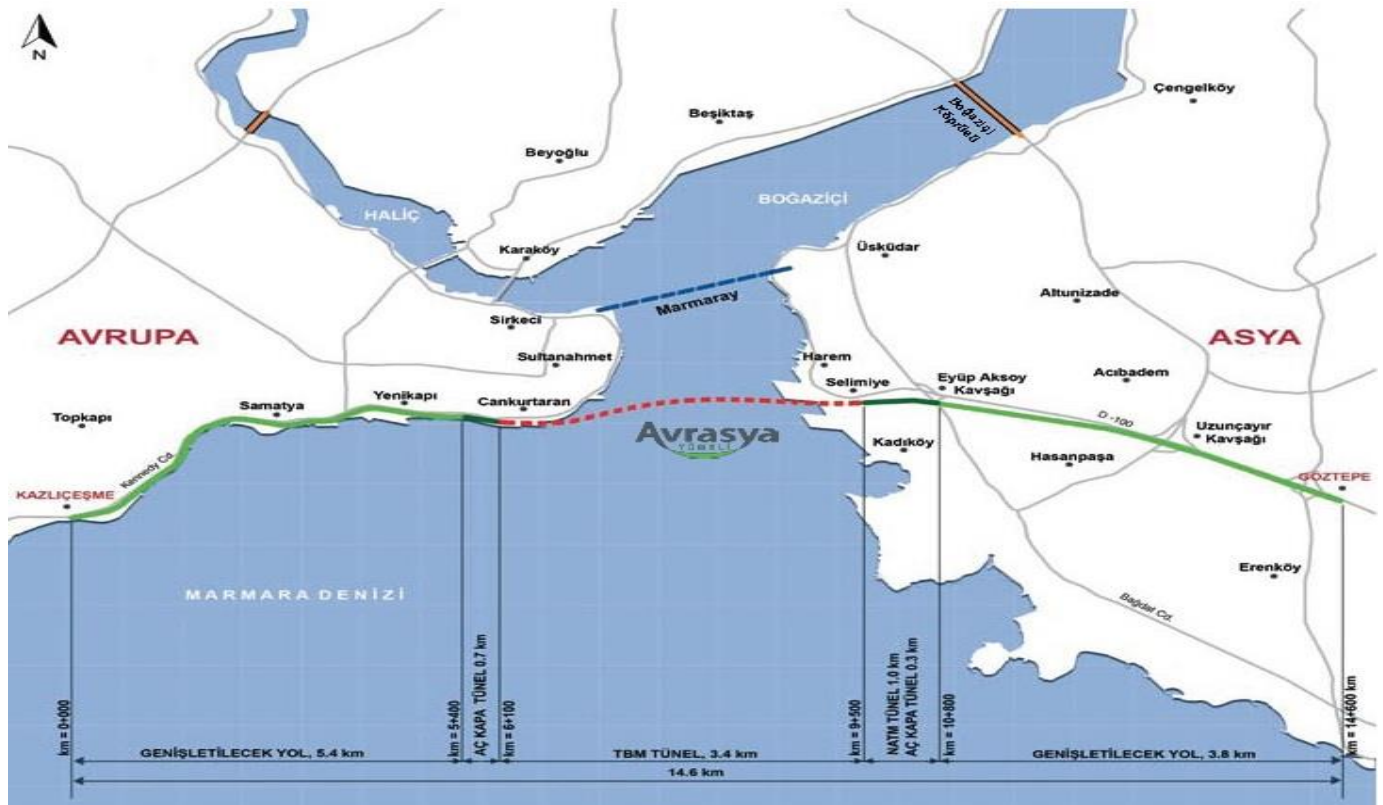


## EURASIA TUNNEL – ISTANBUL STRAIT ROAD TUBE CROSSING PROJECT

The project consists in the intercontinental road linking the Kazlıçeşme quarter located in the European zone of the city of Istanbul with the Göztepe quarter located in Asia by passing under the Bosphorus Strait.



The project consists of three main segments.

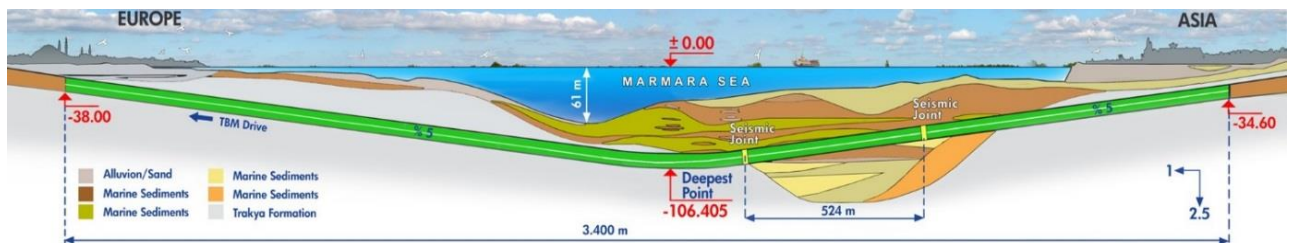
**Segment 1)** On the European side, the road is 5.4 Km long. The works mainly consist in the widening and revamping of the current main and secondary roads and the creation of new interchanges and of vehicle and pedestrian overpasses and underpasses.

**Segment 2)** The road segment is approx. 5.4 km long, 3.3 km of which travel underneath the Bosphorus Strait.

Starting from the Asian side, after a few short trench and cut and cover tunnel passages, there are:

- 2 parallel tunnels approx. 950 m long with an average excavation section of approx. 85 m<sup>2</sup>, each one hosting two road lanes. The tunnels are linked by 4 pedestrian cross-passages and a passage for vehicles. The tunnels were excavated using the NATM conventional tunnelling method.

- Tunnel approx. 3,340 m long underneath the Bosphorus, mechanically excavated using a large diameter (13.71 m) TBM at a maximum depth of 106 m below sea level. Due to the very high pressure to be contrasted at the front (11 bar), the heterogeneity of the soil and the occasional conditions of very high permeability, the works are to be considered unprecedented and definitely complex. Using a Mixshield Slurry TBM, the excavation began in April 2014 and was completed 16 months later, on 22 August 2015. The tunnel has two seismic joints at the two points of contact between sediments with different rigidity values. Segment 2 also includes the toll gates, two ventilation buildings, two electrical substations and all of the equipment required for operating the structure safely. There is also a building containing the offices of the Concessionaire (Automation and Control Building) that also hosts the control room that operates 24/7 and that receives all of the real-time road monitoring and management data via a SCADA (Supervisory Control and Data Acquisition) system.



<b>TBM Tunnel Length</b>	3340 m
<b>Gradient</b>	± 5 %
<b>Maximum Depth</b>	106 below sea level
<b>Internal Diameter</b>	12.0 m
<b>Min. Curve Radius</b>	* 1800 m - horizontal * 3500 m - vertical
<b>Upper Deck Thickness</b>	36 cm
<b>Lower Deck Thickness</b>	50 cm
<b>Upper Storey Height</b>	5 m
<b>Lower Storey Height</b>	4 m

**Segment 3)** On the Asian side, this road segment is approx. 3.8 Km long and consists in the junction of the new stretch with the current D100 road that connects the Göztepe quarter with the Istanbul-Ankara motorway.

The Eurasia Tunnel was opened to vehicle traffic in December 2016 and the Final Acceptance stage was completed in February 2017.

The activities carried out by the Italferr Altinok Joint Venture since the start of the contract have been:

- Project Management

- Detailed design verification
- Work Schedule, Reporting and Contract Management
- Supervision of Construction works
- Supervision of geotechnical and electro-mechanical works
- Supervision of Tunnel Operation activities
- Supervision of Tunnel Maintenance activities

The tunnel has been designed for a vehicle transit capacity of 100,000/day, bringing the travel time between the two continents down from 1 hour and 40 minutes to 15 minutes. The works on the structure were completed 8 months before schedule, thereby proving the engineering efficiency of the Companies involved. This resulted in the Turkish Administration extending the Contract to June 2021.