Environmental and Social Impact Assessment (ESIA) of the Third Bosphorus Bridge and Connected Motorways
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Brian A Cuthbert PhD, Associate Director

Prepared By

Neslihan Artar Aybar, Regional Director, Turkey

Reviewed and Approved By

AECOM
Mustafa Kemal Mahallesi, Dumlupinar Bulvarı No: 266
Tepe Prime B Blok Suite: 51
Çankaya 06800 Ankara Turkey

T: +90-312-442-9863
F: +90-312-442-9864
www.aecom.com
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>Bhp-hr</td>
<td>Brake-horsepower-hour</td>
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<tr>
<td>BOT</td>
<td>Build-Operate-Transfer</td>
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<td>CEQA</td>
<td>California Environmental Quality Act</td>
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<td>CO</td>
<td>Carbon monoxide</td>
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<td>CO₂</td>
<td>Carbon dioxide</td>
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<td>DF</td>
<td>Draft Final (Report)</td>
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<td>DSI</td>
<td>General Directorate of State Hydraulic Works</td>
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<td>EA</td>
<td>Environmental Assessment</td>
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<td>EBRD</td>
<td>European Bank for Reconstruction and Development</td>
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<td>EHS</td>
<td>Environment, Health and Safety</td>
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<td>EIA</td>
<td>Environmental Impact Assessment</td>
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<td>EP</td>
<td>Equator Principles</td>
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<td>ESAP</td>
<td>Environmental and Social Action Plan</td>
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<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
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<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
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<td>EU</td>
<td>European Union</td>
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<td>FHWA</td>
<td>Federal Highways Authority</td>
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<td>GIS</td>
<td>Geographic Information System</td>
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<td>Gr</td>
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<td>HC</td>
<td>Hydrocarbons</td>
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<tr>
<td>HDPE</td>
<td>High Density Poly-Ethylene</td>
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<td>HDV</td>
<td>Heavy Duty Vehicle</td>
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<td>Hr.</td>
<td>Hour</td>
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<tr>
<td>HWCR</td>
<td>Hazardous Wastes Control Regulation</td>
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<td>IAPCR</td>
<td>Industrial Air Pollution Control Regulation</td>
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<tr>
<td>IBB</td>
<td>Istanbul Greater Metropolitan Municipality</td>
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<td>IEEM</td>
<td>Institute of Ecology and Environmental Management</td>
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<td>IEMA</td>
<td>Institute of Environmental Management and Assessment</td>
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<td>IFC</td>
<td>International Finance Corporation</td>
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<td>ISKI</td>
<td>Istanbul Water and Sewage Administration</td>
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<td>JV</td>
<td>Joint Venture</td>
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<tr>
<td>Kg</td>
<td>Kilogram</td>
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<td>KGM</td>
<td>General Directorate of Roadways</td>
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<tr>
<td>LDV</td>
<td>Light-Duty Vehicle</td>
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<td>NEQS</td>
<td>National Environmental Quality Standards.</td>
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<tr>
<td>NH₃</td>
<td>Ammonia</td>
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<td>NMVOC</td>
<td>Non-methane volatile organic compounds</td>
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<td>NO₂</td>
<td>Nitrogen dioxides</td>
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<td>NOₓ</td>
<td>Nitrogen oxides</td>
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<td>O₃</td>
<td>Ozone</td>
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<td>PM</td>
<td>Particulate Matter</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<td>RAMAQ</td>
<td>Regulation on Assessment and Management of Air Quality</td>
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<td>RF</td>
<td>Revised Final (Report)</td>
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<td>SCAQMD</td>
<td>South Coast Air Quality Management District’s</td>
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<td>Sec.</td>
<td>Second</td>
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<td>SO₂</td>
<td>Sulfur dioxide</td>
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<td>TNR</td>
<td>Turkish Noise Regulations</td>
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<td>TURKSTAT</td>
<td>Turkish Statistical Institute</td>
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<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<td>VOC</td>
<td>Volatile Organic Compound</td>
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<td>WB</td>
<td>World Bank</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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<tr>
<td>WMP</td>
<td>Waste Management Plan</td>
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<tr>
<td>YEGM</td>
<td>General Directorate of Renewable Energy (formerly known as EIE)</td>
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0.0 EXECUTIVE SUMMARY

0.1 Background

AECOM has been commissioned by IC İçtaş İnşaat Sanayi ve Ticaret A.Ş. and Astaldi S.p.A. (ICA) to undertake an Environmental and Social Impact Assessment (ESIA) of the proposed Northern Marmara Motorway, including the Third Bosphorus Bridge.

The owner of the proposed project is the General Directorate of Roadways (KGM). The ESIA report will be shared with the lenders to be used in their financing process.

The motorway element of the project will extend to a length of some 60 km between Odayeri and Paşaköy and will include various side roads and connections to the existing road infrastructure on both the European and Asian shores of the Bosphorus. The bridge will have a span of approximately 1.4km and the bridge will cross the northern end of the Bosphorus near to the Black Sea between Garipçe on the European side and Poyraz on the Asian side. It will have capacity for a 2 x 4 lane motorway and two high speed railway tracks and the total length of the project is estimated at approximately 114 km.

Much of the route passes through areas of forestry and the loss of trees and habitat represents one of the main impacts associated with the Project, as well as one of the main areas of opportunity for mitigation in terms of tree planting and habitat enhancement.

0.2 Study Objectives

The aim of this study was to carry out an environmental and social assessment of the Project, document the potential environmental and social impacts associated with its construction and operation and provide mitigation measures to prevent, avoid, reduce or compensate for any adverse impacts. The scope of the ESIA was defined by AECOM (Report No: AECOM-TR-R590-03-00, November 2012) and mutually agreed with ICA and the Lenders.

The approach to this preliminary assessment refers to the guidance contained within the IFC Guidelines, Turkish Environmental Law and also the Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment (IEMA), 2004). Criteria for the determination of sensitivity or of importance or value of receptors, in order to determine significance of impacts, have been broadly established based on approved guidance, legislation, statutory designations and/or professional judgment.

In undertaking this assessment we were advised by ICA that the average construction corridor width is likely to be approximately 60.5m wide; however, wider assessment corridors (up to 500m wide, in the case of ecology and 1,000m wide, in the case of land use) centered on the proposed route have been used for this study, in order to understand the potential for wider impacts including indirect effects of the scheme.
All of the actions identified as mitigation relating to construction and operation of the Project have been collated and presented in a separate document as an Environmental and Social Action Plan (ESAP). This includes a short Afforestation Plan, which deals directly with the actions required to mitigate the identified impacts on the forestry areas through which the Project passes. The following sections of this Executive Summary briefly summarise the findings of the ESIA, following the same structure as the main document.

0.3 Summary of Findings

Chapter 4: Ecology and Biodiversity

An assessment was undertaken to determine the impacts of the Project on ecology and biodiversity in the project area. Preliminary information was based on a desk study which provided information on habitats and species both within the route corridor and in the vicinity of the corridor. Field surveys were undertaken in March and April 2013.

The study found that there are no national parks, nature monuments or nature reserves within the Project alignment and its vicinity. However, there are several Nature Parks at the European and Asian side of İstanbul. The closest nature park to the Project is Şamlar Nature Park located on the European side and about 880 m to the west of the route.

Approximately 2.8 km of the route will pass directly through the namely Sarıyer Feneryolu a Wildlife Improvement Area (WIA) at the European side and there is an area forbidden for hunting in accordance with the 2012-2013 period CHC decisions in the vicinity of Polonezköy, where approximately 5.5 km of the route passes through this area.

In accordance with the Forestry Law, there are no seed stands or biogenetic reserve areas (gene courts) within the Project site and its vicinity. However, there are some conservation forests, seed garden and recreation areas such as urban forest and picnic along the route including:

- Belgrad Conservation Forest: The route just passes through the northern border of the forest which is located at the European side of İstanbul.
- Elmalı Bendi Conservation Forest: Part of the route passes through this forest located at the Asian side.
- Kuzey Boğaziçi (Upper Bosphorus) IPA (which includes the Belgrad forest)
- Other sites include: a Seed Garden located between Reşadiye and Alemdağ Nişantep; an urban forest in Ümraniye near the existing İstanbul Highway (E-80); and various picnic areas.

The majority of the route (nearly 35 km) passes through the Bosphorus Key Biodiversity Area (KBA) which lies along the length of the Bosphorus strait and extends from European side to the Asian side. The KBA comprises a wide range of habitats including sand dunes at the coastline, rocks, maquis communities, pasture lands, forests and lakes. The area also includes an Important Plant Area (IBA) in forested areas west and east of the strait. There are several vulnerable habitats supporting rare plant species within this KBA and some of these areas have been identified as IPA.

Other KBA include the West İstanbul Pasture Lands Key KBA at the European side. The KBA has a total area of 9,612 ha between Bağcılar at the south and Pirinçci at the north. Approximately 11.4 km of the route passes through this KBA. Located within this is the Bati İstanbul Meraları (West İstanbul Pasturelands) IPA, close to Esenler, which comprises the last remaining fragments of limestone grassland, rock outcrops and dry acid heath grass-land located immediately north-west of İstanbul.
In terms of habitats the main impacts will be on broadleaf woodland. Approximately 345 hectares of oak dominant forest will be lost within the 60.5m wide construction corridor of the Project. In addition, approximately 284 hectares of conifer plantation will be lost. Significant mitigation measures will be needed including the requirement to:

- Protect old growth forest habitat and individual trees as much as possible;
- Collect seeds and seedlings from those areas for planting/transplantation;
- Change forestry management of adjacent coppiced or more intensively managed oak woodlands to allow them to revert to 'old growth' forests, thus increasing their ecological value;
- Reduce or avoid tree felling in more extended woodland areas to enable older growth to occur;
- Leave fallen trees to decompose to increase variety of habitats and to improve habitats for invertebrates;
- Thin or clear-fell conifer and non-native plantations and replace with locally sourced broadleaf seed and saplings;
- Allow natural regeneration where possible, including natural succession of scrub habitats;
- Create new woodlands on agricultural or other land – for example on scrub habitats or where rhododendrons and other invasive species have taken over.
- Ensure that all construction related landscaping ties as seamlessly as possible into the local landscape and that only locally sourced native trees and plants are used to seed these;
- Enable habitats to connect under viaducts, over tunnels and by using ecological bridges;
- Connect separated areas of habitat to create a network of habitat corridors, particularly in relation to the remnants of the old growth forests.

Based on the calculation of habitat areas lost due to the construction of the Project, overall 345 hectares of oak forest will be lost and have to be compensated for to be created to compensate for the loss of this type of habitat. Of that total, just over 9 hectares represents the area of old growth that will be lost and that will have to be replaced as mitigation, preferably through management changes in existing coppiced oak dominated woodland in adjacent areas. In addition 284 hectares of conifers will be lost, as well as 112.5 hectares of other less dense habitats containing other dominant tree species (acacia, lime and willow). This gives a total area of oak and conifer dominant areas, as well as other species such as acacia, combined, of 740 hectares.

It is very difficult to calculate the exact number of trees that will be lost when a given area of forest habitat is cleared as the tree density can vary enormously. However, it is recommended that a ratio of four-to-one in terms of new tree planting be implemented in order to compensate for tree loss due to the construction of the Project.

Chapter 5: Land Use

The existing land uses in the immediate vicinity of the Project will change due to direct and/or indirect effects related to the development of the Project. The main objectives of this section of the report are to:

- Identify land use patterns in the Project Area;
- Assess both long term and short term impacts on land use (the comprehensiveness and precision of which has depended on data availability); and
- Recommend appropriate mitigation measures to minimise the adverse impacts caused by the proposed Project.
The assessment found that there will be loss of agricultural land, forest land and private land as a result of the Project. The existing land use of the project area will be affected by the construction of the bridge, motorway, access roads, and construction camps.

Permanent acquisition of lands will be required for the project. The proposed alignment of the motorway will mainly pass through forest lands; however, there are some settlements close to the route. In addition, the main impact of the new motorway will be the fragmentation of forest lands as approximately 80% of the route goes through land that is currently forest. It is also anticipated that some forest and agricultural land may be subject to long term land use changes by implementation of the Project. However, the design of the route includes limited number of interconnections and is therefore not considered to open up currently undeveloped areas to land use change and urbanisation.

Land use patterns affect community cohesion in various ways. Village and suburban areas are often considered highly livable because they are physically segregated from disruptive activities, traffic, poverty and crime. However, the car journeys they generate tend to reduce community cohesion overall, by increasing vehicle traffic impacts through neighbourhoods, degrading walking conditions, and reducing opportunities for neighborhood interaction.

The permanent land take of the scheme has been minimized as much as practicable to ensure no unnecessary loss of land. The majority of scheme is on existing road, with minor realignment and widening in places; however, there are areas of open space that will be affected which is either identified as agricultural land or forestry.

Once construction is complete, full access would be restored for recreational uses where these opportunities remain. Subsequent land use and urban design studies should be undertaken to address the most appropriate use for lands and to identify the urban design along the motorway route.

**Chapter 6: Air Quality**

An assessment of air quality associated with construction and operation of the Project was undertaken. The assessment reviewed key policies and guidelines and described the existing air quality in Istanbul. Baseline conditions were established using existing data provided on air quality on Turkey websites (monitoring data), in local authority Air Quality Review and Assessment Reports, and from the results of an additional monitoring survey undertaken as part of this assessment.

The assessment was undertaken for a base year (2014) for construction for Do-Minimum (controlled emissions) and Do-Something (uncontrolled emissions). For the operational scheme, traffic flow data for the future year (2023) were selected for modeling purposes.

Air dispersion modeling was then carried out for the construction phase and for the future traffic situation. The results of the assessment were evaluated with reference to the Turkish ambient air quality standards and IFC/WB guideline concentrations. The construction studies considered dust and traffic-related air pollutants including nitrogen oxides and particulate matter.

In general, construction activities have the potential to generate fugitive dust emissions as a result of demolition, construction, earth works or trackout of material. For the proposed project, the concentrations of any airborne particulate matter generated by these activities would be controlled using on-site management practices to the extent that the proposed project should give rise to moderate to negligible effects at the nearest sensitive receptors. The impact of fugitive emissions of \( PM_{10} \) at these receptors, with proposed mitigation applied, would be negligible. Overall the effect of fugitive emissions of particulate matter (dust and
PM) from the proposed works is considered to be not significant with respect to potential effects on health and amenity.

The modeling shows that the proposed project would have a negligible effect on the total emissions of pollutants on a regional scale, with increases of less than 0.1% for all pollutants for both the opening year and 15 years after opening.

The operation of the project will result in changes in traffic flows and related air emission along the approach roads and on the wider road network. There will also be point source emissions from the tunnel portals. These emissions will affect local air quality, with possible impacts on human health and welfare, fauna and flora, and materials around affected roads. There may also be wider changes in regional air quality. In general, overall traffic levels are likely to increase as a result of the project although there is likely to be less of an increase in some areas and actual traffic flow reductions in other areas.

Based on modeling results, the overall impact of this new traffic in the northern part of Istanbul District will be the increase in emission levels of pollutants (PM, NO\textsubscript{x}, VOC and CO). However, the overall potential impact is expected to be minor to negligible in the northern part of the District along the proposed Project route.

There will be also some beneficial impact in the southern part of Istanbul District since some of the traffic that uses the existing bridges and the motorway will be using the new bridge and the new motorway instead. Thus, the current emission levels in the southern section will mostly likely reduce. Thus, during the initial years of the operation, we will see the shift of current emission levels from southern to northern parts of the District. However, since the detailed vehicular data for the southern part was not available for this study, the emission levels cannot be estimated and quantified.

A greenhouse gas assessment was performed for the proposed project during the operation phase. The principal greenhouse gas emission during vehicle transport is carbon dioxide (CO\textsubscript{2}). Total annual emissions were estimated to be around 0.27 Million tonnes of carbon dioxide equivalent (Mt CO\textsubscript{2}-e). A comparison of greenhouse gas emissions from the Northern Marmara Motorway with national greenhouse gas inventories was made. Emissions from the project were estimated to be around 0.06% of the national inventory for the year 2011. Also, emissions from the project were estimated to be around 0.68% of road transport emissions from national inventory.

**Chapter 7: Traffic Noise and Vibration**

This part of the assessment considered potential noise impacts resulting from the construction and operation of the proposed Project. It assessed the noise climate along the proposed route, and predicted changes from the existing noise levels (2012) with the Do-Minimum in the Future Year (2023), and Do-Something noise levels in The Future Year (2023). These noise level differences, in conjunction with the noise sensitivity of individual properties, were used to determine the likely noise impacts associated with the introduction of the scheme.

The noise and vibration impacts of the scheme were determined using the guidance contained within the Regulation on the Assessment and Management of Environmental Noise - (Turkish Noise Regulation – (TNR)) submitted by the Official Gazette Date and Number: 10.06.2010/27601.

The noise model was developed with the commercial noise modeling software IMMI v2011-2. The calculations were carried out using the XPS31-133 French Standard which is recommended by the Turkish Noise Directive and European Commission for the Assessment of environmental noise caused by sources such as highway, bridges, and tunnels.
Baseline noise levels at 98 (ninety eight) locations along the motorway were measured and impact assessments were determined using the requirements of the TNR and impact magnitudes were determined against measured baseline noise levels.

Mitigation needs were assessed and the proposed mitigation implemented in the model to improve noise impacts at 10 (ten) locations where noise levels exceeded limiting value as defined in the TNR. Residual impacts remain at 6 (six) of the receivers after mitigation and construction of noise barriers for noise control mitigation measure is required at certain locations.

Chapter 8: Water Quality

This chapter of the ESIA presented the findings of the assessment of impacts on water quality and hydrology. It provided a detailed description of the existing water conditions including surface water courses, and water quality.

It predicted the potential construction activity impacts and operation and development activities impacts. It also identified mitigation measures, which were developed taking into account current best practice and all related regulations and rules. Application of mitigation measures will decrease potential impacts on water quality during both construction, operational and development activities.

However, there may be residual impacts that will remain after mitigation measures have been put in place. There are a large number of watercourses in the vicinity that may be directly or indirectly affected by the Project during construction and operational activities. These receptors range from various watercourses to a number of reservoirs that are drinking water sources for Istanbul and surrounding areas. The water quality for most watercourses is quite low and this has been confirmed by sampling activities undertaken for this assessment. These receptors are considered to be less sensitive than the reservoirs which have a very high sensitivity due to their being used for drinking water.

The project will be conducted in accordance with all relevant legislation for the protection of surface water and groundwater resources. In the area, during construction activities, there may be impacts because of working without scheduling or programming and not undertaking the required activities at the right time. However, the scheduling of the works and working in accordance with all project plans and schedules will prevent the negative effect of this impact.

A noted, the project and some parts of it cross over some surface water resources and part of the project lies within the catchment of some reservoirs, which supply drinking water to Istanbul. However, there are measures that include implementation of the regulations, good practice guidelines and mitigation measures, so that the impacts can be minimized. For example, there may be untreated contaminated water or runoff from various facilities, and leakage, dispersion and spill of chemicals, fuels, oils, etc., used for construction and operational activities. However, use of the most appropriate drainage and culvert systems will prevent impacts on water quality during construction activities, as well as operational and development activities.

Although mitigation measures have been developed, before the commencement of construction and operational activities, all the site workers should be trained in mitigation measures and procedures. As part of this, training should be given about all potential contaminants, spillage or leakage of any polluting material such as fuel, oil etc., and the impacts these may have, as well as contingency and clean-up procedures, so the mitigation measures will be implemented correctly.

Overall there will be a minor impact from construction, operational and development activities of the project on water resources. The activity that has the highest risk on the water quality will be the permanent works associated with the project sections crossing surface water resources. All required controls will have to be
implemented regularly. In addition, according to related regulations, on-going mitigation measures will be required. Therefore, the negative impacts will be minimized during Project construction, operational and development activities.

**Chapter 9: Geology and Soils**

This section dealt with environmental issues associated with geology, soils and waste management conditions relating to the Project. The current conditions within the route corridor were described and likely effects of the development on potentially sensitive receptors assessed. The potential impacts during construction and operational activities and mitigation measures proposed for each parameter were described.

In the Project area there are no geological heritage sites, important geological structures or active mining areas. Therefore, there will be no direct or indirect impact caused by the Project site during construction and operational activities and no mitigation measures will be required in terms of geology, soils or mining. In terms of soil structure, there will be loss of soil on forest land and other type of lands, but although public interest in this Project is very important and soils will be lost, overall the impacts on the soil resource will not be significant.

On the route of the Project, there are hydrogeological resources within or close to the site. There are river beds close to the route and drinking water protection zones relating to reservoirs close to the route. Necessary mitigation techniques will be implemented in accordance with the Water Pollution Control Regulation (WPCR) and risks and impacts will be minimized.

Residual Impacts that are likely to remain after mitigation measures have been put in place, have been identified and assessed and range from Negligible to Minor. Therefore none of these impacts relating to geology, soils, mineral resources, waste management and hydrogeology are assessed as being significant.

**Chapter 10: Waste Management**

This chapter considered each of the main waste streams generated by the construction and operation of the Project and assesses the significance of environmental impacts associated with waste management issues. In each case the assessment was based on a consideration of potential impacts and how these will be managed, reduced or avoided through the use of appropriate mitigation. Further recommendations for mitigation are discussed below.

A detailed Waste Management Plan (WMP) should be prepared and appropriate mitigation measures should be identified. The mitigation measures should be considered and addressed in the project design including temporary waste storage sites, structures, waste collection and transportation infrastructure, etc. Improper waste management procedures or lack of mitigation measures during construction, as well as maintenance and operations phases of the Project may result in adverse environmental impacts on: storm-water quality and thus water quality in the creeks and dams/reservoirs located in the catchment area; soil quality; sea water quality; groundwater quality; and ecological receptors or human health.

The Project management is expected to prepare a WMP as a requirement of the ESAP. The WMP will include strategies and procedures to eliminate potential adverse impacts of waste that will be generated during the construction, maintenance and operation of the proposed Bridge and motorways. The WMP will include management of construction site excavation materials according to Turkish legislation.

The WMP will include procedures to segregate waste as domestic, non-hazardous, biological and hazardous waste and disposal will be carried out as described in Turkish waste legislation with licensed transporters and disposal/treatment facilities.
Assuming preparation of a comprehensive WMP and proper implementation of the mitigation measures included in the WMP, adverse impacts will be minor to negligible during the construction phase and negligible during the maintenance and operation of the proposed Project.

Chapter 11: Visual Impacts

The impact that the Project may have on visual amenity (defined as the pleasantness of the view or outlook of an identified receptor or group of receptors) was assessed. The likely changes at certain defined viewpoints were assessed and mitigation proposed where it was considered necessary.

During the construction period receptor groups which directly face the proposed route and bridge, in close proximity or with immediate views towards it will experience significant adverse visual impacts as a result of the loss of visual amenity and the visually intrusive construction activity associated with the construction of a road bridge, road carriageway, road junctions or associated infrastructure.

However, mitigation measures will reduce the landscape and visual impacts of the proposed route with proposed planting of native trees and shrubs (and as part of the Afforestation Plan), so that in time some of the newly introduced elements will be screened from view and assimilated into the local townscape setting reducing the long term disruption of the overall landscape and visual character of the area.

Nevertheless, high quality landscape designs for roadside verges and interchanges within areas of residential settlement could, over time, contribute to the townscape visual amenity and provide visual screening and filtered views of the proposed development.

Dependent on the restoration landscape design proposals intended for the landing of bridge footings either side of the Bosphorous along with a commitment to high quality design of the proposed Bosphorous bridge, the residual effects could be considered Moderate beneficial as opposed to Moderate adverse, by summer of year 15 operation.

However, there will be significant adverse effects on the visual amenity afforded from many locations from within the immediate area following the development route corridor. Nevertheless, it is considered that the landscape and visual resource of the wider study area will not deteriorate to a significant degree and the overall impact upon landscape and visual amenity in general is therefore restricted to those receptors/areas within close proximity to the proposed route.

Chapter 12: Socio-Economics

The ESIA identified the potential social impacts associated with the construction and the operation of the proposed Project. The social impact assessment (SIA) determined whether the proposed project has positive or adverse effects on individuals, households and institutions. It also explored the unintended consequences, whether positive or negative on the local people. The key objectives of the SIA were to:

- Identify existing social and economic condition of the households around the project area;
- Identify and assess potential project-related social impacts across the whole operational life cycle, from exploration through to decommissioning phases;
- Describe, where appropriate, the general mitigation measures that have been incorporated into the Project.
A settlement questionnaire was issued to villages to gather background information. These surveys mainly served for gathering information on the settlement as a whole.

In addition, a household survey interview with households in the project area was conducted. The survey used the face-to-face interview method. The survey involved a formal visit to families and individual interviews with the adult member of the family using a standard questionnaire. The survey focused on a number of specific issues, including the main sources of livelihood, problems in the project area and attitudes towards the proposed project. The study comprised four phases: pre-field studies, field implementation, coding and data entry, and data analysis.

Secondary data sources were mainly based on government records including the population census and other relevant records of governmental institutions. Other, secondary, sources that were used included: geographical data (including maps), local government statistics, documentation from non-governmental organizations and community-based organizations and newspaper reports.

Significant adverse impacts during construction will relate to land expropriation issues and disruption of local resources and infrastructure. Beneficial impacts include employment opportunities and diversification of economic activities in the region.

Significant adverse impacts during the lifetime of the Project may include: potential indirect effects resulting in long term land use changes in forest and rural areas; the potential for uncontrolled in-migration, linked to land use changes; and an increase in traffic and pollution issues.

Beneficial impacts including the overall improved traffic flow and enhancements to the local economy that this and other developments enabled by the Project would bring to the area.

Chapter 13: Archaeology

A field scoping study and field survey on the evaluation of archaeological were conducted in May 2013. The field walkover was undertaken in certain sections of the project route for a total of 26.43 km and three areas containing archaeological features were observed. In addition to these observations, registers of inventory of four Regional Boards (No II, III, IV and VI) were obtained while records of other Boards were not available during the study.

The literature and the inventory records of the Ministry of Culture and Tourism refer to many archaeological and historical sites in the regions where the construction activities will be carried out. Since it was not possible to walk the entire construction area in the time available, a predictive model was built and regions bearing archaeological potential were identified. The field walkover was conducted in limited sections as vegetation allowed, for the purpose of verification of the existence of historical sites in the areas, as indicated to be carrying archaeological potential by the predictive model. Two of the sites identified were within the construction corridor and its impact area while one other was about 1.5 km away from the project route.

Based on the findings described above, it is recommended that an intensive field survey is conducted after deforestation of the construction areas in coordination with the relevant Regional Boards of Conservation.

It is further recommended that, considering the archaeological potential of the region, it is imperative that all activities involving physical intervention should be conducted under the observation of experienced archaeologists.
It is strongly recommended that all these activities are be conducted in compliance with the Cultural Heritage Management Plan and Chance Find Procedures to be adopted by the constructor.

0.4 Conclusions

The findings of the ESIA show that the most significant adverse impacts associated with the Project relate to:

- Ecology and biodiversity, particularly relating to protected sites, loss of trees, forest habitats, fragmentation and connectivity reduction between habitats.
- Land use changes – some of which will occur as an indirect consequence of the Project.
- Operational noise impacts at certain locations on the route;
- Visual impacts from certain viewpoints;
- Socio-economic impacts, particularly relating to land use changes and the consequence of uncontrolled in-migration; and
- The potential for currently unknown archaeological remains to be uncovered or damaged during construction operations.

Potentially beneficial impacts include:

- The opportunity for ecological enhancements, habitat creation and mitigation particularly in relation to creating new forest and changing management practices in existing forest;
- Visual benefits from an interesting bridge design and sensitive and high quality landscape treatments; and
- Increased employment, economic activity and national connectivity associated with the new infrastructure and access to the northern areas of Istanbul.
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1.0 INTRODUCTION

1.1 Background

AECOM has been commissioned by IC İçtaş İnşaat Sanayi ve Ticaret A.Ş. and Astaldi S.p.A. (ICA) to undertake an Environmental and Social Impact Assessment (ESIA) addressing potential environmental and social impacts associated with the proposed Northern Marmara Motorway, which will also include the planned Third Bosphorus Bridge, (the “Project”) under a Build-Operate-Transfer (BOT) structure.

The owner of the proposed project is the General Directorate of Roadways (KGM). The ESIA report will be shared with the lenders to be used in their financing process.

The motorway element of the project will extend to a length of some 60 km between Odayeri and Paşaköy and will include various connection roads and connections to the existing road infrastructure on both the European and Asian shores of the Bosphorus. The total length of the project is estimated at approximately 114 km.

Although we understand that the average construction corridor width is likely to be approximately 60.5 m wide, wider assessment corridors (up to 500m wide, in the case of ecology and 1,000 m wide, in the case of land use) centered on the proposed route have been used for this study, in order to understand the potential for indirect effects of the scheme. A more detailed project description is provided in Chapter 2 of this report.

1.2 Objectives

This ESIA has been requested by the consortium of banks lending to the ICA (“Lenders”). The aim of this study is to carry out an environmental and social assessment of the Project and document the potential environmental and social impacts and provide mitigation measures to reduce or prevent adverse impacts.

The scope of the ESIA study has been prepared by AECOM (Report No: AECOM-TR-R590-03-00, November 2012) and mutually agreed by ICA and the Lenders.

The objective of this document is to therefore provide the findings of the ESIA undertaken for the Project. This document includes the current proposed route and description of the project and identifies the major environmental issues likely to be associated with the construction and operation of the Project.

All of the actions identified as mitigation relating to construction and operation of the Project have been collated and presented in a separate document as an Environmental and Social Action Plan (ESAP). This includes an Afforestation Plan, which deals directly with the actions required to mitigate impacts on the forestry areas through which the Project passes.

The Project will result in the loss of large areas of woodland and forests of various types and importance and mitigation will be required in order to restore these woodlands and forests and to maintain and improve biodiversity and the ecological value of the remaining habitats.

However, this is not an impossible task because this assessment has identified which habitats are affected by the project and evaluates those habitats. For example, long-established undisturbed deciduous forest (of which there is not very much in the area) is more ‘valuable’, in an ecological sense, than recently created pine plantation or heavily managed woodlands. This is because the former is more diverse and is therefore hard to mitigate for, whilst the latter is easier to recreate or improve. These issues will be discussed in more detail in the Afforestation Plan, which will be included as an Appendix to the ESAP.
Finally, a Draft Stakeholder Engagement Plan (SEP) has been prepared and this has already been submitted to ICA.

1.3 General Approach to Assessment

The approach to this assessment refers to the guidance contained within the IFC Guidelines, Turkish Environmental Law and also the Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment (IEMA), 2004). Criteria for the determination of sensitivity or of importance or value of receptors, in order to determine significance of impacts, have been broadly established based on approved guidance, legislation, statutory designation and/or professional judgment.

Based on the information obtained from the ICA, the route has been determined by the KGM and ICA has no significant influence over the alignment or the consideration of alternatives. Nevertheless, in the design development process some minor alterations to the route have been proposed due to environmental constraints, geotechnical findings, expropriation issues, etc., and some of these changes have been accepted. These are discussed further in Chapter 2 Scheme Description.

AECOM has not therefore assessed alternatives to the scheme, as ICA has no control over the choice or implementation of any alternatives, including the “no action” alternative. In addition, the Project will be operated by ICA for 10 years 2 months 20 days (including 30 months of construction period) as a BOT project.

Furthermore, ICA will not have any control over any future or consequential impacts that may arise from the development of the Project, such as changes in land use or development patterns that may result from the existence of the road, and as such these impacts and mitigations have not been considered in detail in this assessment, although where appropriate such potential future changes have been referred to.

We have therefore focused on potential impacts associated with the Project specifically within the context of the developments proposed in the existing 1:100,000 Istanbul Environmental Plan. The assessment has considered construction and operational effects of the Project up to the end of the concession period.

Details of the general approach to the assessment are given in Chapter 3 of this ESIA report.

1.4 Report Structure and Authors

ESIA is a process and this report presents the findings of that process. Overall management of the ESIA has been undertaken by AECOM, but a significant number of sub-consultants have been used to deliver this assessment. The ESIA has been prepared in four volumes

- The Environmental and Social Impact Assessment (ESIA) Report (this report)
- The ESIA Appendices and Figures
- The Environmental and Social Action Plan (ESAP), including the Afforestation Plan
- The Stakeholder Engagement Plan (SEP)

The structure of the main ESIA report is summarized below and the principle authors of each chapter are identified. It should be noted that for each chapter prepared by a sub-consultant the structure and approach of the assessment has been directed by AECOM.
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