Trans Adriatic Pipeline

Fourth Amendment to the ESIA Greece
Ano Grammatiko & Pentalofo Reroutings

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1 Introduction

1.1 Project Title

This report constitutes the **Fourth Amendment** to the **Environmental and Social Impact Assessment (ESIA)** of the Trans Adriatic Pipeline (TAP) in Greece, which stretches from Kipoi at the Turkish border, via Komotini, Nea Mesimvria (north-west of Thessaloniki) to the Albanian border near the village of Ieropigi.

The ESIA of the TAP project in Greece was submitted to the Ministry of Environment, Energy and Climate Change (MEECC) in June 2013 and the project was granted a positive Decision on Approval of Environmental Terms (Protocol. No. 174848) in September 12, 2014.

Following a number of changes to the pipeline route and to the design and location of permanent and temporary installations of the TAP project, the ESIA has been amended thrice since and was submitted to the Ministry of Economy, Development and Tourism (former Ministry of Development). As a result, the Decision on Approval of Environmental Terms has been modified on 17/11/2015, 05/05/2016 and 16/06/2016.

The present **Fourth Amendment to the ESIA** describes changes to the pipeline route of the TAP project in the areas of Ano Grammatiko and Pentalofos, and assesses the impacts of these changes to the natural, physical, cultural heritage and socioeconomic environment.

1.2 Project Type and Size

The project includes the natural gas pipeline itself as well as temporary infrastructure required for the construction phase and permanent, supporting operational facilities, including block valve stations along the route and two compressor stations in the Greek section (one in Kipoi and a potential second station in the broader area of Serres). More details are provided in Section 2.

The TAP project together with associated projects offers a new gas transportation route between the Caspian Sea and Southern and Central Europe. TAP will transport gas via Greece and Albania, across the Adriatic Sea to southern Italy and further to Western Europe. The Project aims to enhance security of supply as well as to diversify gas supplies for European markets.
TAP will initially have a capacity of 10 billion cubic metres per year (bcm/year). As more gas becomes available, TAP will have the capacity to supply an additional 10 bcm per annum of new gas, expanding to 20 bcm/year as required.

1.3 Project Location

The TAP project will start in Greece, close to the Turkish border, and then cross Albania and the Adriatic Sea and come ashore in southern Italy, allowing gas to flow directly from the Caspian region to European markets. *Figure 1-1* presents TAP's route.

Figure 1-1 Trans Adriatic Pipeline Project Location

Source: TAP AG (2014)

In Greece, the project will stretch from Kipoi in the Regional Entity of Evros to the Albanian border in the Regional Entity of Kastoria, for approximately 550 km. From Kipoi to Nea Mesimvria, a section of approximately 365 km, the route follows to a large extent the existing DESFA pipeline. From Nea Mesimvria westwards to the Albanian border the route has a length of 185 km and does not follow any existing gas infrastructure.

The TAP project route in North Greece crosses 3 Regions, 13 Regional Entities and 30 Municipalities. The administrative setting of the project is presented in ***Table 1-1*** below.

Table 1-1 Administrative Setting of the TAP Project in Greece

Regions	*Regional Entities*	*Municipalities*
East Macedonia and Thrace	Evros	Alexandroupoli
	Rodopi	Arrianon
		Maronia - Sapes
		Komotini
		Iasmos
	Xanthi	Avdira
		Xanthi
		Topiros
	Kavala	Nestos
		Kavala
	Drama	Doxato
		Prosotsani
Central Macedonia	Serres	Amfipoli
		Nea Zichni
		Emmanouil Pappa
		Serres
		Iraklia
	Kilkis	Kilkis
	Thessaloniki	Lagada
		Oreokastro
		Chalkidona
	Pella	Pella
		Skydra
		Edessa
	Imathia	Naousa
West Macedonia	Kozani	Eordea
	Florina	Amyntaio
	Kastoria	Kastoria
		Orestida
		Nestorio

Source: EXERGIA (2014)

1.4 Project Classification

According to the Ministerial Decision 1958/2012 and, as amended, Ministerial Decision 20741/27-4-2012, the TAP project as a whole is classified as category A1 project (*Group 11 'Transportation*

of energy, fuels and chemical substances', s/n 1 'Fuel pipelines of national importance or under European or International networks and associating facilities').

1.5 Project Developer

The project owner is the **Trans Adriatic Pipeline AG**

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TAP consists of the following shareholders: BP (20%), SOCAR (20%), SNAM (20%), Fluxys (19%), Enagás (16%) and Axpo (5%).

1.6 Study Team

The present ESIA Amendment report has been compiled by EXERGIA, Energy and Environment Consultants S.A.

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The Fourth Amendment to the ESIA report has been the result of the work of a number of experts from a wide range of disciplines. These experts are mentioned in Section 6 of the Document Guide (GAL00-EXG-642-Y-TAE-5100).

2 Description of Approved Project

2.1 TAP Project Overview

2.1.1 Project Rationale

The purpose of the TAP Project is to bring gas from new sources in the Caspian Sea to Europe through the so called Southern Gas Corridor.

TAP Project will contribute to the security and diversity of Europe's energy supply by providing the necessary infrastructure to transport gas from the Shah Deniz II field in Azerbaijan by the most direct route, via the pipeline system, to Southern Europe. As part of this plan TAP will be the first pipeline to open the Southern Gas Corridor

Figure 2-1 Southern Gas Corridor

Source: TAP AG Corporate presentation (Oct. '14)

2.1.2 Brief Technical Description

The pipeline system in Greece, as described in the ESIA and Section 3 of the ESIA Amendment (GPL00-EXG-642-Y-TAE-1004), comprises of the following main installations:

- An approximately 550 km long underground pipeline (48 inch) from the Greek/Turkish border to the Greek/ Albanian border;
- Two Compressor Stations – one at Kipoi, Evros (including metering facilities) for the initial throughput of 10 bcm/year, and potentially another one in the general vicinity of Serres for the final capacity of 20 bcm/year. Initially in the 10 bcm case this site will only include a block valve and scraper station;
- 23 BVS (Block Valve Stations) spaced at a distance of approximately ~30 km apart along the pipeline; and

- Associated facilities required during construction (access roads, construction camps, pipe yards, etc.).

The advances of the technical design of the Project and certain stakeholder requests have led to changes to the pipeline route in the areas of Ano Grammatiko and Pentalofos. These changes are described in detail in the subsequent sections of this Fourth Amendment to the ESIA.

2.1.3 TAP System Throughput

Pipeline transportation capacity may be increased from an initial throughput of 10 bcm/year (maximum about 1,350,000 standard cubic meters per hour; average about 1,190,000 standard cubic meters per hour) to 20 bcm/year of natural gas.

The present ESIA Amendment does not introduce any changes to the TAP System Throughput as this was described in the ESIA for the TAP Project.

2.1.4 Project Schedule

The current planning of the Project provides that the commencement of project construction will take place in the second half of 2016, while first gas flow is expected in the beginning of 2020.

2.1.5 TAP Design Philosophy

The TAP facilities (e.g. compressors and gas turbines) will be designed for a lifetime of 25 years. The pipeline itself is designed for a technical life time of 50 years. The design philosophy is to ensure that the gas transportation system fulfils all safety requirements of the base National and European Codes and Standards and that the impact to the environment is kept to a minimum.

The pipeline and stations will be designed in accordance with requirements resulting from:

- National and local regulations;
- Safety of the people living close to the pipeline and of personnel working near the pipeline;
- Protection of the environment;
- Protection of property and facilities;
- Geotechnical, corrosivity and hydrographical conditions;

- Requirements for construction, operation and maintenance;
- Third party activities.

The pipeline will have a design pressure of 95 barg (bars above atmospheric pressure), which will be sufficient for the TAP capacity base case of 10 bcm/year as well as for the potential future extension of the TAP System capacity to 20 bcm/year.

The present ESIA Amendment does not introduce any changes to the TAP Design Philosophy as this was described in the ESIA for the TAP project.

2.1.6 Applicable Codes and Standards

All Project facilities will be designed in accordance with the European Codes (EN) and National Standards. The EU and National standards must be followed and other standards will be used to supplement these where it is beneficial to do so.

For the TAP in Greece the main codes to be used are shown in *Box 2-1.*

Box 2-1 Main Pipeline Design Codes

- No Δ3/Α/οικ. 4303 ΠΕ 26010 5/3/2012 “Technical Regulation: Natural Gas supply systems — Pipelines for maximum operating pressure over 16 bar”, as amended by No. Δ3/Α/8857 20/0/2012.
- EN1594:2009 “Gas supply systems — Pipelines for maximum operating pressure over 16 bar — Functional requirements”

A large number of other codes and standards will be applied for the design of project subsystems or individual project elements. These are presented in detail in *Section 4.1.8* (GPL00-ASP-642-Y-TAE-0052) of the ESIA for the TAP Project. The present ESIA Amendment does not introduce any changes to the applicable codes and standards.

2.2 Main Project Components in Greece

2.2.1 Pipeline

The cross-country pipeline from the Greek/Turkish border to the Greek/Albanian border is approximately 550 km in length and has a diameter of 48’’. The design pressure of the main pipeline is 95 barg (specifically for the part of the pipeline from the point that connects to TANAP to the Compressor Station GCS00, the design pressure is 95.5 barg). The pipeline will be fully buried. The minimum cover depth for the pipeline is 1 m in normal sections, but this can be

increased if necessary where additional protection is required or special conditions apply. For example at road and railway crossings, the minimum cover depth is increased to 1.2 m and 1.5 m respectively. The width of the regular construction working strip for the TAP Project is 38 m, and can be reduced to 28 m where physical constraints require. For construction in elevated and/or forested areas the width will potentially be further reduced to a minimum 18 m corridor.

All the above technical information relevant to the pipeline remains as presented in the ESIA and Section 3 of the ESIA Amendment (GPL00-EXG-642-Y-TAE-1004) for the TAP Project. However, the advances of the technical design of the Project **have led to changes to the pipeline route**. These changes are described in detail in the subsequent sections of this ESIA Amendment.

2.2.2 Block-Valve Stations (BVS)

As described in the Third ESIA Amendment (GAL00-EXG-642-Y-TAE-5101), the TAP project design foresees 22 BVS along the pipeline route while an additional one will be installed at the site allocated for the installation of the Compressor Station in the area of Serres. This BVS will be upgraded to a Compressor Station when sometime in the future the TAP System Throughput increases to 20 bcm/year from the initial 10 bcm/year.

The total area of the BVS installations will be approx. 1040 m² and will be fenced. The building structure of the BVS comprises small buildings of a total building surface of about 36 m². Additionally, an internal safety railing for the building installation will be installed.

The present ESIA Amendment **does not introduce any changes to the location and design of BVSs**, as these were described in the Third ESIA Amendment (GAL00-EXG-642-Y-TAE-5101) for the TAP project .

2.2.3 Compressor Stations (CS)

The pipeline's initial transportation capacity is characterised by a throughput of 10 bcm/year and will potentially be increased to 20 bcm/year.

According to the information provided in the ESIA for the TAP Project and the Second ESIA Amendment (GAL00-EXG-642-Y-TAE-5002), for the initial capacity of 10 bcm/year, one compressor station in the broader area of Kipoi (GCS00) is foreseen of approximately 30-45 MW (2 operating compressor units and 1 on standby of 15 MW each).

For the 20 bcm/year case, the compressor station GCS00 needs to be developed to 75-90 MW by installation of three additional compressors (15 MW each) with associated facilities (total capacity of 5 operating units and 1 on standby, 15 MW each). Furthermore one additional compressor station located in the vicinity of Serres (GCS01) with a nominal power of approximately 100 – 125 MW (4 operating units and 1 on standby, 25 MW each) is foreseen in the 20 bcm/year case. The indicated MW-figures are related to ISO class[1].

In summary, the configuration of the compressor stations, as presented in the ESIA for the TAP pipeline project and the Second ESIA Amendment (GAL00-EXG-642-Y-TAE-5002), is given in the Table below.

Table 2-1 Summary of Installed Capacity at Compressor Stations – Approved Project Design

Pipeline Capacity	*GCS00, GCS01*
10 bcm/year	GCS00 (Kipoi) 30-45 MW (2 operating and 1 on standby of 15 MW each) , in the broader area of the existing DESFA compressor station at Kipoi
20 bcm/year	GCS00 (Kipoi): approx. 75-90 MW (5 operating and 1 on standby of 15 MW each) GCS01 (Serres): approx. 100 - 125 MW (4 operating and 1 on standby of 25 MW each), in the broader area south of Serres

Source: ETG 2012

The present ESIA Amendment **does not introduce any changes to the capacity or configuration of the compressor stations** as these were described in the Second ESIA Amendment (GAL00-EXG-642-Y-TAE-5002) for the TAP project.

2.2.3.1 Layout and design

As presented in the ESIA for the TAP Project and the Second ESIA Amendment (GAL00-EXG-642-Y-TAE-5002), TAP has defined an area of 36 ha for the investigation of each of the CS sites, within which the CS will be positioned during the final engineering phase. The compressor station facilities GCS00 and GCS01 require a surface of 16.7 ha and 16.3 ha respectively. This area will be fenced. Within this surface, about 10 ha will be hosting installations, buildings or roads. In each compressor station, a scraper station will be installed.

The present ESIA Amendment **does not introduce any changes to the layout or design of the compressor stations** as these were described in the Second ESIA Amendment (GAL00-EXG-642-Y-TAE-5002) for the TAP project.

[1] ISO: standard conditions of operation, i.e. Ambient Temperature at 15 deg C, Relative Humidity at 60 % and Ambient Pressure at Sea Level.

2.2.4 Temporary Facilities

2.2.4.1 Storage and Pipe Yards

The current stage of project design foresees the construction of 17 storage and pipe yards along the route of the pipeline. **The location and characteristics of these installations remain the same** as presented in Section 3 of the ESIA Amendment (GPL00-EXG-642-Y-TAE-1004), the Supplement to the ESIA Amendment (GPL00-EXG-642-Y-TAE-5000) and the Third ESIA Amendment (GAL00-EXG-642-Y-TAE-5101).

2.2.4.2 Construction Camps

The current stage of project design foresees the construction of 8 construction camps along the route of the pipeline. **The location and characteristics of these installations remain the same** as presented in Section 3 of the ESIA Amendment (GPL00-EXG-642-Y-TAE-1004), the Supplement to the ESIA Amendment (GPL00-EXG-642-Y-TAE-5000) and the Third ESIA Amendment (GAL00-EXG-642-Y-TAE-5101).

2.3 Project Progress since Permitting

The submission of the ESIA for the TAP project took place in June 2013 and was supplemented with an Annex Report in early September 2014. The Decision on Approval of Environmental Terms for the TAP project was issued in September 12th 2014. The Amendment to the ESIA was submitted in December 2014 and the Modification of the Decision on Approval of Environmental Terms was issued on 17/11/2015.

The Second Amendment to the ESIA was submitted on 23/11/2015 and the Modification of the Decision on Approval of Environmental Terms was issued on 05/05/2016.

The Third Amendment to the ESIA was submitted on 26/04/2016 and the Modification of the Decision on Approval of Environmental Terms was issued on 16/06/2016.

In parallel the following steps have been completed:

- In December 10th 2013, the Host Government Agreement was ratified by the Greek Parliament.
- In July 2014, TAP was granted by the Regulatory Authority for Energy (RAE) with a Permit of an Independent Natural Gas System (INGS).

- In March 2016, the Installation Acts for the Project were issued by the Ministry of Environment and Energy, and were published in the Government Gazette.

- In June 2016, the Installation Permit for the Project was issued by the Ministry of Environment and Energy, and was published in the Government Gazette (FEK 1550 B / 01-06-2016).

3 Project Modifications

The present Fourth ESIA Amendment introduced to the ESIA basecase two major reroutings in the area of Ano Grammatiko, in Edessa municipality, and Pentalofos, in Oraiokastro municipality. As a major rerouting, is considered one that extends beyond the 500m corridor studied during ESIA preparation and the ESIA Amendment preparation. As such, the mentioned reroutings are subjected to thorough investigation, at a level similar to the rest of the ESIA basecase route, in order to make sure that likely environmental, socioeconomic and cultural heritage impacts associated with the proposed rerouting are identified and mitigated as appropriate.

A brief presentation of both reroutings is given in the following, while more details on the environmental, socioeconomic and cultural heritage baseline of the rerouting areas are given in Section 5.

3.1 Rationale for Project Modifications

The changes to the pipeline route have been the result of more detailed route investigations as well as legitimate requests by project stakeholders.

In specific, the proposed rerouting in the Area of Ano Grammatiko was the result of geotechnical investigations and communication of the Ephorate of Archaeology of Pella in order to avoid sites of archaeological interest in the area. In the area of Pentalofos, the proposed rerouting was the result of a request from the Ministry of Defence in order to maintain larger distance from “Mitrousis” army camp.

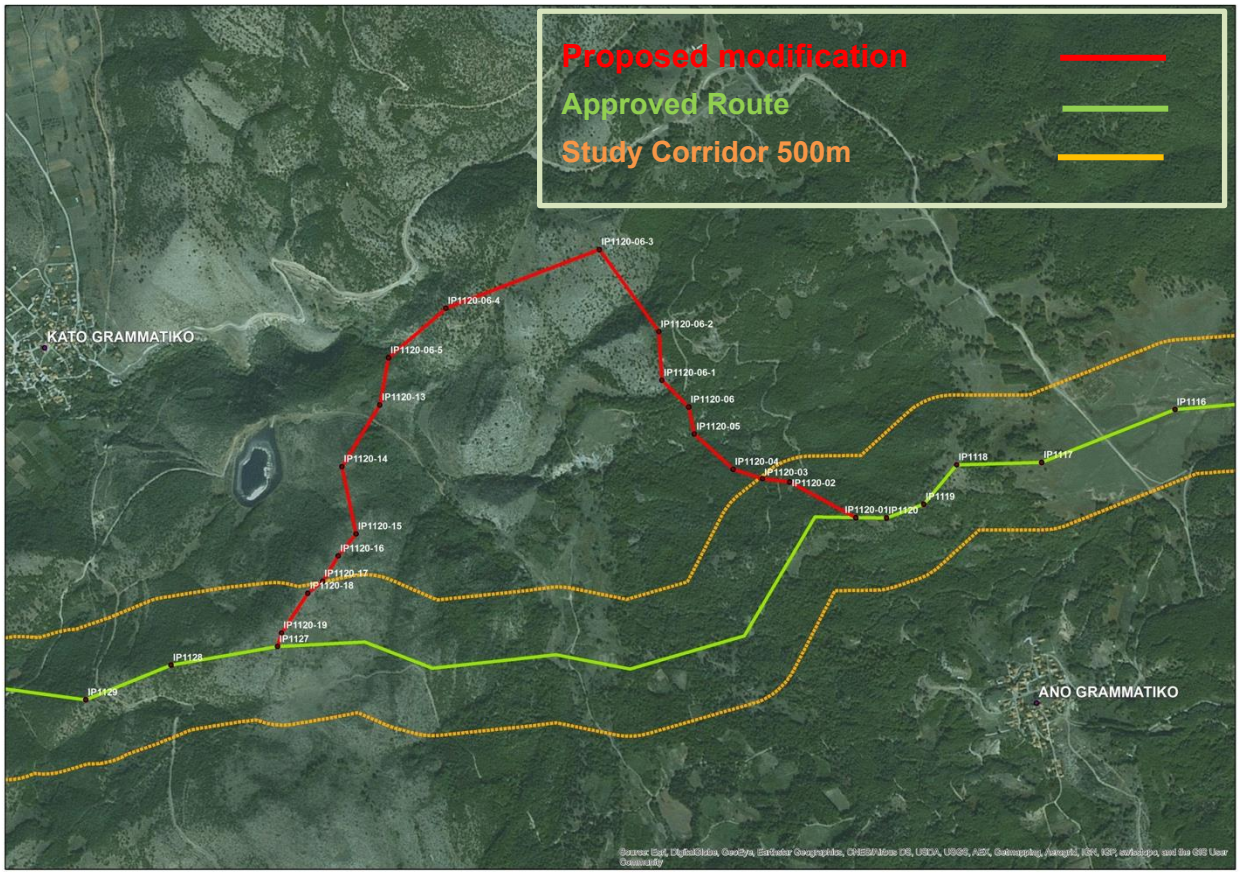
The proposed reroutings underwent thorough investigation to ensure that environmental, socioeconomic and cultural heritage considerations are fully taken into account.

3.2 Modifications in Pipeline Route

3.2.1 Ano Grammatiko rerouting

The proposed rerouting in Ano Grammatiko area (Figure 3-1) is located in Edessa municipality, has approximately 4000m in length and deviates maximum 1500m from the basecase route. It crosses forest land and scrubland of similar type as the basecase route. The area has no protection status (the closest protected area is about 1000m to the east) but does host species of ecological interest, such as the wolf and bear.

Figure 3-1 Proposed rerouting at Ano Grammatiko area

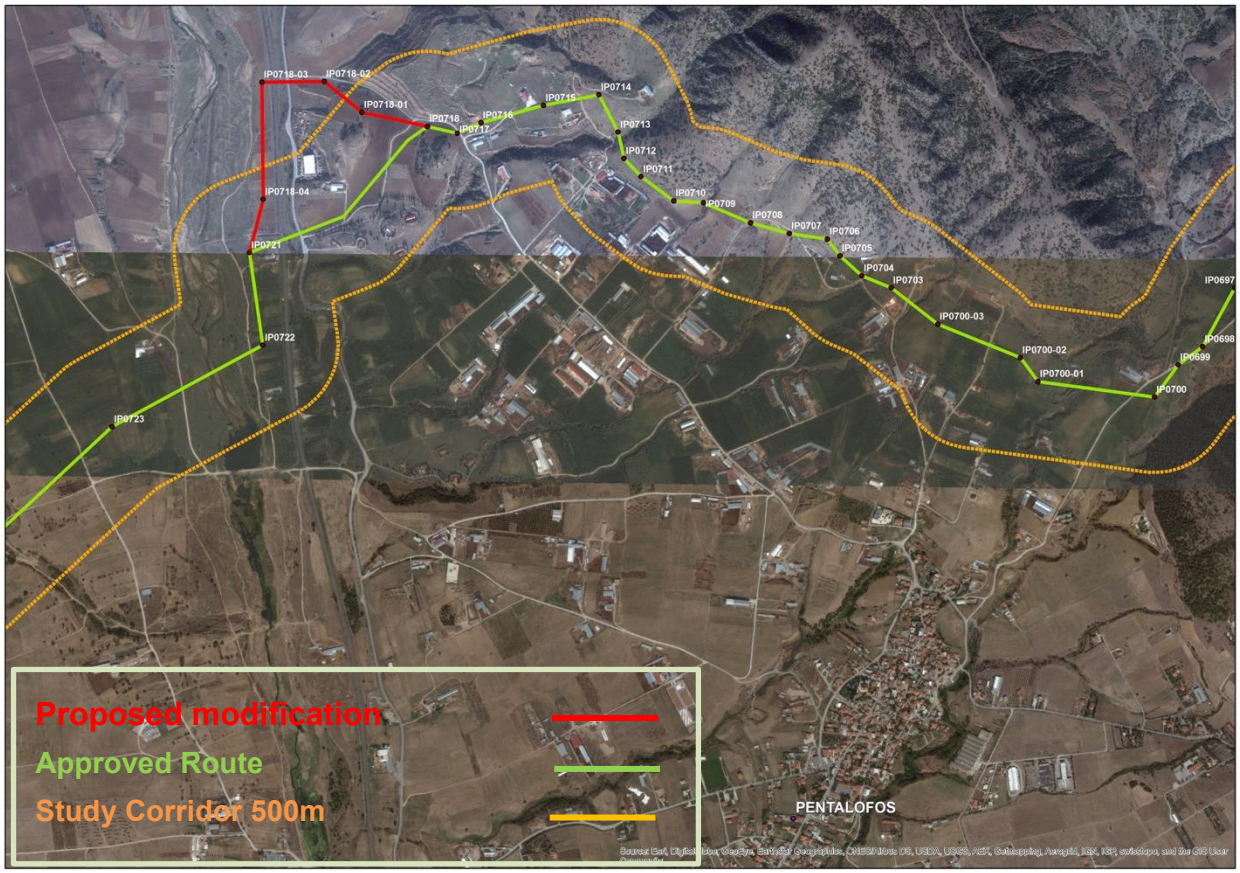


Source: EXERGIA (2016)

3.2.2 Pentalofos rerouting

The proposed rerouting in the area of Pentalofos (Figure 3-2) is located in Oraiokastro municipality, has approximately 1200m in length and it deviates maximum 520m from the basecase route. It crosses agricultural land of similar type as the basecase route. The area has no protection status (the closest protected area is 3500m to the east) and does not host any species of ecological interest.

Figure 3-2 Proposed rerouting at Pentalofos area



Source: EXERGIA (2016)

4 Legislative and Policy Framework

4.1 Introduction

As discussed extensively in Section 3 (GPL00-ASP-642-Y-TAE-0051) of the ESIA for the TAP Project in Greece, the ESIA has been prepared to comply with National Greek legislation, International environmental and social requirements, with specific regard to those of the European Union Legislative Framework, and in alignment with performance requirements of the European Bank for Reconstruction and Development (EBRD).

The same concept has been applied to the Second Amendment to the ESIA, the preparation of which has taken into account applicable provisions of the Greek environmental legislation as well as international standards and best practice in environmental impact assessment.

The following sections provide a description of the legal basis for the preparation of the Fourth Amendment to the ESIA and makes reference to legislative developments in environmental permitting since the submission of the ESIA, focusing on likely changes to the overall permitting framework.

4.2 Legal Basis for the Fourth Amendment to the ESIA

The Fourth Amendment to the ESIA is prepared in compliance with Law 4014/2011 – the framework law for environmental permitting. Art. 6 of Law 4014/2011 states that an ESIA Amendment study is submitted to the competent environmental authorities in cases of modernisation, extension, improvement or modification of a project for which a Decision of Approval of Environmental Terms has already been granted. On the basis of the information provided with the ESIA Amendment, the competent environmental authority decides whether a new ESIA is required to address the changes to the project or the modification information provided is sufficient to issue the updated Decision of Approval of Environmental Terms.

Art. 11 of Law 4014/2011 specifies the contents of the ESIA Amendment study. According to these specifications, the study should at least contain the following:

- Technical description of the project, prior and after the proposed modifications, focusing on the modifications and accompanied by technical drawings and topographic diagrams as necessary

- Description of the environmental baseline, only with relation to the proposed project modifications
- Brief description of the information resulting from environmental monitoring and control of the Project
- Environmental impact assessment of the proposed project modifications
- Mitigation measures to address the impacts of the proposed project modifications and the corresponding environmental monitoring plan

Art. 11 of Law 4014/2011 also foresees that more detailed specifications on the contents of the ESIA Amendment study are to be issued by the Ministry of Environment, Energy and Climate Change (MEECC). These specifications were eventually issued by:

- *Ministerial Decision 170225/2014 – Specifications for the contents of environmental permitting dossiers for projects and activities of A category*

This MD provides a detailed table of contents and specifications for project developers drafting ESIA reports, Environmental Terms update or Modification Studies. The present Fourth Amendment to the ESIA complies with the provisions of the MD.

4.3 Changes to the ESIA Legal Framework since ESIA Submission

A number of changes relevant to the environmental permitting framework have taken place since ESIA submission. The most relevant of these changes as well as their effect on the environmental permitting of the TAP Project are discussed below:

- *Ministerial Decision 167563/2013 – Specification of the procedures and the criteria of environmental permitting of projects and activities under art. 3, 4, 5, 6 and 7 of Law 4014/2011, according to art. 2 para 13 of the Law, the special forms of the above procedures and any other issue relevant to these procedures*

The Ministerial Decision (MD) describes the procedures that have to be followed by the developer and the competent authority during the submission and evaluation of the Environmental Impact Assessment and introduces a number of special forms that have to be used for the exchange of information between the two parties. The Ministerial Decision was

issued in April 2013 and came into effect three months after that date, becoming applicable to this ESIA Amendment.

- *L. 4217/2013 – Ratification of the Host Government Agreement (HGA) between the Hellenic Republic and Trans Adriatic Pipeline A.G.*

The HGA sets out the framework by which the Project will be realized and operated on Greek territory. This includes processes related to land easement and acquisition, the implementation of technical, safety, environmental and social standards and authorization.

- *Law 4280/2014 – Environmental upgrade and private urban planning*

In its Chapter C, the Law introduces a number of changes to the pertinent Forest Law, in the direction of facilitating the installation of certain infrastructure projects in forest land, among which natural gas pipelines are found.

- *Ministerial Decision 1649/45/2014 - Specifications for official review by the authorities and stakeholder engagement and participation during the environmental permitting of Category A projects*

The MD provides details for official review by the authorities and stakeholder engagement procedures.

- *Joint Ministerial Decision 36060/1155/2013 – Definition of a framework of rules, measures and procedures for the integrated pollution prevention and control from industrial activities, in compliance with EC Directive 2010/75/EC*

According to art. 2 and Appendix I, the JMD applies to combustion installations with capacity above 50 MW. For such installations, art. 9 of the JMD provides a number of operating principles under the responsibility of the project owner:

- Undertake all appropriate pollution prevention measures
- Apply Best Available Techniques
- Avoid significant environmental pollution
- Prevent waste generation, according to the waste management hierarchy provided in Law 4042/2012

- In case waste is generated, manage them as per the waste management hierarchy of Law 4042/2012 (i.e. reuse, recycle, recover material or energy, or else dispose of in a way that environmental impacts are minimised).
- Use energy efficiently
- Take necessary measures to avoid accidents and their impacts
- Take the necessary measures during decommissioning in order to ensure pollution prevention and appropriate reinstatement.

5 Environmental Cultural Heritage and Socioeconomic Baseline

5.1 Introduction

This section describes the environmental, socioeconomic and cultural heritage resources along the proposed rerouting in Ano Grammatiko and Pentalofos. The description is structured as per the following main headings:

- Physical Environment - including geology, seismicity and geomorphology, soils, groundwater and surface waters, air quality, acoustic environment and landscape.
- Biological Environment – including aquatic and terrestrial habitats, flora and fauna, biodiversity and protected areas.
- Socioeconomic Environment - including land use, demography, employment, education, infrastructure, public services and public health etc.
- Cultural Heritage - including designated and potential archaeological sites, monuments and intangible cultural heritage.

The information presented in this section is based on desktop work and literature search as well as field surveys where necessary.

Due to the macroscopic nature of the physical environment and the relatively small distance between the ESIA basecase and the new basecase, some of the aspects of physical environment present no notable difference between the two routes. In such cases, and in order to avoid repetition, reference is made to the relevant ESIA sections and ESIA Amendment sections.

5.2 Proposed rerouting at Ano Grammatiko (IP 1120-01- IP 1120-27)

5.2.1 Physical environment

5.2.1.1 Geology, Seismicity and Geomorphology

The proposed rerouting crosses geological formations of Tertiary (Neogene-Pliocene) era. The geology varies from solid volcanic rock agglomerates with lava components in sandy detritus to clay and sandy clay material. Some rounded pebbles of metamorphic rocks with sandy clay cement can be found. In course of the route lithology changes to fine-grained serpentine and compact rock of Jurassic and Triassic gabbros and cretaceous marbles, schists and massive

limestones alternating with zones of sandy, marly "flysch" and areas of fine grained alluvial deposits.

With regards to seismicity, the area belongs to zone 1 of low seismicity with acceleration 0.16 g (reference is made to the *Map of the seismic hazard zones of Greece*). Pre-Neogene basement faults of unknown recent activity and Normal high-angle faults (in Kato Grammatiko area) are classified as possibly active. Detailed information on geology, seismicity and geomorphology can be found to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed presentation of geohazards is provided.

5.2.1.2 Soil and subsoil

The dominant soil type in the proposed rerouting is Vertic Calcic Luvisol, a soil type of medium quality, moderately well drained, less prone to erosion but likely to be impacted by compaction.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054) and Section 5 of the ESIA Amendment report (GPL00-EXG-642-Y-TAE-1006).

5.2.1.3 Groundwater and Surface Waters

The proposed rerouting similarly to the ESIA basecase, crosses the Karstic groundwater body of NW Mountain Vermio (code 908a) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60/EC). On the basis of the depth of groundwater table (estimated at approx. 110 mbgl), permeability of the aquifer material and permeability of aquifer overlying strata (karst terrain), the vulnerability of the groundwater is considered high.

No major surface water bodies are found along the Ano Grammatiko rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.2.1.4 Climate and Ambient Air Quality

Climate and air quality information for the Ano Grammatiko rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.2.1.5 Acoustic Environment

Information on the acoustic environment for the Ano Grammatiko rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.2.1.6 Landscape and Visual Amenity

The proposed rerouting crosses mountainous forested areas, comprising broad-leaved forest, transitional woodland-shrub, as well as natural grasslands, heathlands and pastures. More details on landscape types, sensitivity and visual amenity can be found in Section 6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054) and Section 5 of the ESIA Amendment report (GPL00-EXG-642-Y-TAE-1006).

5.2.2 Biological Environment

Mt. Vermio, the wider area of the proposed rerouting belongs to the north-central floristic region of Greece. The degree of endemism is high and involves 34 (3.2%) Greek endemic taxa, 125 (11.7%) Balkan endemics and 56 (5.2%) sub-Balkan endemics. 52 flora taxa of the mountain are included in Red Lists or are protected by international or national legislation.

With regards to birds, Mt. Vermio is not considered an important bird area. Nevertheless, the mountain is bordered by two Special Areas of Conservation, designated under the Natura 2000 framework (according to the Birds Directive 2009/147/EC), i.e. Lake Agras (Limni kai Fragma Agra - GR1240006) and Lake Petron (Limni Petron - GR1340007), the latter being also an Important Bird Area. The proposed rerouting lies approx. 3km northwest of the Natura 2000 site “Oros Vermio” (GR1210001) and less than a kilomentre west of the Leivaditsi-Tovaritsi Wildlife Refuge.

Mt. Vermio is known as a site inhabited by wolves, while bears appear to have recolonised the mountain in the last years, either as frequent visitors or as a permanent population.

In view of the above, field surveys were carried out during August and September 2015, and April 2016, in order to establish the current baseline with regard to flora and vegetation, birds and large carnivores. The main results are presented in the following.

5.2.2.1 Vegetation – flora

The habitat types found in the study area are all widespread in Greece and the Mediterranean Biogeographic Region, with the exception of habitat type 9250. *Quercus trojana*, the key species of habitat type 9250, has a restricted and fragmented distribution and this is speculated to result either from human disturbance or climatic reasons. It is found across Italy, the Balkan Peninsula (Albania, Bulgaria, Greece, former Jugoslavia) and Anatolia. The forests of *Q. trojana* have a relict character. The habitat type 9250 has been recorded in eight (8) sites of the Natura 2000 network in Greece.

The habitat types identified in the area of the proposed rerouting are shown in Annex 3.1 Habitats and Protected Areas (GPL00-EXG-642-Y-TAE-5004_at06).

With regard to flora taxa, in total 14 taxa of those identified in the proposed rerouting area are included in Red Lists or are protected by legislation or are endemic. More specifically, two taxa (*Hesperis theophrasti*, *Ramonda nathaliae*) are protected by national legislation, five taxa (*Iris reichenbachii*, *Neottia nidus-avis*, *Orchis quadripunctata*, *Paronychia macedonica*, *Ramonda nathaliae*) are included in the category “Other Important Species” in Dafis et al. (1996)[2], one taxon (*Fritillaria montana*) is protected by the Bern Convention, two taxa (*Neottia nidus-avis*, *Orchis quadripunctata*) by the CITES Convention, four taxa (*Angelica sylvestris*, *Fritillaria montana*, *Neottia nidus-avis*, *Pulmonaria officinalis*) are included in the IUCN Red list for the vascular plants of Greece and nine taxa (*Angelica sylvestris*, *Genista depressa*, *Hesperis theophrasti*, *Inula verbascifolia*, *Iris reichenbachii*, *Minuartia attica* subsp. *attica*, *Paronychia macedonica*, *Ramonda nathaliae*, *Ranunculus psilostachys*, *Sesleria robusta*) are Balkan endemics or sub-endemics.

None of the above taxa is known to show decreasing population trends. The non-endemic taxa are widespread and their inclusion in the Red List of IUCN is under the status of Least Concern or Data Deficient. The two taxa included in the CITES convention are widespread and according to current knowledge they are not classified into any threat category. *Hesperis theophrasti* is distributed in most Balkan countries as well as in Anatolia. In Greece, it is distributed in five floristic regions (North and South Pindus, North and East Central Greece, Sterea Ellas and West Aegean islands) so it is relatively widespread. The remaining Balkan taxa have a rather wide

[2] Dafis, S., Papastergiadou, E., Georghiou, K., Babalonas, D., Georgiadis, T., Papageorgiou, M., Lazaridou, T. & Tsiaoussi, V. 1996. Directive 92/43/EEC - The Greek “Habitat” project NATURA 2000: An overview. Life Contract B4-3200/94/756, Commission of the European Communitities DG XI, the Goulandris Natural History Museum, Greek Biotope/Wetland Centre.

distribution in Greece, occurring in at least four floristic regions. *Fritillaria montana* is probably a species of European (wide) distribution although reported from only a few sites in Mt. Vermio3.

The only species that is of significant conservation value in the area is *Ramonda nathaliae*: this is a Balkan endemic, distributed in Greece and Serbia. In Greece, its distribution is confined within only one floristic region, that of North-Central Greece. This species is also protected by national legislation (PD67/81). It belongs to the tropical family of Gesneriaceae, of which only five species have remained in Europe. Nevertheless, it should be noted that *Ramonda nathaliae* forms many populations in North-Central Greece, and no threat has been recorded for them until today. As this species occurs on calcareous cliffs, it has been not severely impacted by human activities and the only threat that the species is speculated to face in the near future is climate change.

5.2.2.2 Avifauna

Ten species of conservation importance were observed in the wider area of the proposed rerouting: the Black Stork (*Ciconia nigra*), the Short-toed Snake Eagle (*Circaetus gallicus*), the Honey Buzzard (*Pernis apivorus*), the Levant Sparrowhawk (*Accipiter brevipes*), the Peregrine Falcon (*Falco peregrinus*), the Rock Partridge (*Alectoris graeca*), the Black Woodpecker (*Dryocopus martius*), the Middle Spotted Woodpecker (*Dendrocopus medius*), the Woodlark (*Lullula arborea*) and the Red-backed Shrike (*Lanius collurio*).

The area of the proposed rerouting appears to be frequented as a foraging ground by black stork and birds of prey (Short-toed eagle, Levant sparrowhawk); nevertheless, no evidence of breeding was recorded for any of them. A minor migratory flow was witnessed during the August 2015 survey, consisting mainly of birds of prey and passerines trying to cross the Vermion range from north to south. The species observed though, commonly migrate over mainland Greece at a broad front. The spring migration flow witnessed during the April 2016 survey consisted of only very few passerine birds of no special conservation importance.

5.2.2.3 Large carnivores

A number of field methods were employed in order to identify presence of large carnivores (i.e. wolf *Canis lupus*, brown bear *Ursus arctos)* in the area of the proposed rerouting. These included:

- Habitat evaluation

[3] IUCN data, http://www.iucnredlist.org/details/165151/0, accessed 6 June 2016

- Interviews with local people (shepherds, hunters)
- Transects for recording large carnivore signs
- Howling sessions
- Habitat /homesite modelling

In total there have been twenty-one (21) events of wolf presence in the area. Wolf reproduction was more evident during the ESIA surveys as it was reported more frequently from the locals at that time. In the current surveys wolf reproduction was reported only once, but several kilometres north of the proposed rerouting. Field signs (tracks, marks) were more evident east of the rerouting area but this is probably related to the lack of livestock grazing there during the survey periods. Nevertheless, one wolf was observed live close to Kato Grammatiko village, during night driving in October 2015.

In summary these data indicate permanent presence of wolves in the study area with a minimum pack size of 3-7 animals.

With regard to the bear, there is limited evidence of bear presence in the area of the proposed rerouting, and all such evidence has been the result of 2015 and 2016 surveys and not of the ESIA ones. A local shepherd reported sighting one female bear with a cub in early autumn 2015 in the area of the proposed rerouting. However, most of the evidence suggests strong presence in the areas east of the proposed rerouting (i.e. Pyrgoi area).

5.2.3 Socioeconomic Environment

The proposed rerouting maintains the same administrative setting (i.e. belongs to the same municipality) as the approved location. There are no changes to the socioeconomic baseline compared to the ESIA. Reference is therefore made to ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054) which provides information on the socioeconomic environment of the area.

5.2.4 Cultural Heritage Environment

The cultural heritage environment baseline for the proposed rerouting was established during a dedicated field survey carried out in August 2015. A total of eight (8) cultural heritage sites were identified within a 2km corridor of Ano Grammatiko rerouting. The most notable sites from this area include:

- Fortress southwest of Kato Grammatiko, in the area of Vasilikos Hill. Remains of an ancient stone fortress with a wall of 1.5 m thickness (**CH-210b**)

- Ancient settlement. Roman pottery scatters are reported at the entrance of the village (**CH-204**)

- Aghios Ioannis chapel (**AM 146**)

Table 5-1 below presents an inventory of the cultural heritage sites in the area of the proposed rerouting. The locations of these sites are presented in Annex 3.4 Cultural Heritage (GPL00-EXG-642-Y-TAE-5004_at09).

Table 5-1 ***Cultural Heritage Sites in the Area of Ano Grammatiko Rerouting***

IP	CH site code	CH site name	Source	Distance to centerline (m)	Site Type	Description	Date
1120-19 to 1127	AM149a	Kato Grammatiko9a	Map study (HMGS topomaps)	40	AHAP	Cropmark enclosure that could possibly indicating a CH site	Uncertain
1120-18 to 1120-19	AM149b	Kato Grammatiko9b	Map study (HMGS topomaps)	60	AHAP	Cropmark (could possibly indicating a CH site)	Uncertain
1120-05	AM148	Kato Grammatiko7	Oral consultation with locals	350	ICH	Information on an old water mill	Uncertain, possibly contemporary
1120-06-4	AM151	Kato Grammatiko10	Ground truthed in August 2015 FS	500	AHAP	Extended stone cairns visible on the east slope of the mountain south of Vassilikos mountain	Uncertain
1128 to 1129	AM146	Kato Grammatiko5	Map study (HMGS topomaps)	880	M	Aghios Ioannis chapel	Uncertain
1120-06-3 to 1120-06-4	CH-210b	Kato Grammatiko Fortress 4	Ground truthed in August 2015 FS	90	AS	Fortress southwest of Kato Grammatiko, in the area of Vasilikos Hill. Remains of an ancient stone fortress with a wall of 1.5 m thickness	Uncertain
1117	CH-204	Ano Grammatiko 2	Site list from LPD at the Greek Ministry of Culture	970	AS	Ancient settlement. Roman pottery scatters are reported at the entrance of the village	Roman

Source: EXERGIA (August 2015)

5.3 Proposed rerouting at Pentalofos (IP 0718 – IP 0721)

5.3.1 Physical environment

5.3.1.1 Geology, Seismicity and Geomorphology

The proposed rerouting crosses the same geological formations as the basecase route, i.e. mainly loose materials (alluvial deposits & neogene sediments). The rest formations are limestones, schist, conglomerate which are characterized as hard rocky formations of Triassic - Jurassic age and a small appearance of Gabbros of Ophiolitic type.

With regards to seismicity, the area belongs to zone 1 of low seismicity with acceleration 0.16 g, as well as zone 2 of medium seismicity with acceleration 0.24 g (reference is made to the *Map of the seismic hazard zones of Greece*). Detailed information on geology, seismicity and geomorphology can be found to Section 6.2.2.2 of the ESIA (GPL00-ASP-642-Y-TAE-0054) where a detailed presentation of geohazards is provided.

5.3.1.2 Soil and subsoil

The dominant soil type in the proposed rerouting is Vertic Calcic Luvisol of medium quality, moderately well drainaged, moderate erosion sensitivity and moderate compaction sensitivity.

More details on soil types and characteristics can be found in Section 6.2.3 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.3.1.3 Groundwater and Surface Waters

The proposed rerouting similarly to the ESIA basecase, crosses the Gallikos porous groundwater body (1005) according to the classification prepared by IGME and adopted by MEECC under the requirements of the Water Framework Directive (2000/60/EC). On the basis of the depth of groundwater table (estimated at approx. 8-25 mbgl), permeability of the aquifer material and permeability of aquifer overlying strata, the vulnerability of the groundwater is considered high.

No major surface water bodies are found along the Pentalofos rerouting.

More details on groundwater and surface waters can be found in Sections 6.2.4 and 6.2.5 of the ESIA (GPL00-ASP-642-Y-TAE-0054) respectively.

5.3.1.4 Climate and Ambient Air Quality

Climate and air quality information for the Pentalofos rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.6 of the ESIA (GPL00-ASP-642-Y-TAE-0054).

5.3.1.5 Acoustic Environment

Information on the acoustic environment for the Pentalofos rerouting is the same as the corresponding information for the ESIA basecase route. Reference is made to section 6.2.7 of the ESIA (GPL00-ASP-642-Y-TAE-0054_00).

5.3.1.6 Landscape and Visual Amenity

The proposed rerouting crosses same type of land as the basecase route, comprising complex cultivation patterns and riparian vegetation. More details on landscape types, sensitivity and visual amenity can be found in Section 6.2.8 of the ESIA (GPL00-ASP-642-Y-TAE-0054) and Section 5 of the ESIA Amendment report (GPL00-EXG-642-Y-TAE-1006).

5.3.2 Biological Environment

The rerouting crosses approx. 410 m of *pseudomaquis* (Habitat type 5350) and 155 m of grassland (Habitat type 62A0) within the corridor of the main route, the rest being cultivations and shrubland. It should be noted that the section between IP0718-3 and IP0721 is located within the flood zone of river Gallikos. The river is of seasonal flow and there are years where even in wet months the flow is not continuous.

The rerouting area is located outside the reported ranges of the jackal (*Canis aureus*) and the wolf (*Canis lupus*). At the beginning of the 2000s, the souslik (*Spermophilus citellus*) was known (Papapavlou, unpublished data) to inhabit the Gallikos delta in Kalohori, approx. 15km south of the rerouting but there is no recent published information neither on the status of the colony there nor in upstream sections of the river. The TAP preconstruction 2016 surveys[4] along the pipeline corridor in Nea Mesimvria and westward to Axios river (approx. 6 km from the rerouting) did not provide evidence of surviving souslik colonies there.

The TAP preconstruction 2015 avifauna surveys provide data on a *Riparia riparia* colony within the Gallikos flood zone (the colony is located approx. 125m east of the rerouting). The species might persist there if the colony has endured 2015 winter floods. *Melanocorypha calandra* is also

[4] TAP RSK EXERGIA preconstruction surveys *Spermophilus citellus*, report in preparation

known to breed in the area mostly outside the corridor but could well move within the corridor from one year to the next. *Lanius minor* also breeds in cultivations west of IP0723 and it could well be present more extensively in the region even within cultivations and shrubland in the rerouting. The turtle dove (*Streptopelia turtur*) breeds within the corridor in Gallikos area and the long-legged buzzard (*Buteo rufinus*) is anticipated to breed in the hills east of the river and north of the route, outside the main corridor.

5.3.3 Socioeconomic Environment

The proposed rerouting maintains the same administrative setting (i.e. belongs to the same municipality) as the approved location. There are no changes to the socioeconomic baseline compared to the ESIA. Reference is therefore made to ESIA Section 6 - Environmental, Socio-economic and CH Baseline (GPL00-ASP-642-Y-TAE-0054) which provides information on the socioeconomic environment of the area.

5.3.4 Cultural Heritage Environment

The dedicated field survey in the area of Pentalofos rerouting in August 2015 did not reveal any significant new findings in terms of tangible or intangible cultural heritage. The most important archaeological sites in the wider area of the rerouting comprise the following:

- The Archaeological area of Pentalofos near Oreokastro, an officially recognized archaeological site comprising a settlement-tuba and bank, a burial tomb, and a settlement-tuba on a bank (CH-31LT-E)
- Flat areas of land with ceramic scatters and roof tiles in low density (CH-37-E, CH-38-E and CH-39-E)

The locations of these sites are presented in Annex 3.4 Cultural Heritage (GPL00-EXG-642-Y-TAE-5004_at09).

6 Stakeholder Engagement

Stakeholder Engagement Activities related to the TAP Project are desribed in detail in Section 7 of the ESIA (GPL00-ASP-642-Y-TAE-0055).

Consultation with stakeholders is part of the ongoing Stakeholder Engagement Plan of the TAP Project. The proposed reroutings of the present report are the result of requests from certain stakeholders and all affected parties are informed about the proposed changes. During the public disclosure procedure, TAP will hold public meetings to present the findings of the Amendment Report.

7 Environmental Monitoring Results

The engineering design for the TAP Project is almost concluded and the tendering process is being completed. **No works for any of its components have been undertaken and therefore no monitoring results are available**.

8 Impact Assessment and Mitigation Measures

8.1 Introduction

This Section identifies and assesses the environmental, socioeconomic and cultural heritage impacts and risks of the proposed reroutings and provides a description of the foreseen measures to address them.

Significance of the residual impacts and risks are assessed taking the implementation of mitigation measures into account. These are either built-into the project design, *i.e.* basically by the routing and siting efforts to avoid or minimise conflicts with the natural, socioeconomic and cultural heritage environment, and using best available techniques as a facility design reference, or are in addition identified as part of the assessment. The latter measures will need to be detailed and implemented in the final design of the Project.

Reference is made to Annex 5 of the ESIA (GPL00-ASP-642-Y-TAE-0053-at01) where details of assessment of impacts methodology are presented. Similarly to the ESIA, the scope of the assessment in this ESIA Amendment covers the three main phases of the Project:

- Construction and Pre-commissioning;
- Operational and Maintenance; and
- Decommissioning and Reinstatement.

The assessment of impacts of each rerouting will be resource/receptor led. Each rerouting is presented in a systematic manner detailing the following:

- **Predicted impacts** – the sensitivity of the affected resource/receptor and the magnitude of the potential impact/risk, prior to the implementation of any mitigation measure;
- **Mitigation measures to address the impact / risk** – the key measures adopted, as well as a discussion on the various alternatives considered where appropriate; and
- **Significance of residual impacts** – the significance of any remaining impacts after the incorporation of mitigation, whether not significant, minor, moderate or major (major impacts are likely to be of high stakeholder concern).

Impacts assessed in the following *sections* are therefore those that could not be avoided or mitigated further through route refinement and which require complementary mitigation

measures. It should be clarified that the route refinement is an on-going process based on available constraints and data. During the preconstruction phase, additional on-site route optimisation will be undertaken to further minimise potential project impacts.

The present Section presents the measures to avoid, mitigate or offset adverse impacts and to minimise and manage risks on the environment, workforce and local population from Project activities that may cause harm or nuisance.

8.2 Grammatiko Rerouting

8.2.1 Physical environment

8.2.1.1 Soil and subsoil

Key potential impacts to soil and subsoil relevant to construction, operation and decommissioning of pipeline sections are presented below.

Table 8-1 Key Potential Impacts - Subsurface and Soil

Construction Phase	*Operations Phase*	*Decommissioning Phase*
• Disturbance and degradation of soil due to compaction • Accidental pollution of soil by solid and liquid wastes or spills of hydrocarbons / fuels	• No key potential impacts foreseen	• Accidental pollution of soil by accidental spills, solid and liquid wastes

Source: ERM (2013)

The area of Ano Grammatiko rerouting does not host any permanent installations, therefore permanent changes of ground surface and loss of soil are not relevant. Due to soil characteristics, soil erosion is not expected to be an issue; however, construction activities (mainly removal of vegetation, trenching and movements of construction machinery and vehicles) carried out along the working strip can lead to soil compaction.

To avoid or reduce compaction, established mitigation methods will be applied during construction and reinstatement and soils in the construction strip are anticipated to return to previous use. The removal and storage of topsoil, subsoil and any parent material will be managed to facilitate the restoration stage. The site will be re-vegetated immediately after construction, while construction will take place mostly in dry periods. Additionally, deep ploughing will be applied immediately after construction.

The risk for soil pollution through accidental spills of fuels and lubricant or improper disposal of waste and wastewater will be minimised by appropriate wastewater treatment, waste

management, proper storage and management of polluting substances, *i.e.* good housekeeping practices in construction by the EPC contractor. A *Spill Contingency and Response Plan* to prevent and respond to any spill will be implemented. Accidentally polluted soil will be excavated and disposed of as waste according to the type of pollution.

Details on standard impact assessment and mitigation measures relevant to soil and subsoil are provided in section 8.5 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.2.1.2 Groundwater and Surface Waters

Key potential impacts associated to freshwater resources in the area of Ano Grammatiko rerouting are mostly related to accidental pollution of freshwater resources during construction by solid, liquid wastes or hydrocarbons / fuels. Despite the fact that the water table is relatively deep (approx. 110 m bgl) the fact that the substrate is karstic increases the risk of a potential spill finding its way to the groundwater.

Accidental pollution of water resources by solid, liquid wastes and accidental spill of hydrocarbon/ fuels, can occur through the following construction activities:

- Production and disposal of solid and liquid wastes. Wastes generated during construction are classified into the following four categories: inert (without risk of pollution), domestic (to be transported to a controlled municipal waste disposal site), oily and hazardous (to be segregated for collection and disposal by specialist contractors), and liquids (“black” and “grey” water from construction and operation camps, rainwater from sealed surfaces and roofs);

- Storage and handling of fuels and chemicals, to be used for construction machinery. Accidental spills from vehicles, storage tanks and chemical stores, metalworking and welding can pollute water resources.

Standard mitigation measures to address potential impacts associated to freshwater resources have been analysed in section 8.4 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.2.1.3 Climate and Ambient Air Quality

The key potential impacts on climate and ambient air quality relevant to construction, operation and decommissioning of pipeline sections are presented in the table below.

Table 8-2 Key Potential Impacts – Ambient Air Quality

Construction Phase	*Operations Phase*	*Decommissioning Phase*
• Temporary impacts on local air quality due to atmospheric emissions during the project construction from construction machinery and vehicle movements. Main pollutant emitted will be PM (particulate matter, dust).	• Vehicle movements associated with maintenance will be minimal, therefore no key potential impacts foreseen.	• No key potential impacts foreseen

Source: ERM (2013)

Taking into account that no settlements are located closer than 200m from the proposed rerouting in Mt. Vermio area, no significant impacts relevant to climate and ambient air quality are anticipated during construction. In any case, standard mitigation measures such as dust suppression by water spraying will be applied where dust generating activities like earthworks or transport on unpaved roads take place in the immediate vicinity of settlements. Details on impact assessment and mitigation measures relevant to climate and ambient air quality are provided in section 8.2 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.2.1.4 Acoustic Environment

The key potential impacts relevant to the acoustic environment during the construction, operation and decommissioning of pipeline sections are presented in the table below.

Table 8-3 Key Potential Impacts – Acoustic Environment

Construction Phase	*Operations Phase*	*Decommissioning Phase*
• Disturbance of nearby settlements from working sites • Potential for sleep disturbance; day and night-time nuisance and potential stress from construction activity noise	• No key potential impacts foreseen	• Disturbance of nearby settlements from working sites • Potential for sleep disturbance; potential stress from decommissioning activity noise

Source: ERM (2013)

Taking into account that there are no settlements closer than 200m from Ano Grammatiko rerouting in the Mt. Vermio area, no significant impacts to the acoustic environment are foreseen. Standard mitigation measures, such as limiting construction activities to daytime hours, will be applied in any case. Details on impact assessment and mitigation measures relevant to the acoustic environment are provided in section 8.3 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.2.1.5 Landscape and Visual Amenity

Grammatiko rerouting in Mt. Vermio area will cross mountain forested areas, a landscape character type of high sensitivity (reference is made to section 8.6 of the ESIA (GPL00-ASP-642-

Y-TAE-0056), where details on impact assessment and mitigation relevant to landscape are provided). However, any impacts to visual amenity will be limited during the construction period, while after reinstatement the pipeline will not be visible at all. Therefore, impacts to landscape and visual amenity are considered minor.

8.2.2 Biological Environment

The following table presents the key potential impacts of Ano Grammatiko rerouting on ecology during its key phases.

Table 8-4 Key Potential Impacts - Ecology

Activity	*Construction Phase*	*Operational & Maintenance Phase*	*Decommissioning Phase*
Flora Habitat loss	X		X
Disturbance and / or displacement of animals from general construction activities	X		X

Source: Exergia (2016)

In the following Sections, each potential impact is being assessed, giving information on how each source is likely to have an impact on receptors and the mitigation measures inbuilt within the Project.

8.2.2.1 Construction and Pre-commissioning Phase

8.2.2.1.1 Potential Impact

Flora Habitat Loss

Six (6) habitat types are reported within the rerouting corridor: five (5) of them are included in Annex I of the Directive 92/43/EU, while the sixth one (925A) is of national interest. Habitat type 9250 has a restricted distribution, reported from only eight (8) sites of the Natura 2000 network in Greece. An additional important feature of the habitat type 9250 in the study area is that it hosts aged individuals of *Quercus trojana* of high diameter and height. This fact increases the conservation value of the stands of 9250 in the study area.

With regards to the flora, one taxon can be considered of increased conservation interest, *Ramonda nathaliae*, which is a relict species of the Tertiary era, belonging to a tropical angiosperm family with only five representatives in Europe. This taxon is a Balkan endemic and its distribution in Greece is restricted within one floristic region.

However, both the 9250 habitat type as well as the taxon *Ramonda nathaliae*, are not endangered and their distribution as well as the size of the populations of the plant taxon are not decreasing and are not known to be under threat. As a result, impacts related to the presence of the 9250 habitat type and the taxon *Ramonda nathaliae* in the study area are considered of moderate significance.

Disturbance and Displacement of Fauna

Birds

The field surveys in April 2016 produced no additional evidence of protected bird breeding territories crossed by the proposed rerouting. Cutting through the forested part may affect the middle-spotted woodpecker (and not so the black woodpecker which is found further uphill). Construction activities might disturb the black storks foraging in the area as well as the Levant sparrowhawks. Cutting through the scrubby vegetation may destroy nests of *Lanius collurio* and *Lullula arborea* which are speculated to breed in the vicinity of the pipeline corridor. The relevant impacts are considered of minor significance.

Large carnivores

The ESIA route from IP1118 to IP1127 crosses an area of high wolf habitat suitability and high bear moving/foraging habitat suitability. The proposed rerouting seems to circumvent this area although still crosses important bear habitat for moving and foraging and wolf habitat in general.

In specific, the proposed rerouting still bisects very highly suitable habitats for large carnivores. In particular, it crosses the border area of high wolf habitat suitability between IP1120-13 and IP1127; the pipeline corridor area of the rerouting is considered excellent for bear foraging and moving, but this is a general feature for this part of Mt. Vermio. The amount of vegetation – forest removed due to pipeline construction is somewhat reduced compared to the initial route. Moreover, the rerouting bisects the rocky steep ravine of a tributary of Kato Grammatiko stream with permanent water flow, suitable as a resting area for both species, as well as a second currently un-fragmented ravine of seasonal or torrential flow in a rocky and steep terrain.

The relevant impacts are considered of moderate to major significance.

8.2.2.1.2 Mitigation Measures

Flora Habitat Loss

General measures to minimise habitat loss are described in Section 8.7.2.2.1 of the ESIA (GPL00-ASP-642-Y-TAE-0056). The most relevant of these measures are:

- Establishment of working strip to restrict area of impact to within working corridor;
- Pre-construction habitat surveys must be conducted so as to identify specific issues.
- Access road upgrading will follow existing tracks and trails where possible;
- Construction facilities to be sited on unused land of no particular ecological value;
- No construction materials will be taken from the surrounding environment unless approved by the competent authority;
- Establish a pre/post construction biodiversity baseline from which all mitigation, restoration, and loss / degradation can be measured;
- Ecological awareness training should be provided to all personnel.

Specific mitigation measures to minimize the disturbances on habitat type 9250 and to avoid a negative effect on the *Ramonda nathaliae* population are the following:

- Cutting of *Quercus trojana* individuals, and especially those of older age should be maintained at the lowest possible level
- *Ramonda nathaliae* was found in a small area of few square meters about 120 m from the pipeline corridor. Avoid blasting in this site, long-term alterations of the water level and logging.

Disturbance and Displacement of Fauna

General mitigation measures to address disturbance and displacement of fauna are provided in the ESIA – Section 8.7.2.2.4 (GPL00-ASP-642-Y-TAE-0056). The following specific measures are more relevant to Ano Grammatiko rerouting.

Breeding birds

- Where possible undertake vegetation clearing (of trees, bushes etc.) of pipeline working strip before or after the breeding season, i.e. before March 1st or after September 30th. This will also favor the foraging species breeding outside the project area as well as local populations of common bird species

Large carnivores

- Reduce working strip in the rerouting area when area is forest or scrubland.
- Avoid dawn-dusk and nighttime works where wolves, bears and other wildlife are mostly active around dens and homesites.
- Avoid blasting.
- Check for wildlife trapped in the trench each morning
- Trucks and other machinery should use only main forest road already under formal use.
- Allow for natural forest regeneration at the working strip, as far as possible.
- Negotiate a reduction in livestock grazing for 10 years after construction to allow natural forest regeneration and to protect plantations.
- Protect steep slopes from erosion.
- No hunting during the construction period.

8.2.2.1.3 Residual Impacts

The implementation of the above mentioned mitigation measures will reduce impact significance as follows:

- For vegetation and habitats, from moderate to minor significance
- For birds, from minor significance to not significant
- For large carnivores, from moderate / major significance to minor / moderate

8.2.2.2 Operations and Maintenance Phase

There are no anticipated impacts on biotic environment during the operation and maintenance phase of Ano Grammatiko rerouting. Reference is made to general mitigation measures during pipeline operation and maintenance in Section 8.4.3 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.2.2.3 Decommissioning Phase

It is expected that the same type of equipment, machinery and vehicles, with the ones used for construction, are to be used during decommissioning. As a result, similar impacts, mitigation measures and residual impacts are expected as for the construction phase.

8.2.3 Socioeconomic Environment

Considering that the socioeconomic environment along Ano Grammatiko rerouting is equivalent to that of ESIA basecase in the area, the anticipated socioeconomic impacts are the same. A detailed description of these impacts and of the respective mitigation measures on economy, employment and income, land and livelihoods, infrastructure and public services, community health and safety, traffic and transport is presented in Sections 8.10-8.16 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.2.4 Cultural Heritage Environment

Key potential impacts relevant to cultural heritage from the construction, operation and decommissioning of the Ano Grammatiko rerouting may include the following:

- Direct physical disturbance of or damage to CH sites;
- Degradation of or damage to above-ground structures due to pollution or vibration;
- Disruption to visitors of cultural heritage sites;
- Negative effects on the setting or ambience of cultural heritage sites.

However, in the case of Ano Grammatiko rerouting, cultural heritage surveys have not identified any potential site of cultural heritage interest relatively close to the construction corridor (i.e. at a distance of 50m), with the exception of cropmarks likely to indicate presence of cultural heritage findings. The most important CH site in the area, the Fortress in Kato Grammatiko, an ancient

stone fortress with a wall of 1.5 m thickness (CH-210b), is about 90 m away from the proposed rerouting. Therefore, no impacts to cultural heritage are anticipated.

8.2.5 Approval from authorities

TAP AG has contacted the competent Ephorate of Archaeology of Pella and the Forestry Office of Edessa, which have both issued their positive opinion on the proposed changes. The relevant correspondence is provided in Annex 5 (GPL00-EXG-642-Y-TAE-5004_at12).

8.3 Pentalofos Rerouting

8.3.1 Physical environment

8.3.1.1 Soil and subsoil

Key potential impacts to soil and subsoil relevant to construction, operation and decommissioning of pipeline sections are presented below.

Table 8-5 Key Potential Impacts - Subsurface and Soil

Construction Phase	*Operations Phase*	*Decommissioning Phase*
• Disturbance and degradation of soil due to compaction • Accidental pollution of soil by solid and liquid wastes or spills of hydrocarbons / fuels	• No key potential impacts foreseen	• Accidental pollution of soil by accidental spills, solid and liquid wastes

Source: ERM (2013)

The area of Pentalofos rerouting does not host any permanent installations, therefore permanent changes of ground surface and loss of soil are not relevant. Due to soil characteristics, soil erosion is not expected to be an issue; however, construction activities (mainly removal of vegetation, trenching and movements of construction machinery and vehicles) carried out along the working strip can lead to soil compaction.

To avoid or reduce compaction, established mitigation methods will be applied during construction and reinstatement and soils in the construction strip are anticipated to return to previous agricultural productivity. The removal and storage of topsoil, subsoil and any parent material will be managed to facilitate the restoration stage. The site will be re-vegetated immediately after construction, while construction will take place mostly in dry periods. Additionally, deep ploughing will be applied immediately after construction.

The risk for soil pollution through accidental spills of fuels and lubricant or improper disposal of waste and wastewater will be minimised by appropriate wastewater treatment, waste management, proper storage and storage of polluting substances, *i.e.* good housekeeping practices in construction by the EPC contractor. A *Spill Contingency and Response Plan* to prevent and respond to any spill will be implemented. Accidentally polluted soil will be excavated and disposed of as waste according to the type of pollution.

Details on standard impact assessment and mitigation measures relevant to soil and subsoil are provided in section 8.5 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.3.1.2 Groundwater and Surface Waters

Key potential impacts associated to freshwater resources in the area of Pentalofos rerouting are mostly related to accidental pollution of freshwater resources during construction by solid, liquid wastes or hydrocarbons / fuels. The water table is shallow which increases the risk of a potential spill finding its way to the groundwater.

Accidental pollution of water resources by solid, liquid wastes and accidental spill of hydrocarbon/ fuels, can occur through the following construction activities:

- Production and disposal of solid and liquid wastes. Wastes generated during construction are classified into the following four categories: inert (without risk of pollution), domestic (to be transported to a controlled municipal waste disposal site), oily and hazardous (to be segregated for collection and disposal by specialist contractors), and liquids (“black” and “grey” water from construction and operation camps, rainwater from sealed surfaces and roofs);

- Storage and handling of fuels and chemicals, to be used for construction machinery. Accidental spills from vehicles, storage tanks and chemical stores, metalworking and welding can pollute water resources.

Standard mitigation measures to address potential impacts associated to freshwater resources have been analysed in section 8.4 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.3.1.3 Climate and Ambient Air Quality

The key potential impacts on climate and ambient air quality relevant to construction, operation and decommissioning of pipeline sections are presented in the table below.

Table 8-6 Key Potential Impacts – Ambient Air Quality

Construction Phase	*Operations Phase*	*Decommissioning Phase*
• Temporary impacts on local air quality due to atmospheric emissions during the project construction from construction machinery and vehicle movements. Main pollutant emitted will be PM (particulate matter, dust).	• Vehicle movements associated with maintenance will be minimal, therefore no key potential impacts foreseen.	• No key potential impacts foreseen

Source: ERM (2013)

Taking into account that no settlements are located closer than 200m from the proposed rerouting, no significant impacts relevant to climate and ambient air quality are anticipated during construction. In any case, standard mitigation measures such as dust suppression by water spraying will be applied where dust generating activities like earthworks or transport on unpaved roads take place in the immediate vicinity of settlements. Details on impact assessment and mitigation measures relevant to climate and ambient air quality are provided in section 8.2 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.3.1.4 Acoustic Environment

The key potential impacts relevant to the acoustic environment during the construction, operation and decommissioning of pipeline sections are presented in the table below.

Table 8-7 Key Potential Impacts – Acoustic Environment

Construction Phase	*Operations Phase*	*Decommissioning Phase*
• Disturbance of nearby settlements from working sites • Potential for sleep disturbance; day and night-time nuisance and potential stress from construction activity noise • Potential temporary disturbance and/or displacement of fauna (*e.g.* reduction of usable habitat) from construction activity noise	• No key potential impacts foreseen	• Disturbance of nearby settlements from working sites • Potential for sleep disturbance; potential stress from decommissioning activity noise • Potential temporary disturbance and/or displacement of fauna (*e.g.* reduction of usable habitat) from decommissioning activity noise

Source: ERM (2013)

Taking into account that there are no settlements closer than 200m from Pentalofos rerouting, no significant impacts to the acoustic environment are foreseen. Standard mitigation measures, such as limiting construction activities to daytime hours, will be applied in any case. Details on impact assessment and mitigation measures relevant to the acoustic environment are provided in section 8.3 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.3.1.5 Landscape and Visual Amenity

Pentalofos rerouting in Gallikos plain will cross mainly cultivated areas, a landscape character type of low sensitivity (reference is made to section 8.6 of the ESIA (GPL00-ASP-642-Y-TAE-0056), where details on impact assessment and mitigation relevant to landscape are provided). In addition, any impacts to visual amenity will be limited during the construction period, while after reinstatement the pipeline will not be visible at all. Therefore, impacts to landscape and visual amenity are considered minor.

8.3.2 Biological Environment

Since the proposed rerouting lies mostly within the pipeline corridor, which has been studied extensively during ESIA preparation, and taking into consideration that the area does not host any habitats or species of conservation interest, likely impacts on the biological environment associated with the proposed rerouting construction, operation and decommissioning, are covered in the ESIA and are not duplicated here. Reference is made to Section 8 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.3.3 Socioeconomic Environment

Considering that the socioeconomic environment along Pentalofos rerouting is equivalent to that of ESIA basecase in the area, the anticipated socioeconomic impacts are the same. A detailed description of these impacts and of the respective mitigation measures on economy, employment and income, land and livelihoods, infrastructure and public services, community health and safety, traffic and transport is presented in Sections 8.10-8.16 of the ESIA (GPL00-ASP-642-Y-TAE-0056).

8.3.4 Cultural Heritage Environment

Key potential impacts relevant to cultural heritage from the construction, operation and decommissioning of the Pentalofos rerouting may include the following:

- Direct physical disturbance of or damage to CH sites;
- Degradation of or damage to above-ground structures due to pollution or vibration;
- Disruption to visitors of cultural heritage sites;
- Negative effects on the setting or ambience of cultural heritage sites.

However, in the case of Pentalofos rerouting, cultural heritage surveys have not identified any potential site of cultural heritage interest relatively close to the construction corridor (i.e. at a distance of 50m). Therefore, no impacts to cultural heritage are anticipated.

8.3.5 Approval from authorities

TAP AG has contacted the competent Archaeology Ephorate of Thessaloniki and the Forestry Office of Thessaloniki, which have both issued their positive opinion on the proposed changes. The relevant correspondence is provided in Annex 5 (GPL00-EXG-642-Y-TAE-5004_at12).

9 Conclusions

The present Fourth Amendment to the ESIA describes two changes introduced to the pipeline route after the modification of the Environmental Terms Approval Decision in 16/06/2016. These changes, in Ano Grammatiko and Pentalofos, have taken place as a result of engineering investigations or as a result of feedback that the project team received from affected stakeholders during the ongoing Stakeholder Engagement process.

These changes were demonstrated to be rather small compared to the size of the TAP Project in Greece. However, the project team undertook a thorough investigation of the relevant areas, including field surveys where necessary, in order to ensure that likely impacts to the environment, society and cultural heritage are duly identified, assessed and mitigated.

The project team's investigations, with the information that has been gathered both from the field surveys that took place during the preparation of this Report and all the data that has been used during the main ESIA, revealed that likely impacts and mitigation measures due to the project modifications are largely similar to the ones already described in the ESIA. The most notable of these are described in the relevant Sections of this ESIA Amendment, while reference is made to Sections of the ESIA in order to avoid duplication of information.

In short, the proposed modifications pose no additional burden to the environment (including physical, biological, socioeconomic and cultural heritage) compared to the ESIA, as the impacts identified are not significant or of minor significance. Standard and specific mitigation measures, as described in the ESIA or this ESIA Amendment, are put in place to ensure that the environmental footprint of the Project and the proposed modifications is minimised.

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