

## **EXTENSION OF LINE 3 OF ATHENS METRO TO PIRAEUS REGION NON-TECHNICAL SUMMARY**

This Design concerns the construction and operation of the new Line 3 extension from HAIDARI Station to Piraeus. This extension is underground throughout its length and passes beneath the densely populated Municipalities of Aghia Varvara, Korydallos, Nikea and Piraeus. The proposed Southwest-bound route shall serve densely populated areas not currently served by the Metro system.

The proposed route is approx. 8.97 km long (all within a tunnel) and includes 6 new stations: AG. VARVARA, KORYDALLOS, NIKEA, TAMBOURIA, PIRAEUS and DIMOTIKO THEATRO (Municipal Theatre). This extension is the continuation of Monastiraki-Egaleo-Haidari line section and starts at the end of the temporary HAIDARI forestation tunnel.

This Environmental Impact Assessment Study (EIAS) has been prepared in accordance with Law 3010/25.04.2002 (which constitutes the adaptation of Law 1650/86 with the European Directives 97/11EU and 96/61EU) and Joint Ministerial Decisions (JMD) No. 15393/05.08.2002 and 69269/5387/25.11.90. Based on the aforementioned JMD No. 15393/2332/05.08.2002 concerning the classification of public and private works and activities in categories, this Project constitutes a design of a Metro Line and falls under **Sub-Category 1 of Group No. 10 “Special Works – Elevated, Ground and Underground Railways (Metro works)”**. The structure of the design is according to the relevant Legislation.

The tunnel alignment starts at K.P. 1+372.11, i.e. at the end of HAIDARI temporary forestation tunnel, and terminates at K.P. 8+969, i.e. at the end of the forestation of the currently under design alignment at the University of Piraeus. The proposed route serves densely populated areas not currently served by any other means of fixed route. PIRAEUS terminal station shall be connected with ISAP Line 1, the local OSE terminal line to Peloponnese and the port.

It is pointed out that the initially designed terminal station was EVANGELISTRIA Station. For the construction of this station it was required to temporarily occupy a part of the adjacent Piraeus Home for the Elderly yard. However, during consultations between ATTIKO METRO S.A. (AM) and the involved agencies, the BoD of the Home for the Elderly strongly refused to accept this occupation and proposed to construct the terminal station at a distance of 150-200m further to the north, i.e. towards Piraeus street. However, based on geological investigations and relevant studies, it was found that, inter alia, if this station were to be constructed further to the north, it would be technically unfeasible to construct the new forestation of the terminal station due to inappropriate ground conditions (shoal deposits consisting of soft silt and loose sand). As a consequence, the proposed alternative solution, i.e. the construction of the new terminal station to the north of the Home for the Elderly, was technically unfeasible. In view of the above, AM decided not to construct EVANGELISTRIA Station and establish, in the current phase, DIMOTIKO THEATRO Station as the terminal station of Piraeus extension.

The subject line shall be underground throughout its length; the proposed tunnel sections are a single tube double track tunnel up to K.P. 8+748 and a triple track tunnel

in the remaining section (K.P. 8+748 – K.P. 8+969). The proposed Eleonas (former Ag. Savas) Depot shall be used to accommodate the Piraeus extension.

All double track tunnels shall be constructed using the underground TBM tunnel boring method, while the triple track tunnel section shall be constructed using a conventional method. As far as stations are concerned, AG. VARVARA, KORYDALLOS and PIRAEUS Stations shall be entirely constructed using the cut and cover method. In NIKEA Station, a part of the concourse area shall be constructed using the cut and cover method, while the remaining part shall be constructed using the underground boring method. In TAMBOURIA Station, the concourse area shall be constructed using an underground boring method due space constrains, while the shaft of the remaining installations shall be constructed using the cut and cover method in an adjacent unbuilt area. DIMOTIKO THEATRO shall be constructed using mainly the cut and cover method, while a small part of it shall be constructed using the underground boring method. At the last section, the excavation works shall commence at DELIGIANNI Shaft prior to the TBM arrival. The TBM shall then enter the completed triple track tunnel and shall continue its drive up to Deligianni shaft, where it shall be disassembled and transferred elsewhere.

The terminal shaft is located in the University of Piraeus parking area. It can be used both as an emergency exit and as a ventilation shaft during its operation. This shaft shall be connected with the triple track access tunnel through an approx. 35m-long access gallery.

During the construction of the extension, there shall be certain necessary traffic arrangements around future worksite installations for the construction of stations and shafts. In the area located after Venizelou shaft, the tunnel alignment passes next to and under El. Venizelou street; thus, access to the future worksite installations for the TBM start-up shaft shall be relatively easy, requiring minor traffic arrangements which will probably burden the traffic conditions in this specific street. The construction of AG. VARVARA Station on El. Venizelou street shall burden the traffic due to the fact that El. Venizelou street shall be progressively closed to traffic. The construction of KORYDALLOS Station at Eleftherias square and of NIKEA Station at El. Venizelou square is not expected to cause significant traffic problems to the adjacent streets. As regards TAMBOURIA Station, it shall be required to expropriate a small area for the construction of the relevant shaft, as well as to make special traffic arrangements on Etolikou street, in order to serve the worksite needs. The construction of PIRAEUS Station shall aggravate the traffic flow in that area, due to the progressive prohibition of circulation at Akti Kallimassioti. Finally, at DIMOTIKO THEATRO Station it shall be required, among other to prohibit circulation on a part of Vas. Georgiou Avenue.

All necessary safety systems (fire detection and fire protection, ventilation and lighting) shall be installed in all stations and shafts, as well as inside the tunnels of the extension. Moreover, escalators and lifts for PSNs shall be installed in all Stations and shall connect all levels of the stations' public areas, such as the platform level, the concourse/transfer level and the street level.

As regards **the impact of the examined extension**, it should be noted that all detrimental environmental impact investigated and analyzed within the framework of this study concern mainly the project construction phase and, as a consequence, are reversible. In particular:

As regards the water consumption, liquid waste and the impact on water resources, the required quantities of water for the general use of the worksite areas, shall be secured by connecting the interior network of the above areas with EYDAP network; these quantities are not expected to be particularly large. Therefore, no direct or indirect impact is expected on the existing water supply network. As regards the sewage network, the existing EYDAP network shall be used both for sewage and drainage purposes. It is expected that the anticipated quantities shall also be limited during the construction, as well as during the operation. Finally, the adverse impact on water table level and the ground water level due to the construction of the Project shall be limited, since this impact is foreseen to be mostly local and not very significant. Moreover, waste water inside the excavations / tunnels due to construction activities do not have an impact on the hydrogeological conditions in the Project area, where the excavation works are executed below the ground water table.

The anticipated changes to the ground during the execution of construction works are mainly due to the excavations, are related to the changes in the relief, are minor and short-term. The construction works shall create transverse cuts on the relief with a maximum depth of approx. 35m. The excavations consist in the removal of earth and rocky materials and are expected to cause a minor disturbance to the geological layers, while for the protection of the slopes provision is made for a sufficient retaining system. No adverse impact is expected to occur during the operation of the Project on the physical and chemical ground properties. The Project shall operate under complete watertight conditions (based on the specifications) and, as a consequence, no leakage to the surrounding rocks is expected.

The quantity of debris (6.4 tons/day) is not expected to be particularly important, provided that debris are properly collected and disposed; therefore, it is estimated that there will be no adverse impact on the surrounding area and the garbage handling system of the Municipalities. The total earth volume deriving from the excavation of tunnels, stations and shafts amounts to 1.450.000m<sup>3</sup>. Excavation spoil deriving from the examined extension shall be disposed either in Markopoulo area, i.e. in "Maleas" and "Stavrou" areas approved for the disposal of aggregates, or in Sepolia area, i.e. in "Fragkos", "Mousamas" and Liossion landfill sites, on condition that this spoil does not contain any toxic or other harmful substances.

As regards the greenery along the route of the alignment and, in particular, in the areas of the stations, the total number of trees and bushes affected during the construction is relatively large; however, these trees and bushes are mainly of an average age, with the exception of pine-trees and eucalyptus which are older. The most environmentally adverse locations for worksite occupation are KORYDALLOS, NIKEA, AG. VARVARA and DIMOTIKO THEATRO Stations, which are considered sensitive in environmental terms due to the fact that, for the installation of worksites it is required to change the aesthetics and the landscape of these areas, while there shall be a significant impact on the pedestrian flow and the use of areas by the citizens in the surrounding area.

During the construction phase and in all worksite areas, all efforts shall be made to re-plant the removed trees near to their original locations, in order to minimize any interventions on the roadside greenery. Where the above is not feasible, these trees shall be planted as close as possible to their initial locations, as per the special study that has to be prepared.

In any case, during the construction of the stations and the shafts, there shall be impact on the worksite areas, i.e. additional noise and atmospheric pollution, as well as along the roads used by heavy vehicles. However, it is pointed out that the construction period is fixed and the worksite areas shall be fenced throughout the construction.

As regards the atmospheric pollution and based on the results of the evaluation of the relevant assessments for the years 2010 and 2020, the scenarios “WITH Metro” manifest a significant improvement compared to the “WITHOUT Metro” respective scenarios, for the entire length of the extension. After comparing the relevant results, it seems that in all road sections that have been examined, the effect of the new Metro extension on the quality of the atmospheric pollution (index: pollutants/transferred passenger) is positive, given that, in relation to the expected pollutant increase and the concentration of pollutants within the time periods under examination, **the operation of the new extension can restrain the pollutants to levels lower than the levels expected in case of non-implementation of the Project.**

With regard to the acoustical environment, the disturbance due to the execution of the Project construction works is estimated to exceed the lawful limit; however, after installing sound barriers (i.e. installation of temporary panels), this disturbance shall be kept to lower levels. Moreover, the Project construction period shall be reduced, thus further reducing the extent of any negative impact. During the operation phase, based on the assessments presented in the relevant chapter, the acoustical environment throughout the entire road network under examination is not expected to be aggravated, given that no significantly increased impact is expected at any road sections under examination. On the contrary, in the majority of the examined road sections, i.e. approx. 80%, the existing road traffic noise level is expected to decrease.

As regards the vibrations, based on the relevant results of the preliminary investigation, it seems that in almost all turnouts (switches) (for both the adverse and normal scenarios), high levels of noise and vibration are expected, thus rendering necessary the implementation of floating slabs. This ascertainment, in combination with the results of the worst case scenario, suggest the possibility for higher levels, which must be investigated in greater detail in the framework of the proposed “special final study of groundborne noise and vibrations”, so as to ensure the most appropriate support scheme against vibrations.

With regard to the traffic, during the construction phase the road network of the area around the stations shall be burdened; however, certain necessary traffic arrangements shall be implemented in the perimeter of the future worksite installations for stations and shafts, in order to restrict the relevant impact to the minimum possible extent. During the operation of the Project, the examined extension is expected to have **positive impact on the traffic** in the adjacent and wider area of the Project, given that, upon operation of this extension, the overall trip time within its influence zone is expected to become shorter, the road network shall be decongested and the atmospheric pollution shall be decreased, leading thus to the improvement, in general, of the environment and the quality of life of residents of Attica Basin.

As regards the aesthetic environment, the equipment, worksites and activities related to construction, which are required during the implementation of the new extension, are expected to cause visual disturbance, in terms of aesthetics, to the immediate

environment. It is advisable to address and mitigate these impacts to the maximum possible extent, taking, however, into consideration the fact that the average resident of Athens and Piraeus is familiarized with the presence and operation of various types of worksites. Once the Project is completed, all its functions are underground and, as a consequence, the surrounding areas are not expected to suffer any visual disturbance.

In order to avoid any impact on the historic – cultural environment during the construction phase and upon commencement of the relevant works, all concerned Archaeological Departments should be notified in writing about the work schedule, so as to assess whether their presence is necessary or not. In case significant archaeological finds are revealed during the construction of works, the related Archaeological Departments should be also notified immediately and the solutions to be given in such a case, at the cost and under the responsibility of the Project Owner, should be in accordance with the recommendations of these Departments, benefiting the archaeological finds.

Finally, the impact on the socio-economic aspect of the immediate environment by the examined extension is expected to be proportional to the impact by Base Project in the long run, although the center of the city has already been developed. In particular, a smooth population increase is expected, without sharp price increases and trends to develop activities proportionally to the current trends along the central Avenues. In general, the expected impact is expected to be neutral or positive but never negative. We must highlight ***the positive effect of not occupying a part of the yard of the Piraeus Home for the Elderly***, as provided for within the framework of the initially planned EVANGELISTRIA terminal station.

In relation to the aforementioned impact, as examined in detail in the respective chapter, series of general and special measures is proposed to be implemented both during the construction and operation phases, which are deemed necessary in order to address successfully the environmental impact, so that this impact is either eliminated or kept under the acceptable limits.

It is clear that, despite any negative environmental impact of the Project, especially during the construction, this Project is going to contribute positively, in the long run, to the environment of the wider area of the western suburbs and Piraeus. It is worth mentioning that, **as regards the examined extension, all detrimental environmental impact concern mainly the Project construction phase and, as a consequence, this impact is reversible**, as long as the proposed remedial measures are implemented.