECURITY CRIMINAL PSYCHIATRIC HOSPITAL (FRH))		100
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (BURN CENTER)		50
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (PEDIATRIC HOSPITAL)		150
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (PEDIATRIC SURGERY SCIENCE HOSPITAL)		200
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (PEDIATRIC NEUROLOGY SCIENCE HOSPITAL)		150
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (PEDIATRIC HEMATO ONCOLOGY HOSPITAL)		250
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (PEDIATRIC CARDIOVASCULAR SURGERY HOSPITAL)		250
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (OBSTETRICS AND NEWBORN HOSPITAL)		250
ISTANBUL ANATOLIA NORTH REGION	SANCAKTEPE	SANCAKTEPE CITY HOSPITALS (PEDIATRIC GASTROENTEROLOGY VE METABOLISM DISEASES HOSPITAL)		150
ISTANBUL ANATOLIA NORTH REGION	USKUDAR	ISTANBUL ZEYNEP KAMIL MATERNITY AND CHILDREN'S EDUCATION AND RESEARCH HOSPITAL	501	400
ISTANBUL ANATOLIA NORTH REGION	USKUDAR	ISTANBUL HAYDARPASA NUMUNE ERH	709	800
ISTANBUL ANATOLIA NORTH REGION	USKUDAR	ISTANBUL DR.SIYAMI ERSEK THORACIC AND CARDIOVASCULAR SURGERY ERH	525	400
ISTANBUL ANATOLIA NORTH REGION	USKUDAR	ISTANBUL USKUDAR STATE HOSPITAL	263	400
ISTANBUL ANATOLIA NORTH REGION		TOTAL	<b>3.982</b>	<b>8.700</b>
		<b>TOTAL of ANATOLIAN SIDE</b>	<b>7.052</b>	<b>12.276</b>
ISTANBUL BAKIRKOY REGION	BAGCILAR	ISTANBUL BAGCILAR ERH	498	800
ISTANBUL BAKIRKOY REGION	ESENLER	NEW HOSPITAL (ESENLER MATERNITY AND CHILDREN'S HOSPITAL)		150

NAME of THE HEALTH REGION	DISTRICT	HOSPITAL NAME	NUMBER OF CURRENT BEDS	NUMBER OF FINAL PLANNED BEDS <sup>2</sup>
ISTANBUL BAKIRKOY REGION	BAHCELIEVLER	ISTANBUL PHYSICAL THERAPY AND REHABILITATION ERH	267	400
ISTANBUL BAKIRKOY REGION	BAHCELIEVLER	NEW HOSPITAL (BAHCELIEVLER STATE HOSPITAL)		300
ISTANBUL BAKIRKOY REGION	BAKIRKOY	BAKIRKOY CARDIOVASCULAR SURGERY+ONCOLOGY		1.040
ISTANBUL BAKIRKOY REGION	BAKIRKOY	ISTANBUL BAKIRKOY DR.SADI KONUK ERH	277	500
ISTANBUL BAKIRKOY REGION	BAKIRKOY	ISTANBUL BAKIRKOY PROF.DR.MAZHAR OSMAN PSYCHIATRIC ERH	1.472	1.400
ISTANBUL BAKIRKOY REGION	BAKIRKOY	ISTANBUL LEPPA DERMATOLOGICAL-VENEREAL DISEASES HOSPITAL	50	0
ISTANBUL BAKIRKOY REGION	BAKIRKOY	ISTANBUL SKIN AND REPRODUCTION DISEASES HOSPITAL	31	0
ISTANBUL BAKIRKOY REGION		TOTAL	<b>2.595</b>	<b>4.590</b>
ISTANBUL BEYOGLU REGION	BESIKTAS	ISTANBUL BESIKTAS SAIT CIFTCI STATE HOSPITAL	50	50
ISTANBUL BEYOGLU REGION	BEYOGLU	ISTANBUL PROF.DR.N.RESAT BELGER BEYOGLU OPHTHALMOLOGICAL ERH	100	100
ISTANBUL BEYOGLU REGION	BEYOGLU	TAKSIM ILK YARDIM ERH		200
ISTANBUL BEYOGLU REGION	EYUP	ISTANBUL EYUP STATE HOSPITAL	140	140
ISTANBUL BEYOGLU REGION	KAGITHANE	ISTANBUL IL OZEL IDARESİ DENTAL HOSPITAL	25	25
ISTANBUL BEYOGLU REGION	KAGITHANE	ISTANBUL KAGITHANE STATE	51	50
ISTANBUL BEYOGLU REGION	SARIYER	ISTANBUL ISTINYE STATE HOSPITAL	128	0
ISTANBUL BEYOGLU REGION	SARIYER	ISTANBUL SARIYER ISMAIL AKGUN STATE HOSPITAL	40	0
ISTANBUL BEYOGLU REGION	SARIYER	ISTANBUL METIN SABANCI BALTALIMANI OSTEOPATHIC ERH	133	0
ISTANBUL BEYOGLU REGION	SARIYER	NEW HOSPITAL (SARIYER CAYIRBASI)		350
ISTANBUL BEYOGLU REGION	SISLI	ISTANBUL SISLI ETFAL ERH	784	0
ISTANBUL BEYOGLU REGION	KAGITHANE	NEW HOSPITAL (SEYRANTEPE)		700
ISTANBUL BEYOGLU REGION	SISLI	ISTANBUL OKMEYDANI ERH	753	800
ISTANBUL BEYOGLU REGION		TOTAL	<b>2.204</b>	<b>2.415</b>
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR STATE HOSPITAL	100	100
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (GENERAL HOPITAL)		441
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (GYNAECOLOGY)		451
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (PEDIATRIC)		451
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (CARDIOVASCULAR SURGERY)		303
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (ORTHOPEDIC AND NEUROLOGICAL SCIENCES)		347

NAME of THE HEALTH REGION	DISTRICT	HOSPITAL NAME	NUMBER OF CURRENT BEDS	NUMBER OF FINAL PLANNED BEDS <sup>2</sup>
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (PHYSICAL THERAPY AND REHABILITATION)		200
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (ONCOLOGY)		359
ISTANBUL CEKMECE REGION	BASAKSEHIR	ISTANBUL BASAKSEHIR IKITELLI CITY HOSPITALS (PSYCHIATRY)		128
ISTANBUL CEKMECE REGION	BUYUKCEKMECE	ISTANBUL BUYUKCEKMECE STATE HOSPITAL	50	200
ISTANBUL CEKMECE REGION	BEYLKDUZU	NEW HOSPITAL (BEYLKDUZU)		300
ISTANBUL CEKMECE REGION	CATALCA	ISTANBUL CATALCA ILYAS COKAY STATE HOSPITAL	50	100
ISTANBUL CEKMECE REGION	ESENYURT	ISTANBUL ESENYURT STATE HOSPITAL	175	450
ISTANBUL CEKMECE REGION	AVCILAR	ISTANBUL BAKIRKOY DR. SADI KONUK ERH AVCILAR SERVICE BUILDING	100	400
ISTANBUL CEKMECE REGION	KUCUKCEKMECE	ISTANBUL MEHMET AKIF ERSOY CARDIOVASCULAR SURGERY ERH	260	500
ISTANBUL CEKMECE REGION	KUCUKCEKMECE	ISTANBUL KANUNI SULTAN SULEYMAN ERH	648	650
ISTANBUL CEKMECE REGION	SILIVRI	ISTANBUL SILIVRI PROF.DR.NECMI AYANOGLU STATE HOSPITAL	223	200
ISTANBUL CEKMECE REGION	SILIVRI	ISTANBUL SILIVRI PENAL INSTITUTION STATE HOSPITAL	30	30
ISTANBUL CEKMECE REGION		TOTAL	<b>1.636</b>	<b>5.610</b>
ISTANBUL FATIH REGION	ARNAVUTKOY	ISTANBUL ARNAVUTKOY STATE HOSPITAL	211	150
ISTANBUL FATIH REGION	BAYRAMPASA	ISTANBUL BAYRAMPASA STATE HOSPITAL	100	300
ISTANBUL FATIH REGION	FATIH	ISTANBUL HASEKI ERH	536	400
ISTANBUL FATIH REGION	FATIH	ISTANBUL ERH	504	500
ISTANBUL FATIH REGION	GAZIOSMANPASA	ISTANBUL GAZIOSMANPASA TAKSIM ERH	249	250
ISTANBUL FATIH REGION	GAZIOSMANPASA	NEW HOSPITAL ( VILAYETLER BIRLIGI PHYSICAL THERAPY AND REHABILITATION HOPITAL)		250
ISTANBUL FATIH REGION	SULTANGAZI	ISTANBUL LUTFIYE NURI BURAT STATE HOSPITAL	75	0
ISTANBUL FATIH REGION	SULTANGAZI	NEW HOSPITAL (SULTANGAZI STATE HOSPITAL)		600
ISTANBUL FATIH REGION	ZEYTNBURNU	ISTANBUL YEDIKULE THORACIC DISEASES AND SURGERY ERH	385	400
ISTANBUL FATIH REGION	ZEYTNBURNU	ISTANBUL SULEYMANIYE GYNECOLOGY AND OBSTETRICS ERH	74	100
ISTANBUL FATIH REGION		TOTAL	<b>2.134</b>	<b>2.950</b>
		<b>TOTAL of EUROPEAN SIDE</b>	<b>8.569</b>	<b>15.565</b>
		<b>TOTAL of ISTANBUL</b>	<b>15.621</b>	<b>27.841</b>

- 1) This planning only covers hospitals affiliated with Ministry of Health. University Hospitals and Private Hospitals are not included in this list.  
2) Number of The final beds appear as zero means that the hospital will be closed.

## **ANNEX N**

### **ESIA Team**

ESIA Member	Academic Profession	Responsibility within ESIA
Prof. Dr. Cem B. Avci	BSc Civil Engineering, Bogazici University, Istanbul MSc Water Resources, Princeton University, USA PhD Hydraulic Engineering, Purdue University, USA	Project Director ESIA Specialist
Dr. Isil Gultekin	BSc Environmental Engineering, Yildiz Technical University, Istanbul MSc Environmental Technology, Bogazici University, Istanbul PhD Environmental Technology, Bogazici University, Istanbul	Project Manager ESIA Specialist
Ece Ayse Berkay	BSc Environmental Engineering, Istanbul Technical University, Istanbul MSc Environmental Engineering, Istanbul Technical University, Istanbul PhD Environmental Technology, Bogazici University, Istanbul (ongoing)	Waste management
Serpil Sarioglu Alpay	BSc Environmental Engineering Yildiz Technical University, Istanbul MSc MSc Environmental Technology, Bogazici University, Istanbul	Regulatory review
Cagdas Sepci	BSc Environmental Engineering, Yildiz Technical University MSc Environmental Engineering and Science, Istanbul Technical University	Baseline data collection, field surveys, coordination, impact assessment
Mehmet Emre Hakyemez	BSc Environmental Engineering, Kocaeli University MSc Wind Energy, Istanbul Technical University	Baseline data collection
Bora Genc	BSc Environmental Engineering, Yildiz Technical University MSc Environmental Engineering and Science, Istanbul Technical University	Baseline data collection
Prof. Dr. Hayri Duman (Botanist)	Biology Department, Gazi University, Ankara BSc in Biology, Firat University MSc and PhD in Botany, Department of Biology, Gazi University	Flora: Baseline data collection, field surveys, impact assessment
Prof. Dr. Mustafa Sozen (Zoologist)	Biology Department, Zonguldak Karaelmas University, BSc in Biology, Selçuk University, Konya Msc in Hydrobiology, Ankara University, Ankara PhD in Animal Systematic (Mammals), Ankara University, Ankara	Fauna: Baseline data collection, field surveys, impact assessment
Kerem Ali Boyla (Ornithologist)	BSc in Biology, METU MSc in Applied Ecology and Conservation, University of East Anglia, Norwich, England	Birds: Desktop baseline data review
Ayşe Bayvas (Art Historian)	BA of Archaeology, Istanbul University, Faculty of Literature, Department of Archaeology and Art History, Art History Science,	Archaeology assessment
Doc. Dr. Sevket Donmez (Archaeologist)	BA, Master and PhD in Protohistoria and Near Eastern Archaeology, Istanbul University	Archaeology assessment

Doc. Dr. Hasan Ferudun Ozgumus (Archaeologist)	PhD in Early Christian Archeology, Istanbul University Institute of Social Studies, Archeology and Art History Department Master Degree in Byzantine Art Science, Istanbul University Institute of Social Studies, Archeology and Art History Department	Archaeology assessment
Ekim Bakirci (Frekans Acoustics)	BSc Mechanical Engineering, Middle East Technical University, Ankar MBA, Bilgi University, Istanbul	Baseline noise measurements and noise modeling
Ismail Ulusoy (Ennotes)	BSc Environmental Engineering, Cumhuriyet University Sivas	Air quality modeling
EKOTEST Environmental Consultancy and Measurement Services Ltd.		Baseline air quality measurements