Trans Adriatic Pipeline

ESIA Albania
Annex 5 – Baseline and Impact Assessment Methodolodgy

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5 BASELINE AND IMPACT ASSESMENT METHODOLOGY

5.1 Baseline Methodology

5.1.1 Introduction

A wide range of methodologies were used in developing the TAP environmental baseline in Albania. *Section 5* of the ESIA Report presents a summary of the generic methodology used by all teams in collecting baseline data.

This annex provides a summary of all methodologies utilised for each of the environmental, socioeconomic and cultural disciplines, as well as criteria from which the current quality and importance of features can evaluated. Limitations have also been listed in *Section 6* of the Report. As the methods for particular analysis (e.g. water samples) can be particularly technical, *Annex 6 Baseline Data* should be read in conjunction with this Section for further details. Furthermore, mapping indicating sample points and the study area is also provided in *Annex 4 Baseline Maps and Photographic Reports,* this Annex should also be referred to throughout.

5.1.2 Offshore and Nearshore Physical Environment

5.1.2.1 Oceanography

The oceanographic data is based upon a range of long term data sets including region wide circulation models, current modelling, temperature, current speed and direction modelling from the literature. Further data is derived from long term data sets for the wave and tide regimes, providing important height and direction information.

5.1.2.2 Climate and Air Quality

The climate and air quality data is derived from offshore wind stations providing average wind speed and direction data. Specific air quality information is not available for the offshore environment, therefore general conclusions on the offshore air quality have been drawn based upon the nature of offshore emissions and the onshore coastal datasets.

5.1.2.3 Seabed Geology and Morphology

The seabed geology and morphology data is provided from a combination of literature sources and survey data from the 2011 environmental and geophysical survey. The following sources provide the baseline data;

2011 sediment analysis conducted as part of the 2011 environmental survey presented in *Section 6.2.3* of *Section 6, Environmental, Social and Cultural Baseline* of the ESIA;

- Desk based review presented in *Section 6.2.5* and *Section 6.2.6* of *Section 6, Environmental, Social and Cultural Baseline* of the ESIA;

5.1.2.4 Water Quality

Water quality is described in line with the Water Framework Directive. With this objective the physico-chemical characteristics were assessed through a combination of field survey as laid out in *Section 6.2.3* of *Section 6, Environmental, Social and Cultural Baseline* of the ESIA, and through analysis of available literature.

5.1.2.5 Summary of Activities Performed in the Field

The following activities were performed in the field with regard to the Offshore Physical Environment:

- Confirmation and identification of the sediment type through sampling and laboratory analysis;
- Identification of water and sediment physico-chemical properties through field sampling and laboratory analysis; and
- Morphological analysis conducted through a preliminary assessment using Side Scan Sonar (SSS) followed by the use of multi-beam echo sounding to provide precise geo-morphological data.

5.1.2.6 Key Methodological Elements

The key methodologies utilised for the offshore physical environmental assessment are laid out in *Section 6.2* of *Section 6, Environmental, Social and Cultural Baseline* of the ESIA and include:

- Sediment sampling for analyses of physico-chemical parameters;
- Seawater sampling for analyses of physico-chemical parameters;
- Seawater profiling; and
- Geophysical survey using Side Scan Sonar (SSS), multi-beam echo sounding, magnetometry and video recording.

5.1.3 Offshore and Nearshore Biological Environment

The methodology for baseline data collection for the biological environment involved 2 key elements: 1) desk based literature review; and 2) baseline field surveys undertaken in the nearshore area of the pipeline.

It is important to evaluate the importance locally, nationally and internationally of those species and habitats recorded both in the literature and in the field surveys. The first phase of this was an analysis of protected sites within the area of influence and wider region and protected species and habitats that occur within the area.

5.1.3.1 Designated Sites and Sensitive Habitats

Desk based surveys revealed the potential presence of habitats and species of interest.

To map the extent of potential habitats comprised by sensitive or protected species the mentioned survey using Side Scan Sonar (SSS), multi-beam echo sounding, and video recording survey of the near shore seabed (0 to -30 m depth, 7 km) was conducted. The survey was in the vicinity of the route for the Trans Adriatic Pipeline (TAP) corridor, and conducted in two phases in September-October 2011.

5.1.3.2 Nutrients and Plankton

The nutrients and plankton communities in the study area play a fundamental ecological role. Data for the plankton baseline was acquired through a review of available literature and the collection of field samples and subsequent analysis to ascertain the levels of dissolved oxygen and chlorophyll-a.

Most of the desk based review information is provided from the data collected in October 2000 and May 2001, within the framework of the Interreg II project (CoNISMa, 2002). The study focussed on specific planktonic groups, namely copepods, ostracods and coccolithophorids.

5.1.3.3 Marine Benthos

The marine benthos in the region supports a wide range of fisheries and habitats, some of which are considered sensitive and protected. A desk based review provided an initial baseline data of the communities present in the offshore biological environment and concentrated on European projects such as the INTERREG (Italy – Albania) Project. A nearshore survey has been undertaken including a marine benthos analysis.

5.1.3.4 Fish and Crustaceans

A desk based review was initially conducted to ascertain the presence of rare and endangered species in the wider area using the IUCN red list as the primary source of information. This key source of information was also reviewed to provide a thorough baseline of species of commercial importance.

Sources of information on the commercial species and their communities included Adriatic specific regional data from the Food and Agricultural Organisation (FAO) and national fisheries statistics available at an Albanian level.

5.1.3.5 Marine Mammals and Reptiles

The baseline for the mammals and reptiles using the wider area concentrated purely on a review of literature including IUCN red list and sightings, and stranding data for both cetaceans and reptiles, derived from International sources (e.g. FAO and regional monitoring programmes for the Mediterranean).

5.1.3.6 Seabirds

A desk based review was undertaken on available information regarding the coastal nesting and wintering areas, migration paths, etc, review of the literature (local and internationals sources, such BirdLife International), as well as data collected during specific onshore surveys (See *Section 5.1.6.1*).

5.1.3.7 Key Methodological Elements

The key methodologies utilised for the offshore biological environmental assessment are laid out in *Section 6.2.6.2* of *Section 6, Environmental, Social and Cultural Baseline* of the ESIA and include:

- Sediment sampling for characterisation of the benthic community; and
- SSS and video analysis for identification and characterisation of sensitive habitats.

5.1.3.8 Summary of Activities Performed in the Field

In addition to the desk based review a thorough field survey was conducted within the area of influence of the pipeline within the shallow water (<30 m) zone.

The field survey included triplicate samples from 28 sample stations, each of which was sent for laboratory analysis. The benthic samples were obtained through the use of a Van Veen type grab. Some of the sampling stations were preceded by a drop down video survey of the station to provide field notes of the area of confirmation of the station as suitable for grab sampling.

5.1.4 Nearshore, Offshore Socioeconomic and Cultural Heritage

Please refer to the *Section 5.1.7* and *Section 5.1.8* of this Annex.

5.1.5 Onshore Physical Environment

5.1.5.1 Climate and Air Quality

5.1.5.1.1 Climate

Climate was based on long-term data observed in meteorological stations, located in the areas crossed by the pipeline route. A total of 15 meteorological stations were identified for rainfall measurements, where 13 of these stations are also used for measuring air temperature.

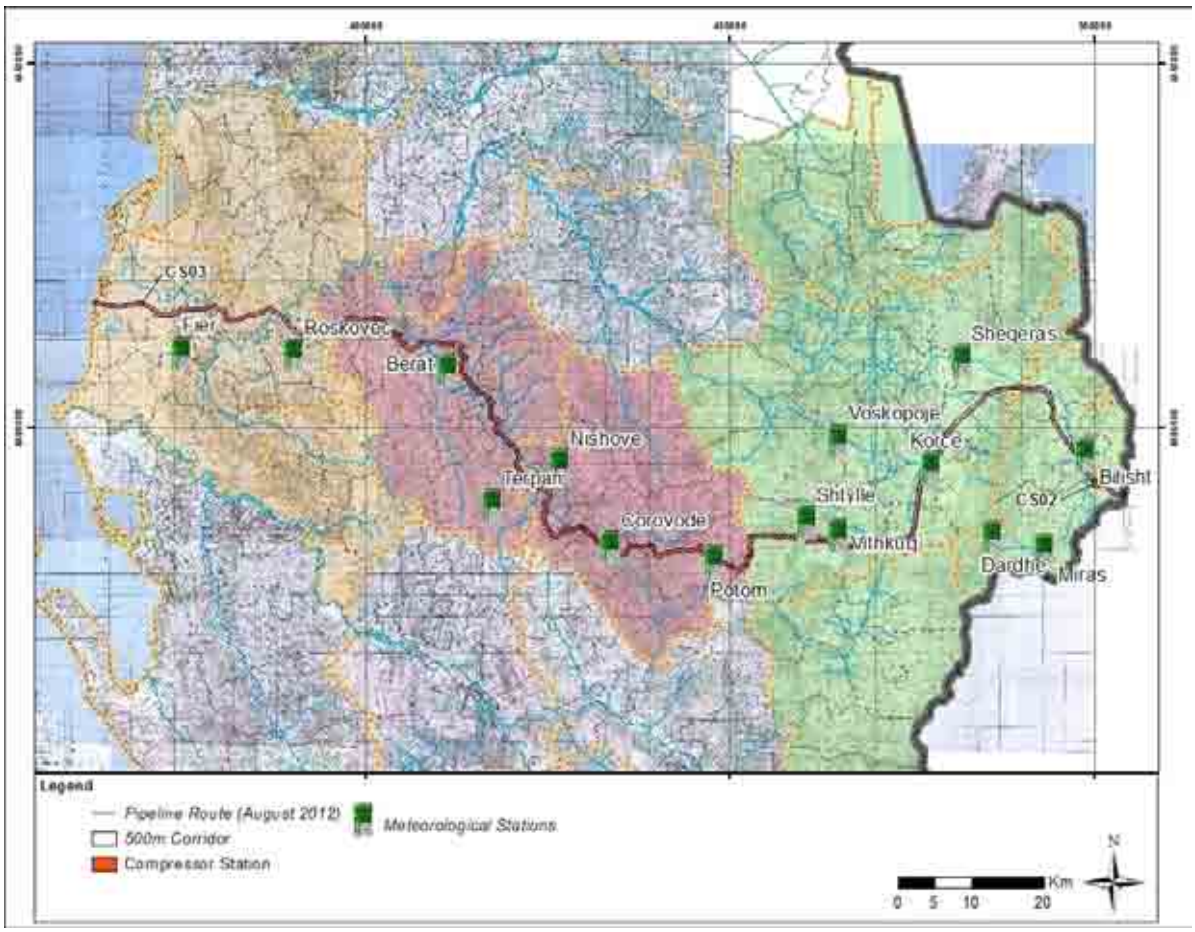
Table 5.1-1 provides a brief description of each meteorological station that was used, and *Figure 5.1-1* shows their location along the pipeline route in Albania.

Table 5.1-1 Meteorological Stations used for Climate Data

Number	*Meteorological station*	*River basin*	*Section*	*Altitude (m)*
1	Dardhe	Devoll	Eastern	1310
2	Miras	Devoll	Eastern	1050
3	Bilisht	Devoll	Eastern	890
4	Sheqeras	Devoll	Eastern	817
5	Korca	Devoll	Eastern	899
6	Voskopoje	Devoll	Central East	1180
7	Vithkuq	Osum	Central East	1250
8	Shtylle	Osum	Central East	1150
9	Potom	Osum	Central East	980
10	Corovode	Osum	Central West	410
11	Nishove	Osum	Central West	650
12	Tërpan	Osum	Central West	707
13	Berat	Osum	Central West	226
14	Roskovec	Seman	Western	55
15	Fier	Seman	Western	12

Source: Hydrometeorological Institute of Albania (2011)

Figure 5.1-1 Location of Meteorological Stations used for Climate Data



Source: Hydrometeorological Institute of Albania (2011)

As shown in *Figure 5.1-1*, there is a good distribution of meteorological stations throughout the pipeline route and along the different sections. The vertical distribution of these stations also covers different elevations, from 12 m above sea level (masl) up to 1,310 masl.

Long-term meteorological data from the Hydrometeorological Institute of Albania (HMIA) were extracted and processed from the 1951 to 1990 series. However, after 1990 Albanian data is not complete or reliable due to political and historical changes in the country during this period.

5.1.5.1.2 Ambient Air Quality

No data from air monitoring stations is publicly available in Albania, therefore ambient air sampling was undertaken. A total of 5 air samples were collected at compressor station locations and at sensitive receptors in order to obtain data to describe ambient air quality along the TAP pipeline route.

Samples were collected by using DrägerTubes®, glass vials filled with a chemical reagent that reacts to a specific chemical or family of chemicals. A calibrated 100 ml sample of air is drawn through the tube with the Dräger accuro® bellow pump, and if the targeted chemical is present, the reagent in the tube changes colour. The length of the colour change typically indicates the measured concentration. The following parameters were analysed in air quality samples:

- Oxides of nitrogen (NO_x);
- Sulphur dioxide (SO_2);
- Hydrocarbons (HC); and
- Carbon monoxide (CO).

An additional sample was collected at one of the locations selected for quality control purposes by using a different methodology: the diffusive/passive sampling technique, consisting of diffusion tubes which remained at the sampling point for several days. Diffusion tubes were introduced in a protective shelter, located in an appropriate place for air sampling approximately 2 m above ground level.

5.1.5.2 Acoustic Environment

The activities associated with the TAP pipeline construction and operation and associated facilities will include noise sources (e.g. compression stations). Given the absence of background noise data in the study area, a noise baseline investigation was conducted to characterise existing ambient noise levels in order to assess the potential impacts of noise levels related to the TAP Project. In addition, the areas that could potentially be affected by noise from the TAP Project were reviewed to identify potential noise-sensitive receptors.

Because noise levels can vary over a given time period, various descriptors are used to quantify them. The noise descriptor used in this report is the equivalent sound level (L_{eq}). Definitions of technical noise terms used in this section are summarised in *Table 5.1-2*.

Table 5.1-2 Definitions of Acoustical Terms

Term	*Definitions*
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm10 of the ratio of the pressure of the sound wave to a reference pressure (which is 20 micropascals or 20 micronewtons per square metre).
A-Weighted Sound Pressure Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasises the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Equivalent Noise Level, Leq	The average (on a sound energy basis) A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.

Source: California Department of Transportation (1998)

The following sections describe the Methodology used perform the survey.

5.1.5.2.1 Noise Survey Methodology

The activities associated with TAP pipeline construction and operation and associated facilities will include noise sources (e.g. compression stations). A noise baseline investigation was conducted to characterise existing ambient noise levels in order to assess the potential impacts of noise levels related to the TAP Project. In order to perform the noise survey a desktop cartographic analysis was deemed necessary, aimed at identifying sensitive receptors.

On-site verification was then performed in order to confirm sensitive noise receptors adjacent to the pipeline route where selected. These may potentially be affected especially by the pipeline construction works.

Noise receptors in proximity of the CSs were also identified, given the potential impact near this area during the operation phase.

As a result the following were used in order to determine the background acoustic environment:

- 9 noise locations along the pipeline route in Albania;
- 3 noise locations in proximity of the CS03; and
- 3 noise locations in proximity of the CS02.

The following Tables report the location of noise measurement points along the pipeline and near the compressor stations.

Table 5.1-3 Summary of Noise Measurements along the Onshore Pipeline

Noise measurement location	*Location*	*Section*	*Approximate distance to the pipeline (m)*
1	CS02-Alternative	Eastern	50
2	Trestenik	Eastern	300
3	Corovode	Central Western	150
4	Guri i bardhë	Central Western	200
5	Uznovë	Central Western	50
6	Hoxhaj	Central Western	50
7	Gjokalli	Western	1700
8	Sheq-marinas	Western	1100
9	Semani	Western	300

Source: ERM Field Survey 2011

Table 5.1-4 Noise Monitoring Sites at CS03

Noise measurement	*Receptors*	*X coordinate UTM 34 N [m]*	*Y coordinate UTM 34 N [m]*	*Minimum distance from the CS03 [m]*
CS03-3	Isolated house	370848.47	4515360.41	1150
CS03-5	House in Sheq-marinas village	368318.78	4515360.41	1570
CS03-8 New	House behind the cemetery	369282.06	4515663.81	900

Source: ERM Field Survey 2012

Table 5.1-5 Noise Monitoring Sites at CS02

Noise measurement	*Receptors*	*X coordinate UTM 34 N [m]*	*Y coordinate UTM 34 N [m]*	*Minimum distance from the CS02 [m]*
CS02-1	House in Vishocice Village	499752.32	4493573.36	920
CS02-2	Bektashi Mausoleum	498441.54	4492439.97	1250
CS02-4	House in Trestenik Village	501330.86	4491606.86	1150

Source: ERM Field Survey 2012

Noise levels in the proximity of each source or receptor were monitored through the use of a sound meter level Type 1, in compliance with the requirements of American National Standards Institute (ANSI) S1.4 for Type 1 Precision sound level measurement instrumentation.

The sound level meter was calibrated prior to use with a portable certified acoustical calibrator, and the calibration was checked and verified after each period of use.

The noise measurements allowed determination of the Equivalent Noise Pressure Level (LeqA) corresponding to a receptor in a specific reference time. The LeqA is defined as:

Equation 5-1 Definition of Leq(A)

$$Leq(A) = 10\log_{10}\left(\frac{1}{T}\int_0^T \frac{p^2}{p_0^2}dt\right)$$

where: p is the instantaneous noise pressure level corresponding to the receptor;

p0 is the reference noise pressure level;

T is the integration period.

Monitoring along the pipeline route was undertaken using a SC-20e sound level meter programmed to record various statistical noise levels over a 15-minute consecutive period in L_{eqT} mode. This mode is the equivalent continuous sound pressure level. It is the linear average of the square of the sound pressure during the time period of the measurement in decibels (in this case, 15 minutes). Additional noise measurements were undertaken in order to characterise noise sources identified during noise monitoring. In this case, monitoring was undertaken using the same SC-20e sound level meter in L_{eq1} mode. This mode is the equivalent continuous sound pressure level during 1 second, in decibels.

At the most sensitive receptors identified in proximity of CS03 and CS02, short and long term measurements during day and night time have been carried out to characterize the actual acoustic climate and consequently to be able to compare the background noise level with the future potential noise impact produced by the CS operation (in activity continuously both day and night time). The noise measurements were undertaken using a LarsonDavis sound meter level and a Brüel&Kjær sound meter level.

Noise measurements were performed according to the following prescriptions:

- Absence of precipitations (rain, snow, etc.);
- Wind speed < 5 m/sec;
- Microphone with anti-wind foam cap;
- Microphone orientated vertically (random incidence) in order to record sources coming from all directions; and
- Microphone positioned at a proper height (assumed receptors' height), in this case 1.5 m above ground level.

5.1.5.2.2 Evaluation Criteria

In order to characterize the Acoustic Environment of the area the background noise levels monitored during the field survey were compared with in force legislation (national and international) on noise pollution.

The Noise Level Standards identified by the International Finance Corporation (IFC, 2007) for residential, institutional, and educational receptors are reported in the following *Table 5.1-6*.

Table 5.1-6 IFC World Bank Group Noise Level Standards

Period	***IFC World Bank Group***	
	Industrial and commercial	***Residential, institutional and educational***
Day-time (07:00 -22:00)	70 dBA	55 dBA
Night-time (22:00 - 07:00)	70 dBA	45 dBA

Source: IFC 2007

Albanian Directive n.8 dated 27/11/2007 “Noise limits in the design environments” defines for residential areas (in detail, for areas “outside the house”) affected by operation activities the same limits as IFC for day time; for night time, instead, the IFC limit is more stringent. Hence, as reported in the previous table, the monitored noise levels have been compared with IFC standards.

5.1.5.3 Surface Water

In line with the Water Framework Directive (WFD), the following elements were analysed:

- Hydromorphology;
- Water quality; and
- Sediments.

5.1.5.3.1 Hydromorphology

A description of standard channel morphology (width, flow type, conditions on shore zones and substrate types) was provided for the main watercourses found within the study area. Topographic maps (scale 1:25,000) were geo-referenced and integrated into the AutoCAD program. Watersheds of the water courses intersected by the pipeline route were delineated in these maps, in order to determine the catchment areas and the length of those watercourses that will be affected.

Hydromorphological descriptions using desk-based information, GIS data and experience of the local experts were obtained for 22 sites along the pipeline route. Out of these, a total of 14 analysis points were selected for visual observations. Field surveys were performed at these 14 sites to validate desktop data and collect additional information. *Table 5.1-7* below presents the details of the locations for which hydromorphological descriptions were provided.

Table 5.1-7 Hydromorphology Analysis Points

Number	***Analysis point***	***Section***	***Area (km2)***	***Location of Crossing (km)***
1	Str. Tresteniku north Trestenik village	East	-	2.8
2	Devolli 1 km before Bilishti town	East	172	8.6
3	Str. Stropani east Babani village	East	19.6	13.2
4	Ventroku irrigation channel	East	-	16.9
5 (*)	Str. Dvorani tributary of Dunaveci River	East	35.0	45.6
6 (*)	Str. Kamenica tributary of Dunaveci River	East	23.8	46.9
7 (*)	Str. Stershoi tributary of Dunaveci River	East	6.46	50.5
8	Dunaveci River 1.7 km northwest of Floqi village	East	15.0	51.1
9	Osumi River 2.5 km downstream of Leshnja village	Central East	54.0	57.2
10 (*)	Osumi River at the very beginning, 2.6 km south of Shtylla village	Central East	10.1	68.3
11	Osumi River 1.2 km before Corovode city	Central West	971.8	103.9
12 (*)	Osumi River 2.57 km downstream of Corovode city	Central West	1120	107.2
13	Osumi River 5.65 km downstream of Corovode city, at the foot of Verzhezha village	Central West	1130	110.2
14 (*)	Vokopola River 0.9 km before discharging into the Osumi River	Central West	149	123.2
15	Osumi River 2.83 km before * discharging into the Vertopi River	Central West	1441.8	130.9
16	Vertopi River at 0.40 km before discharging into the Osumi River	Central West	46.8	132.9
17 (*)	Osumi River at Fush Peshtan	Central West	1550.8	134.8 and 136.2
18	Vodica River at 1.66 km before discharging into the Osumi River	Central West	63.0	139.9

Number	Analysis point	Section	Area (km2)	Location of Crossing (km)
19 (*)	Osumi River near Lapardha	Central West	1939.5	157.1
20	Semani River near Jagodina	West	5380	180.7
21	Semani River near Rreth Libofshë	West	5625	192.5
22	Drainage channel in Semani field	West	-	206.4

Notes: (*) Points described through desk-top information only

Source: ERM (2011)

In addition to the desk-top and field survey analysis of the points above, long-term hydrological data was obtained from hydrometric stations located in the catchment areas. This information was processed, so the hydrological parameters were evaluated for the intersection points where the pipeline route will intercept the watercourses. This data was extracted from series between 1951 and1990, as after this period Albanian data is not complete or reliable (as previously described for climate and air quality). The following *Table 5.1-8* presents key details of the hydrological stations.

Table 5.1-8 Hydrological Station Locations and Catchment Data

Number	River Name	Hydrologic Station	Section	Catchment Area (km^2)	Discharge (m^3/s)
1	Devolli	Miras	Eastern	89	1.57
2	Dunaveci	Turan	Eastern	240	3.21
3	Osumi	Leshnja	Central East	53	1.56 (0.780)
4	Osumi	Corovode	Central West	974	14.3
5	Vokopola tributary Osumi	Vala e Bigës	Central West	152	2.49
6	Osumi	Bogove	Central West	1,230	17.6
7	Osumi	Ura Vajgurore	Central West	2,073	30.2
8	Semani	Ura Mbrostarit	Western	5,389	90
9	Gjanica tributary Semani	Fier	Western	234	4.02

Source: Hydrometeorological Institute of Albania (2011)

5.1.5.3.2 Water Quality

Water quality was also described along the pipeline route in Albania in line with the Water Framework Directive (WFD). With this objective, physical-chemical-bacteriological quality indicators were analysed by means of visual analysis and standard sampling of running water with appropriate equipment.

Sampling points were defined during the desk-based study and from the route refining survey in 2009. These sampling points are located mainly in water bodies which have constant flow throughout the year and take into account water bodies that may be affected as a result of construction activities. Sampling points are listed in the following *Table 5.1-9* (see *Figure 6.4-22 in Section 6* for their location).

Table 5.1-9 Water Quality Points

Number	*River Name*	*Section*	*Area*	*Location of Crossing (km)*
10	Trestenik Creek	Eastern	Trestenik	2
11	Devolli River	Eastern	Bilisht	8.5
12	Stropani Torrent	Eastern	Stropan (Babani)	13
13	Irrigation Channel	Eastern	Vranishte (Pilur)	17
2	Osumi River	Central east	Vithkuq	57
14	Staravecke River	Central east	Potom	85.1
3	Osumi River	Central west	Corovode	103.9
4	Vokopola Torrent	Central west	Bogove(Ustië)	122.9 – 123.9
5	Vërtop Torrent	Central west	Polican	132.9
6	Osumi River	Central west	Fushë Peshtan	134.9 – 135.9
7	Osumi River	Central west	Otllak	156.9
8	Semani River	Western	Strume (Jagodine)	192.4
9	Draining channel	Western	Libofshë (Rreth Libofshë)	206.4

Note: Numbering of sampling locations is not correlative due to reroutings in the East and Central east Sections

Source: ERM, 2011

Points where the water courses intersect with the pipeline route were identified, and surface water samples were collected approximately 100 - 400 m upstream and downstream (distance depending on terrain conditions). Water samples were collected directly by filling the containers. A Ruttner sampler was used in the Semani River (sampling point RS1), as well as for samples collected from the bridge over the Vjose – Levan – Fier irrigation canal.

Some of the parameters in surface waters (temperature, dissolved oxygen-DO, pH and conductivity) were analysed directly in-situ using an HI 9828multi-parametric probe. The rest of the parameters were analysed in the following laboratories:

- Chemical laboratory of Faculty on Natural Science at Tirana University: some physical-chemical and nutrient parameters;
- REDISH Laboratory in Tirana: bacteriological analysis; and
- Theolab S.p.A. in Italy: heavy metals, COD, TOC, AOX, PAH, PCB, and TPH. Samples were shipped using the chain of custody to the Theolab S.p.A. laboratory in Italy. Chain-of-custody documentation was initiated at laboratory with the release of the sample collection containers from laboratory to ERM. A field chain-of-custody form accompanied the samples to the laboratory. The chain-of-custody form terminated with the laboratory's signature acknowledging receipt of samples and by returning to ERM a copy of the field chain-of-custody. Due to unavailability of Albanian laboratories, sample collected in Staravecke River was completely analysed in Theolab S.p.A. laboratory.

Laboratory quality certificates as well as a description of analytical methods used were included in *Annex 6, Baseline Data.*

Water sample conservation was based on US-EPA methods (Methods for chemical analysis of water and wastewater, Ohio-USA, 1983). Water samples for BOD, nutrients and bacterial contamination were stored in ice boxes and were sent to laboratory directly in order to be analysed within 48 hours of water sampling. Other indicators were stored in the same conditions and were analysed based on the times specified in the US-EPA Methods mentioned above. The methodologies used at the Italian accredited Laboratory Theolab were EPA and APAT CNR IRSA, which is according to EN ISO.

5.1.5.3.3 Sediments

Additionally, sediment samples were collected from selected main rivers with the potential of contamination. These samples were collected from the river bed to a depth of 10 cm using a simple grab (scoop) or a hand core sampler and then preserved in boxes with ice palettes and sent to laboratory Theolab S.p.A. in Italy, where methods of analysis are based predominantly of the USA Environmental Protection Agency. The methodologies used at the Italian accredited Laboratory Theolab were EPA and APAT CNR IRSA, which is according to EN ISO. Samples were shipped using the chain of custody to the Theolab S.p.A. laboratory in Italy. Chain-of-custody documentation was initiated at laboratory with the release of the sample collection containers from laboratory to ERM. A field chain-of-custody form accompanied the samples to laboratory. The chain-of-custody form terminated with laboratory's signature acknowledging receipt of samples and by returning to ERM a copy of the field chain-of-custody.

5.1.5.4 Geology, Geomorphology, Erosion and Groundwater

5.1.5.4.1 Geology and Geomorphology

The geological study of the Study area concerning the preparation of this ESIA report was based on the following sources of information:

- Geological map of Albania, scale 1:200,000 (Xhomo *et al.*, 2002): used to obtain data on the tectonics and the stratigraphy of the study area;
- Seismotectonic map of Albania, Scale 1:200,000 (Aliaj *et al.*, 2000): used to obtain data on the active tectonic faults of Albania;
- Geohazards Map of Albania (Shkupi *et al.*, 2000);
- The study of the results from previous drilling carried out by the Albanian Geological Survey related to the water supply for the Korca and Bilishti cities;
- Site visits in the Study area. The East Section was visited in September 2011, while Central East, Central West and West Sections were visited in June 2011. The results of these visits

are described in detail in the data sheets of the geo-morphological and geological study of the Study area (included in *Annex 6 Baseline Data*); and

- Previous geological studies performed on the Central East and Central West sections of the TAP pipeline route in Albania: used to obtain data on the stratigraphy in the East and West Sections of the pipeline route, particularly related to erosion and sedimentation along the Semani coastal area.

5.1.5.4.2 Erosion

Examination of erosion was undertaken using the following guidelines:

- Risk assessment methods of soil erosion by water - a review and recommendations; L. Geraedts *et al.*, 2009;
- EU Soil Protection Strategy; D. de la Rosa, 2003; and
- Land use planning guideline in the context of article 12 of the Seveso II Directive – 105/2003/EC.

Assessment procedures undertaken were based on a qualitative approach (using expert knowledge to evaluate important processes, to formulate criteria and to discover local areas at risk), quantitative approach (based on measured data providing relative comparisons regarding baselines and thresholds) and CORINE data (1992) that assesses the risk of soil erosion in Mediterranean Europe by overlaying soil erodibility[1], erosivity[2] and topography using a factorial approach[3] applied on a 1 km x 1 km grid and using GIS.

Site visits in the Study area were undertaken in the study area (the East Section was visited in September 2011, while the Central East, Central West and West Sections were visited in June 2011). The results of these visits are described in detail in the land use and soil quality data sheets of the Study area (see *Annex 6.1 Baseline Data*). In these datasheets information about the erosion degree in each survey point is included.

The potential soil erosion risk was combined with a land cover factor to assess actual erosion risk. In order to update the erosion action for this Project, the Team filled in a form to collect data on vegetation cover (as % total surface), slope gradient, length of slope, presence of soil and stones on land, extent of land uncovered by crops, structural aggregates, texture, drainage and water permeability.

1 Erodibility: the influence of the soil profile (apart from that of relief) on the soil erosion process, determined by the availability of material for erosion and the generation of overland flow volume from rain (ISSS, 1996).
2 Erosivity: potential ability of rain to cause erosion. (ISSS, 1996).
3 Factorial Approach: factorial models explain system characteristics in terms of external variables. The five soil-forming factors suggested by Jenny (1941) are: (i) climate, (ii) organisms, (iii) topography, (iv) parent material, and (v) time. (University of Wisconsin-Madison, Department of Soil Science. New York. NY.)

5.1.5.4.3 Groundwater

A total of 3 groundwater samples were collected from available wells located along the pipeline route. Samples were collected using a disposable bailer that was introduced in the well to retrieve water samples; this was then decanted into a number of bottles with each filled until no air bubbles were present. The bottles were sealed, labelled, and placed inside a cooler with ice packs for shipment.

Samples were shipped using the chain of custody to the Theolab S.p.A. laboratory in Italy. Chain-of-custody documentation was initiated at laboratory with the release of the sample collection containers from laboratory to ERM. A field chain-of-custody form accompanied the samples to laboratory. The chain-of-custody form terminated with laboratory's signature acknowledging receipt of samples and by returning to ERM a copy of the field chain-of-custody.

The following parameters were analysed in each groundwater sample:

- Anions;
- Heavy metals (Al, Sb, As, Be, Cd, Co, Cr, Fe, Mn, Hg, Ni, Pb, Cu, Se, Ta and Zn);
- Total oil substances;
- Animal and vegetable oils and fats;
- Total Petroleum Hydrocarbons (TPHs);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Total coliforms;
- BOD5;
- Total COD;
- Suspended particulate matter;
- Total dissolved solids; and
- Total organic carbon (TOC).

Annex 6 Baseline Data includes a copy of the laboratory quality certificates, as well as a description of analytical methods used.

5.1.5.5 Soil Quality and Agricultural Land Use

Soils vary naturally in their capacity to function; therefore, quality is specific to each kind of soil. This concept encompasses two distinct but interconnected parts: inherent quality and dynamic quality. Characteristics such as texture, mineralogy, etc., are innate soil properties determined by the soil formation, climate, topography, vegetation, parent material and time factors. Collectively, these properties determine the inherent quality of a soil. They help compare one soil to another

and evaluate soils for specific uses. Map unit descriptions in soil survey reports are based on differences in the inherent properties of soils. More recently, soil quality has come to refer to the dynamic quality of soils, defined as the changing nature of soil properties resulting from human use and management. Some management practices, such as the use of cover crops, increase organic matter and can have a positive effect on soil quality.

Across the TAP pipeline route in Albania, agricultural use of land and agriculture value of soils may be affected by land take and construction processes involved in the Project. Further sampling of agricultural use of land and agriculture value of soils along the pipeline route were commissioned for this reason and from 2009 survey data, desk study information, GIS data and from the experience of local experts. Surveys were undertaken from June to September 2011 and included sampling at a number of locations along the pipeline route.

The objectives of the soil quality and land use surveys are listed below:

- Provide comprehensive Land Use and Soil Quality (herein after referred as LU&SQ) baseline data of the pipeline route of TAP through Albania;
- Identify and assess environmental sensitivities of the pipeline route through agricultural activities and vice versa;
- Evaluate the associated and potential impacts of pipeline activities on the environment (especially on agricultural areas); and
- Evaluate potentially contaminated soils along the pipeline route, as well as soils at compressor station locations.

The soil in the study area along the pipeline route was surveyed by visual assessment of soils for fertility parameters, including sampling of upper layers of soil at locations with agricultural land use for analyses of soil profile major characteristics, like particle size analyses, total organic carbon and macronutrients. A template was used to collate data for land use, soil profile description and soil quality (included in *Annex 6.1 Baseline Data*). Sufficient locations were observed (46 waypoints):

- East Section: 9 waypoints;
- Central East Section: 6 waypoints;
- Central West Section: 18 waypoints; and
- West Section: 13 waypoints.

The location of these waypoints was selected using the following criteria:

- Proper representation of all agricultural fields where the pipeline crosses independently of their surface, agricultural activity intensity, and crops;

- Inclusion of all soil types traversed by the pipeline even when their agricultural value is not the same;
- Specific sites – when deemed that environmental interference between the specific soil qualities and the construction of the pipeline are more pronounced; and
- Intensity of agriculture development and/or specific sites under the agricultural intensification plan.

For further analyses of specific indicators that allow the assessment of the inherent quality and soil capability, soil samples were taken on specific sites for the purposes of:

- Completing the information on the characterisation of the above soil qualities;
- Completing the information on potential changes to the soil profile dynamic qualities; and
- Completing the information on land ability classification.

During field observations and laboratory analysis, the determination of soil type, land use and soil quality was done by describing the following indicators:

- Physical properties like soil structure, depth of soil and rooting, infiltration and bulk density and water holding capacity;
- Chemical properties at each site observed as pH, Total N, Total P and Organic carbon, Exchange Capacity (CEC) and Base Saturation (BS); and
- Biological properties like microbial biomass carbon (C) and N, potentially mineralizable N.

The methodology for forest evaluation was limited to:

- Categorisation of the type of forest cover (shrub, medium forest, grown forest);
- Type of forest (sumps, degraded forest, managed forest); and
- Percentage of forest surface covered in the vicinity of cultivated fields (but along the pipeline route).

The soil quality survey includes an analysis of soil samples of upper soil layers at the following locations to screen existing soil contamination:

- Areas with evidence of soil being affected; and
- Areas where compressor stations are expected to be located.

A total of 4 soil samples were collected for these purposes. The samples were collected and placed directly into laboratory-supplied sample containers (glass jars) and were sealed, labelled, and placed inside a cooler with ice packs for shipment. Samples were shipped using the chain of custody to the Theolab S.p.A. laboratory in Italy as described in previous sections.

The following parameters were analysed for each soil sample:

- Residue at 105° C as total;
- Fraction sieved 2 mm dry basis at 105°;
- Heavy metals (Al, Sb, As, Be, Cd, Co, Cr, Fe, Mn, Hg, Ni, Pb, Cu, Se, Ta and Zn);
- Total Petroleum Hydrocarbons (TPHs);
- Polychlorinated Biphenyls (PCBs); and
- Polycyclic Aromatic Hydrocarbons (PAHs).

Theolab S.p.A. laboratory quality certificates are included in Annex 6, Baseline Data as well as a description of analytical methods used and a detail of the parameters analysed.

5.1.5.5.1 Summary of Activities Performed in the Field

The following activities were performed in the field with regard to soil quality and land use:

- Confirmation and/or identification of soil types through:
  - Field observation of the soil profile;
  - Literature review of the Soil Atlas of Europe and Albanian Soil Types;
  - Sampling, main physical and chemical analysis; and
  - Determination of soil type after assessing the aforementioned elements.
- Data collection on soil formation, dominant parent material, slope, soil profile depth, content of macronutrients and humus (based on laboratory analysis), texture and fragmented rock along the soil surface (see *Annex 6.1 – Section 6.1.6*);
- Field assessment of the soil cover or Land Use (for arable cultivated lands, not-cultivated lands, pastures and abandoned lands) for pertinent aspects: actual crops, the short-term history of cultivation (last 2 – 3 years), agricultural development trend (crop structure), intensity degree of agricultural inputs' usage, level of mechanisation, status of irrigation, presence of surface works and actual average yields (see *Annex 6.1 – Section 6.1.6*);
- Assessment of soil quality based on data collected during the field survey and lab analyses as well as the existing data from previous studies from the Albanian Institute of Soil Science (today Soil Department of Agricultural Technology Transfer Centre – QTTB). Data were discussed by comparison with Land Capability Classification and Soil Quality Assessment Field Record; and
- Collection of soil samples in visually contaminated areas and compressor station locations, and assessment of soil quality based on analytical results provided by the laboratory in comparison with Dutch Standards.

Analysis of the main parameters was a tool used for calculating Soil Capability (agronomical and economical potential of soils).

Following is a summary of the key methodological elements used to evaluate the three main concepts: Land Use, Soil Quality, and Soil Capability.

Key Methodological Elements - Land Use

The specific methodological elements used for the land use evaluation consisted of the following:

- A representative plot along the pipeline route was selected to determine the "importance" of each element relating to topography, crop structure, irrigation status, parcelling into plots, drainage status, irrigation status and intensity of agricultural production;
- Covered and uncovered surfaces of the plot were expressed as a percentage;
- Type of crop actually planted and crop history of the representative parcel;
- Intensity degree of production (also based on the documentation provided by the Regional Agricultural Directorates of Korça, Berat and Fier);
- Observations were concentrated on the number of plants per ha, crop health, level of mechanisation, and agricultural inputs for arable crops (cereals, vegetables and forage crops);
- An approximate assessment was made for the level of productivity, type of pasture (winter or summer), over grazing for pastures;
- The level of intensity for fruit trees was evaluated (intensive, semi-intensive or extensive), number of plants, health status, age, cultivar, etc.; and
- Based on the history of soil usage and the average indicators from different locations observed, the agricultural development trend of the area was assessed.

Key Methodological Elements – Soil Quality

The specific methodological elements used to evaluate the soil quality consisted of the following:

- Soil profile depth (this parameter was defined in the field for all sampling locations for further chemical – physical analysis);
- Main horizons of soil profile and especially the upper horizon (Horizon A). The following horizons detected across the soil samples undertaken are defined below according to definitions provided by the United Nations Food and Agriculture Organization (FAO):
    - Horizon A: Mineral horizons which formed at the surface where all or much of the original rock structure was obliterated and which are characterized by one or more of the following:

- An accumulation of humified organic matter thoroughly mixed with the mineral fraction and not displaying properties characteristic of E or B horizons;
- Properties resulting from cultivation, pasturing, or similar kinds of disturbance; or
- A morphology which is different from the underlying B or C horizon resulting from processes related to the surface.

o Horizon B: Horizons that formed below an A, E, O or H horizon, and in which the dominant features are the obliteration of all or much of the original rock structure, together with one or a combination of the following:

- Illuvial[1] concentration, alone or in combination, of silicate clay, iron, aluminium, humus, carbonates, gypsum or silica;
- Evidence of removal of carbonates;
- Residual concentration of sesquioxides[2];
- Coatings of sesquioxides that make the horizon conspicuously lower in value, higher in chrome, or redder in hue than overlying and underlying horizons without apparent illuviation of iron;
- Alteration that forms silicate clay or liberates oxides[3] or both and that forms a granular, blocky, or prismatic structure if volume changes accompany changes in moisture content; or
- Brittleness.

o Horizon C: Horizons or layers, excluding hard bedrock, that are little affected by pedogenetic processes and lack properties of H, O, A, E, or B horizons. Most are mineral layers, but some siliceous and calcareous layers, such as shells, coral and diatomaceous earth, are included. The C layer material may be either like or unlike that from which the solum presumably formed. A C horizon may have been modified even if there is no evidence of pedogenesis. Plant roots can penetrate C horizons, which provide an important growing medium. Included as C layers are sediments, saprolite, and unconsolidated bedrock and other geologic materials that commonly slake within 24 hours when air dry or drier chunks are placed in water and when moist can be dug with a spade. Some soils form in material that is already highly weathered, and such material that does not meet the requirements of A, E or B

1 Illuvial: part of a soil profile where minerals, humus, or plant nutrients have been deposited after being washed down from above.(Oxford Dictionary of Archaeology)
2 Sesquioxides: usually refers to the combined amorphous oxides of iron and aluminium (http://agriculture.science-dictionary.org)
3 The oxidation process is related to an interchange of electrons between different chemical compounds.

horizons is designated C. Changes not considered pedogenetic are those not related to overlying horizons. Layers having accumulations of silica, carbonates, or gypsum, even if indurated, may be included in C horizons, unless the layer is obviously affected by pedogenetic processes; then it is a B horizon.

- Reaction with HCL (10% conc.) of profile horizons to assess the presence of carbonates;
- Parent material (bed rock) that is based on soil chemical characteristics;
- Presence of root systems in the profile and the colour of the profile; and
- Presence of fragmented rock in the profile and the soil surface.

Key Methodological Elements – Land Capability

The specific methodological elements used to assess land capability (based on the combination of all the data collected):

- Slope gradient of the soil surface;
- Presence of organic matter in the upper horizon;
- Soil structure in the upper horizon;
- C, N and P content (total) in the upper horizon;
- Soil compacting;
- pH in the upper horizon; and
- Presence of anions/cations and salts that characterise the soil agronomic potentials (Na, Mg, Cl, SO_4).

Land capability classification generally shows the suitability of soils for most kinds of field crop. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. In the capability system, soils are generally grouped at 3 levels — capability class, subclass, and unit. The assessment of land observed along the pipeline into these classes has served as part of the economic assessment of land classification for compensation purposes (for temporary and/or permanent damages).

According to the US Department of Agriculture for the Capability classes, the broadest groups are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. Based on the methodology of the Albanian Institute of Soil Science (1992) the agronomic potentiality is designated under 6 classes as listed below:

- Class I: soils have slight limitations that restrict their use;

- Class II: soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices;
- Class III: soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both;
- Class IV: soils have very severe limitations that restrict the choice of plants or that require very careful management, or both;
- Class V: soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat; and
- Class VI: soils have very severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

5.1.5.5.2 Sampling Methods and Field Measurement

The Guidelines and Standards on soil study approved by the Ministry of Agriculture, Food and Consumer Protection (MAFCP) were strictly adhered to in the case of field sampling and measurement. A multi-disciplinary approach was adopted for non-ecological characterisation and data acquisition. The land use and soil quality components covered include field observations, laboratory analyses and consultation with national documents on soil classification, soil capability and Albanian agricultural statistics. Field sample locations were identified using Global Positioning System – GPS (in Universal Transverse Metric – UTM).

5.1.5.5.3 Quality Assurance/Control Procedure

Standard methods and procedures were strictly adhered to in the course of this study. QA/QC procedures were implemented during sample collection, labelling, analyses and data verification. Chain of custody procedures including sample handling, transportation, logging and cross-checking in the laboratory were also implemented.

All analyses were carried out in General Directory of Accreditation (Albania) accredited laboratories. The methods of analyses used in this study were those specified in ISO 17025 and other internationally accepted analytical procedures in order to ensure the reliability and integrity of the data obtained. The Quality Assurance Procedure covers all aspects of the study and includes sample collection, handling, laboratory analyses, data coding and manipulation, statistical analyses, presentation and communication of results. Laboratory quality certificates as well as a description of analytical methods used, is included in *Annex 6 Baseline Data.*

5.1.5.6 Landscape and Visual Amenity

The assessment of impacts of the TAP on landscape and visual amenity has been undertaken in accordance with accepted methodologies derived from best practice guidelines.

In the absence of published guidelines on landscape and visual impact assessment in Albania, the assessment was conducted with reference to the *Guidelines for Landscape and Visual Impact Assessment*[1] (UK).

The assessment approach for the TAP follows approaches used widely by landscape architects in other European countries,

The methodology for **baseline data gathering and evaluation** is presented below. The methodology is applicable to the assessment of short term impacts during the Project construction and to any long term impacts during its operation and future decommissioning.

Key steps undertaken for the baseline description and evaluation are:

Step 1 – Study Area

- A landscape and visual study area was established. This was defined for both the baseline and impact assessment. The extent of the study area was determined for the various elements of the proposal and was driven by their varying size and scale. The study area was defined in order to capture all significant landscape and visual effects;

Step 2 – Baseline Landscape character and visual amenity

- The baseline landscape character assessment of the study area was defined. This resulted in defined local landscape character areas. The sensitivity of the local landscape character areas landscape to the proposed change was evaluated; and
- The baseline description of visual amenity from key viewpoint locations was prepared. The sensitivity of the viewers to the proposed change was determined at given viewpoint locations. This was informed by the viewer type and the quality of the existing view.

5.1.5.6.1 Step 1: Study Area

The study area for the landscape and visual baseline and impact assessment is usually defined as the geographic area from which the proposals are likely to be visible. The geographic area where structures are expected to be visible will be subject to impacts.

Impacts on the character of a landscape will arise as a result of the change to the character of the receiving landscape due to the visibility of the project components.

Impacts on visual amenity will arise as a result of the visibility of the project components from particular locations where viewers are present or passing through.

1 The Landscape Institute and the Institute of Environmental Assessors (Second Edition) 2002. Guidelines for Landscape and Visual Impact Assessment

For the purpose of the TAP landscape and visual assessment, a study area was established for the principal elements of the scheme based on their size and scale as outlined above. These are presented below:

Pipeline Works

The pipeline is to be installed trenching and backfilling construction techniques. Full reinstatement of landcover and vegetation will be undertaken following pipeline burial. Implications of this on landscape and visual amenity will be confined mainly to the construction stage, and the scale of the works is such that the likely significant direct effects will be confined to a 500 m corridor centred on the centreline. The baseline landscape character and visual amenity of the pipeline corridor was described, and an evaluation of sensitivity to the proposed change was determined. Baseline landscape character was deemed to apply to a minimum 2 km corridor centred on the pipeline centreline.

Compressor Stations

As these structures are of some scale and height, a larger study area was proposed, and this will cover a geographic area from which any given compressor station is likely to be visible. Thus for each compressor station site, a study area comprising a 15 km radius from the centre of each compressor station was established. The baseline landscape character and visual amenity within each 15 km radius study area was described and an evaluation of sensitivity to the proposed change was determined.

Ridge Modifications

Changes to the topography of some mountain ridgelines are proposed at four locations in order to accommodate TAP pipeline installation. Given the elevated locations of these proposed changes to existing mountain topography, there is potential for them to be visible from the surrounding landscape for some considerable distance. In recognition of this, a 30 km radius study area centred on each ridge modification was selected specifically for the preparation of Zones of Theoretical Visibility (ZTVs). The impact assessment for the ridge modifications addressed the landscape and visual baseline generally set out for the pipeline works. The wider, 30 km study area is also referred to in the landscape and visual impact assessment for the purpose of identifying the main geographic areas from which the ridge modifications are expected to be visible in the wider landscape covered by this study area. It is anticipated, however, that all significant effects will be captured with reference to the landscape character areas identified for the pipeline works in the baseline section of the report. This is because the scale of the change associated with ridge modifications is relatively small compared with the overall vast scale of the receiving mountain landscape.

5.1.5.6.2 Step 2: Baseline Landscape and Visual Amenity

The landscape of the study area was analysed as a desk-based exercise using both map and aerial photo data. The baseline study was informed by field survey data, collected during several site visits performed in 2011 and 2012.

- Landscape value is the relative value or importance attached to a landscape (often as a basis for designation or recognition), which expresses national or local consensus because of its quality, special features including perceptual aspects such as scenic beauty, tranquillity or wildness, cultural associations or other conservation issues;
- Landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and how this is perceived by people;
- Landscape quality (or condition) is based upon judgements about the physical state of the landscape and its intactness from visual, functional, and ecological perspectives. It also reflects the state of repair of individual features and elements which make up the character in any one place; and
- Landscape sensitivity is defined in relation to the specific type of change envisaged and depends on landscape character and how vulnerable this is to change. Landscapes which are highly sensitive are at risk of having their key characteristics fundamentally altered, leading to a different landscape character. Sensitivity is assessed by considering the physical characteristics and perceptual characteristics of landscapes in light of particular forms of development.

The principal local landscape character areas were identified and described as part of the baseline study. An evaluation of the sensitivity of each landscape to the proposed change was undertaken.

5.1.6 Onshore Biological Environment

5.1.6.1 Terrestrial Ecology

Methodology for baseline data collection for habitats and flora involved 4 key elements: 1) Re-examination of data from the Compiled Report - Albania Route Alternatives Appraisal Report (TAP-FEED-AL-EIA-REP-7001 Rev.3, 2010); 2) Desk-based literature review, including examination of GIS datasets; 3) Consultation with the Albanian Government including the Ministry of Environment, Forestry and Water Administration (MoEFWA) and NGOs; and 4) Additional baseline field surveys undertaken along the length of the finalised pipeline route.

However, to help in producing the baseline data it was important to evaluate the importance locally, nationally and internationally of those habitats and species recorded within the study area. Thus, the Evaluation Criteria section below was used to outline this procedure.

5.1.6.1.1 Desk Study and Data Review

Data collected from the 2009 Alternative Appraisal surveys (performed for the Albania Route Alternatives Appraisal Report, 2010) was re-examined for the 2011 desk-based study. A study area for this previous work and the 2011 review was defined within a 2 km buffer along the length of the pipeline route. This area encompassed most additional areas where associated infrastructure would be placed such as compressor stations, block valve stations and yards. However in some cases for roads, grid connections, yards and other facilities these were outside the main 2 km buffer and so separate 2 km buffer areas were established for these components. Within these areas a review of existing information was undertaken which gathered a range of information allowing identification of potential sensitive areas and areas of interest for the field survey. The information gathered included information on:

- Ramsar Sites (from Wetlands International);
- Areas of Special Conservation Interest or Emerald Sites (ASCIs);
- Nationally Protected Areas (including National Parks, Managed Reserves and Natural Monuments);
- Important Bird Areas (IBAs) and Important Plant Areas (IPAs);
- Land cover classification from the CORINE database (last completed 2008); and
- CORINE biotopes.

Where appropriate, the dataset was updated with information gathered in 2011, 2012 or from updates to the protection status of sites which may have changed from 2009 to 2011. In addition to this study, a Cartographic GIS-based study was carried out in tandem with examination of the CORINE data. This exercise involved the use of satellite imagery within a 500 m corridor along the entire route to provide mapping layers of vegetation types and land uses as well as to identify European habitats, where possible. This was then used and compared with the CORINE data.

This exercise was undertaken in 2009 and 2011 to prepare field surveys by highlighting areas with greater potential for nature conservation interest and where further survey should be undertaken.

In addition to the 2011 and 2012 desk-based data collection, records taken for habitats, flora and fauna from the 2009 surveys were re-examined. These records have in many ways been used as the core component upon which the 2011 and later 2012 surveys were based and focused. Using this data, it was possible to focus further surveys in areas where the confirmed presence of key species was taken, or from areas which previously appeared to have potential for particular habitats or species. It was also possible from this review to reduce survey effort in areas that previously showed little nature conservation interest. In particular, this technique helped to tailor the 2011 and 2012 survey for large carnivores, focusing effort on areas thought to be of key importance for this highly mobile group, and for which a detailed study was required.

5.1.6.1.2 Field Survey

Habitats, Flora and Forestry Survey Methodology

The survey for habitats and flora was undertaken by a skilled survey team. It was conducted to describe the existing habitat types and to identify floral species of interest from an international and national perspective. The main tasks included:

- Ground truthing of the habitat cartography (from satellite imagery, CORINE GIS data and 2009 data);
- Provide details of Protected Areas, Corine Biotopes and Natural Monuments;
- Provide a description and distribution of main vegetation types and habitats along the pipeline route;
- Identification, description and distribution of flora species of interest, indicating endemic, rare, endangered and threatened plants. For instance, endangered/protected species at the national level and endangered/protected species at the international level (Council of Europe/EU); and
- Provide details of any local use of plant species for herbal remedies or for wider ecosystem services.

Surveys across the entire study area were conducted in June and November 2011 followed by a dedicated survey within designated and protected areas in April 2012. One further detailed survey (conducted to the same effort level as previously carried out for non-pipeline infrastructure) was undertaken in July 2012 of the re-routed pipeline section between Kp 77 to Kp 91 as well as a number of key roads, two grid connections and the Northern Section (including Durres Road and the main pipe yard).

For the roads, yards, grid connections and other infrastructure the surveys largely focused directly on the footprint rather than covering a wider 500 buffer, as used for the pipe corridor (see Flora section below). The reasoning for this was based on the fact that impacts were likely to be localised and limited to the direct footprint.

Habitats

In general, vegetation and flora surveys focused on species of conservation interest and the European Habitats classification. To identify European Habitats this was done using CORINE landcover data, data from the survey conducted in 2009 and from the survey conducted in 2011. Habitats were classified using the Interpretation Manual of European Union Habitat (European Commission DG Environment, 2007), with particular reference made to 'Priority Habitats'.

In the Interpretation Manual of European Union Habitat, all semi-natural habitats in the European Union are classified with dominant and key species provided from which each particular habitat can be classified.

Flora

Features such as (1) endangered /protected or endemic/important flora species, and (2) mature forest stands, were included to the extent feasible. This data was based on the areas visited during the field surveys (including 500 m corridor along the pipeline and the direct footprint of all infrastructure) and existing desktop data (e.g. GIS CORINE data and detailed satellite imagery).

- Species of interest at an Albanian and EU and Global level;
- Flora nomenclature - Flora of Albania, vol. 1 - 4 (Paparisto *et al.*, 1988 - 2000). and the threat level for species was based on the Albanian Flora "Red Book" (Vangjeli, *et al.*, 1995); and
- Qualitative or semi-quantitative analysis, depending on the species (species abundance was not provided).

Where appropriate, the condition of the vegetation was assessed according to the degree to which it resembles relatively natural, undisturbed vegetation, using the following criteria:

- Species composition (species richness, degree naturality, level of weed invasion); and
- Vegetation structure (representation of each of the original layers of vegetation).

Forestry

In addition to the main habitat and flora surveys a dedicated forestry survey was undertaken in November 2011 and updated in July 2012. This survey focused on examination of the economic value of the forestry within the pipeline corridor. In areas selected for survey sample plots were used in high forest, coppice forest and shrub forest. In these sites diameter, tree height, slope

aspect, and slope inclination and from this data the standing volume was estimated to give an overall value (where possible).

Fauna Survey Methodology

The field survey for fauna was undertaken by a skilled survey team. Surveys were undertaken to record (i) species richness of the study area, (ii) status and distribution of observed or potentially present animal species, (iii) habitat requirements and preferences of selected species of special conservation interest, and (iv) legal protection of the animal species by national legislation and regulations.

Surveys of the terrestrial environment along the pipeline route and associated infrastructure were undertaken to identify fauna species of interest. Priority was given to those species of international or national protected status and, where possible, if signs could not be seen, habitat capable of supporting such species was identified.

The surveys were qualitative or semi-quantitative (depending on the species) where species abundance was not recorded. Specific species features or locations such as nests and breeding sites, burrows, etc. were provided on the basis of the desktop study, re-examination of 2009 data or from 2011 and 2012 field survey findings. However, no specific extensive surveys along the entire route were undertaken in 2011 or 2012.

Due to the variety of fauna groups, surveys were organised into fauna groups with specialists concentrating on the various groups (i.e. large carnivores, otters, birds, and fish).

Large Carnivores

The field survey activities focused on those areas considered (from 2009 surveys and further desk study) to be of high potential to support such species. The area focused on habitat preliminarily located between the East, Central East and Central West sections, from the Albanian-Greek border and Berat. Large carnivores (i.e. bear, wolf) together with otters are species of high nature conservation interest and are also indicative of habitat quality and integrity.

Specific field activities for these species included:

- Tracks and signs survey including investigation of the presence of animal tracks, droppings and other field signs (Bang and Dalstrom, 2001; Jedrzejewski and Sidorovich, 2010; Breitenmoser *et al.*, 2006);
- Local knowledge identification by interviewing local people through means of a systematic questionnaire (qualitative method);
- Conflict events through recording livestock depredation cases and other damaging incidents; and
- Killed/hunted individuals by collecting statistics on the number of culled/hunted animals over time.

Otter Survey

Sites investigated included all river crossings along the route as well as standing water bodies and ponds or marsh areas. The survey mainly focused on permanent waters with food availability and low human disturbance. Key watercourses surveyed along the route included the Osumi River, Semani River, Devolli River and Vokopola Stream (Bego et al., 2011).

Field activities for otters included searching along river banks and at the edge of water bodies for spraints (faeces), footprints, feeding remains (fish, amphibians, birds) and resting sites (including holts and more temporary structures) (Bego, et al., 2011). Particular emphasis was placed on locating resting sites where rivers would be crossed by the pipeline route since, under European legislation, otter resting sites are protected, and special licensing is required for any works to be undertaken at such locations.

Birds

The survey consisted of a rapid walkover survey (Bibby, et al., 2000) at selected points along the pipeline route undertaken by a dedicated ornithologist with assistance from the overall terrestrial ecology team. The survey aimed to cover as much ground as possible along the pipeline route and within a 500 m buffer and to consider all habitats being crossed by the pipeline route and associated infrastructure (e.g. mixed agricultural matrix, forest areas, pastures, coastal wetlands, grasslands, etc.). The survey prioritised those areas where endangered/protected species were thought to be present (from the 2009 survey or desk study) and where ground-truthing to confirm/validate desktop data was needed.

Field activities for birds included survey through direct observation or identification by call, along with counting of all individuals. Any breeding behaviour was also noted and habitat capable of supporting particular species not observed or breeding habitat for non-confirmed breeders was also noted.

Small Mammals, Reptiles and Amphibians

The survey considered all habitats within the 500 m corridor. While no species were trapped to create a complete picture of species present, areas considered of highest interest such as wetlands and riparian areas, forest edges, etc. were prioritised to provide as much detail of species presence/absence as possible.

Small mammal, reptile and amphibian survey included direct observation as well as indirect analysis of field signs (i.e. tracks, trails, burrows and other field signs) along the pipeline corridor.

5.1.6.2 Aquatic Ecology

The analysis of the river ecosystems is largely based on the use of indicators derived from the Water Framework Directive (WFD). These have included investigations on phytoplankton, phytobenthos, macroinvertebrates and fish.

5.1.6.2.1 Desk-based Study

The study area of the pipeline route includes a number of key watercourses in Albania and as part of the desk-based study, data was sought on the biological characteristics of three key watercourses (Devolli, Osumi and Semani Rivers) and their tributaries (Dunaveci, Vokopola and others). Environmental monitoring of rivers using biological indicators such as habitats and flora (macrophytes, riparian vegetation and phytobenthos) and fauna (macroinvertebrates and fishes) is a relatively new practice in Albania and thus only limited recent, standardised and comprehensive data is available for comparison with data collected during the baseline surveys in 2011. The sampling locations were selected in coherence with the hydromorphology and water quality assessments for rivers (see *Section 5.1.5.3.1 Hydromorphology*).

Many indices have been produced internationally for freshwater ecosystems, and several standards have been stated for the assessment of environmental and ecological characteristics of rivers using aquatic organisms as indicators, taking into account their species composition and abundance. Where possible, data collected using standard methods was sought.

Habitats and Flora

For Albanian habitats and flora, data on macrophytes (i.e. species that live in or on the riverbed) and riparian vegetation (species that live along river banks) was sought. Data on floristic studies concerning riparian vegetation (e.g. Kárpáti and Vajda, 1961; Kárpáti, 1962) are scattered and old, although some can still be found in the Database of National Herbarium. Some of the most detailed studies on river macrophytes were on those found within the Shkodra Lake-Buna River hydrological system (Kashta and Rakaj, 2001; Kashta 2007; Rakaj M and Kashta, 2010) and the Coastal Lowlands of Albania (Buzo 2000; Buzo, et al., 2001). There are few studies on freshwater algae which are mostly concentrated on algae communities within rivers of North Albania (Vermoshi, Cemi, Drini, Buna) and the South and Southeast of Albania (Shkumbini, Devolli, Vjosa, Drino, etc.) (Kashta, 1994, 2004, 2009). A preliminary study of flora species in Albanian rivers revealed about 125 species of hydrophilic plants/macrophytes (Mullaj, et al., 2007).

Limited data on phytobenthos was available according to the desk study. However, the study of phytobenthos which includes microscopic plants that inhabit the surface layers of the riverbed is commonly undertaken in Europe where this assessment uses benthic diatoms as indicators to assess river water quality, taking into account their species composition and abundance and relevant indices according to the Water Framework Directive (WFD) (European Union, 2000). Diatoms are also good indicators of nutrient enrichment and other pressures that can be used to assess river water quality. Diatom species also have different tolerance (or preference) for environmental conditions such as nutrients, organic pollution, pH, oxygen, etc. Polluted waters tend to support an increased abundance of those species whose optima correspond with the levels of the pollutant in question while others are absent or occur in low abundance.

Fauna

The desktop study for macroinvertebrates included looking through a large amount of data, much of it well over 10 years old. Freshwater benthic macroinvertebrates are tiny animals that inhabit the rocks, logs, sediments, debris and aquatic plants within an aquatic environment during the larval period of their life. They are also highly sensitive to changes in environmental conditions and are a key component of studies in relation to aquatic ecology.

Environmental monitoring of the rivers using macroinvertebrates is a relatively new practice in Albania. Among the first attempts of this nature was an assessment of the Ishmi River using macroinvertebrates (Beqiraj, 2004). More recently, macroinvertebrates were used in the environmental monitoring of the Vjosta River (Beqiraj, et al., 2008), the Devolli River (Beqiraj, 2010), the Shkumbini River (Paparisto, et al., 2010) and for the Erzeni River (Beqiraj, 2011). These assessments usually focus on species composition (i.e. Ephemeroptera, Plecoptera, Trichoptera, Odonata, Diptera, Coleoptera, Gastropoda, Hirudinea, Oligochaeta, etc.) in terms of diversity and abundance within a habitat as species differ in their tolerance to the amount and types of pollution. Indices such as the EPT Family Index and the MGBI Index aimed at assessing the ecological and environmental state of rivers are also used.

There have also been a number of earlier studies on molluscs (Dhora and Welter-Schulttes, 1996) and terrestrial and aquatic insects (Apfelbeck, 1904; Franciscolo, 1979; Csiki, 1940; Murraj, 1968; Misja, 1973). More recently, Oga (2006) completed a study on aquatic insects of the Coleoptera (beetles) and Heteroptera (bugs) orders in the Shkumbini River watershed while others have focused on molluscs in the Buna River (Dhora, 2002; Dhora & Beqiraj,2001) and beetles in different parts of Albania (Paparisto,2001; Laçej, 2005; Dhora, 2005). Data were collected from the above studies with particular emphasis placed on those studies undertaken locally near the pipeline route and undertaken within the last 10 years.

For the desk study in relation to fish, studies on fishes within the Devolli, Osumi and Semani basins are limited (Crivelli and Shumka, 2009). The diversity, distribution, and conservation status of freshwater fish in some areas of Albania are still very poorly known, and few sources of detailed study were available for the desk study to refer to. This is evident from recent descriptions of many new species in the area (Bianco and Kottelat, 2005; Economidis, 2005; Kovačiću and Šanda, 2007; Miller and Šanda, 2008; Zupančič, et al., 2010; Bogutskaya, et al., 2010). Most records of new species are still described in transboundary water systems from neighbouring countries like Montenegro and Greece rather than Albania, although some of the new taxa are reported to occur in Albania as well (Šanda, et al., 2008; Šanda and Kovačić, 2009). Apart from these studies, the only existing publication on the distribution of different fish species in any Albanian river system is that of Cake and Miho (1999) for the Shkumbini River (central Albania), and that is based on an investigation carried out at only 4 localities.

5.1.6.2.2 Field Study

The field survey was undertaken under high flow conditions in June and August 2011 as well as under low flow conditions in September and November 2011. For the initial surveys high flow surveys were undertaken in 8 of the sites. It was not possible to sample under high flow conditions for those sites in the East Section due to the change in the alignment so the only low flow surveys were undertaken at these sites, which occurred in September 2011.In total 13 sampling locations were identified along the pipeline route whereby these sites were chosen based on previous survey data (2009), GIS data and from the experience of local experts. The 13 sample sites cover the Devolli, Osumi, Semani Rivers and their tributaries traversed by the pipeline route and vary in terms of altitude, current velocity, depth, etc. Each of the 13 study sites is listed in *Table 5.1-10* below, and the general location for the Habitats and Flora, Phytobenthos, Macroinvertebrates and Fish sub-sections is the same.

Table 5.1-10 Sampling Locations for Aquatic Ecology (June – August, September 2011)

Site number	*Section*	*Name*	*Area*	*Central Coordinates*	
1	East*	Trestenik creek	Trestenik Area	E 501880	N 4491499
2	East*	Devolli river	Bilishti Area	E 498230	N 4496112
3	East*	Stropani stream	Stropani Area	E 495377	N 4499323
4	East*	Ventroku channel	Vranishti Area	E 493901	N 4502751
5	East*	Dunaveci stream	Mollaj area	E 475909	N 4485559
6	Central East	Osumi river	Vithkuqi Area	E 469105	N 4484914
7	Central East	Qafa creek	Qafa Area	E 440574	N 4483011
8	Central West	Vokopola stream	Uji i Zi Area	E 423873	N 4491765
9	Central West	Osumi river	Poliçani Area	E 421094	N 4497224
10	Central West	Osumi river	Vertopi Area	E 419683	N 4497491
11	Central West	Osumi river	Otllak Area	E 407860	N 4511758
12	West	Semani river	Mbrostar Area	E 378668	N 4517136
13**	West	Channal	Topoja Area	E 368852	N 4512553

*Legend: *Indicates samples taken under low flow conditions in September 2011, all others were undertaken between June and August under high flow conditions. **Indicates survey point outside of the alignment but directly connected. Source: ERM field surveys (June and August 2011)*

The state of flora (macrophytes, riparian vegetation and phytobenthos), and fauna (macroinvertebrate and fish fauna) at each sampling location were assessed for abundance and diversity as well as conservation significance in terms of threatened species and important aquatic environments. The sample and analysis methodology for river ecology is described further in the sub-sections below.

During the later low flow surveys in November 2011, 8 of the original sample sites were revisited where it was thought that further detail was required. These sites are listed in *Table 5.1-11* below. The methodology employed for each survey for aquatic flora and habitats, phytobenthos, macroinvertebrates and fish was the same as that employed during the earlier summer surveys during high water conditions.

Table 5.1-11 Sampling Locations for Aquatic Ecology (November 2011)

Site number	*Low Flow Survey*	*Section*	*Name*	*Area*	*Central Coordinates*	
6	M, P, F, Fl	Central East	Osumi river	Vithkuqi Area	E 469105	N 4484914
7	P, F	Central East	Qafa creek	Qafa Area	E 440574	N 4483011
8	M, P, F, Fl	Central West	Vokopola stream	Uji i Zi Area	E 423873	N 4491765
9	M, P, F, Fl	Central West	Osumi river	Poliçani Area	E 421094	N 4497224
10	M, P, F, Fl	Central West	Osumi river	Vertopi Area	E 419683	N 4497491
11	M, P, F, Fl	Central West	Osumi river	Otllak Area	E 407860	N 4511758
12	P, F, Fl	West	Semani river	Mbrostar Area	E 378668	N 4517136
13*	P, F	West	Channal	Topoja Area	E 368852	N 4512553

*Legend: M – Macroinvertebrates; P – Phytobenthos; F – Fish; Fl – Aquatic Habitat and Flora. It should be noted that the exact locations for surveys were not always the same for each discipline although all sample points were undertaken in the same area and reach of river. *Indicates survey point outside of the alignment but directly connected.*
Source: ERM field surveys (November 2011)

Habitats and Flora

A rapid assessment of aquatic communities (macrophytes and riparian flora) within the study area was carried out in summer, 'high flow survey' (1-6 June and 22-24 August) and in autumn, 'low flow survey' (3-6 November 2011). During the high flow survey, 13 sites were surveyed and sampled where as during the low flow survey, 5 sites were surveyed and sampled ie Vithkuq, Uji i Zi, Policani, Vertop, Otlak and Mbrostar as presented in *Table 5.1-11*.

Each sampling location was characterised by collecting data on the physical features of the stream and quantifying species abundance of aquatic macrophytes and riparian vegetation within a 100 m transect.

In shallow water, macrophytes were recorded by wading in a zigzag manner across the channel, while, in deeper waters, macrophytes were recorded from the bank. Submerged macrophytes in turbid waters were quantified using a rake. Percentage cover of flora at each location was estimated using a 5-point scale (cover is a percentage of the channel area) as shown in *Table 5.1-12*.

Table 5.1-12 Scale Used for Flora Percentage Cover Estimation

Scale	*Percentage Cover*
1	< 0.1
2	0.1 – 1
3	1 – 5
4	5 – 10
5	> 10

Source: ERM field surveys (June and August 2011)

Phytobenthos (Diatoms)

Sampling sites for phytobenthos within each section of the pipeline route during high flow surveys (between June and August 2011) and low flow surveys (in November 2011) are outlined in *Table 5.1-10* and *Table 5.1-11*. The surveys were conducted at 13 sites during the high flow survey and at 8 sites during the low flow surveys ie Vithkuqi, Qafa, Uji i Zi, Policani, Vertop, Otlak, Mbrostar and Topoje. The same methodology was employed to collect diatoms samples during both the high flow and low flow surveys as presented below.

Epilithic phytobenthos samples were collected from within the main flow of the river and tributaries at the sample site. Sampling of diatoms was based on benthic diatoms from submerged hard surfaces (stones were the preferred substratum), whereby at least five stones of a size that were not moved by mean hydrological conditions were selected from locations throughout the site. Any loosely attached surface contamination (e.g. organic remains) were removed by washing the substratum in stream water briefly before being placed in a tray with 30 - 50 ml of river water. Here the upper surface of substratum was scraped with a stiff toothbrush to remove the diatom film into a labelled sample bottle. At each of the sample locations 4 replicates were undertaken. These were then analysed in line with the procedures derived from the application of the EU WFD (2000).

From the results, additional ecological indices such as Shannon's diversity index (Shannon & Weaver 1949) and trophic state (Rott, et al., 1999) was calculated and used to assess the environmental state.

Macroinvertebrates

Benthic macroinvertebrates have been surveyed in 13 selected sites across the length of the TAP pipeline route in June and August as presented in *Table 5.1-10* and at 5 selected sites in November i.e. Vithkuq, Uji i Zi, Policani, Vertop and Otllak, the details of which are presented in *Table 5.1-11*.

The methodology for sampling and data analysis were based on Dowing & Rigler (1984), Rundel et al. (2002) and Vuori et al. (1999). A rapid assessment of the state of the freshwater macroinvertebrate community was undertaken using the standard kick net method (CEN, 2003) i.e. 23 cm x 25 cm net size with 0.5 mm mesh size. Replicates of 3 were collected at each sampling location, and the samples were then preserved for further examination in the laboratory where most of the taxa were identified down to the family and genus level, and where possible, down to the species level. Species were then assessed in terms of abundance and diversity. This information was used to calculate the environmental quality/state of each sampling site using the HBRW Tier 2 (2002) system which has 4 classifications, which are “non-impacted,” “slightly impacted,” “moderately impacted,” or “severely impacted.” This is based on the EPT Family index, i.e. presence of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) within each site.

The total number of taxa (TT) and average abundance (A av) of each taxa in each sample were assessed for each survey period to compare and analyse between the ‘high flow survey’ and the ‘low flow survey’.

Fish

The sampling sites for the fish surveys are presented in *Table 5.1-10* for high flow surveys. During the low flow surveys three sites were sampled within the Western, Central West and Central East Sections. Dedicated electrofishing surveys were conducted and the same methodology was employed during both sampling periods as described below.

The abundance and diversity of fish fauna at each sampling location were determined using an electro-fisher device, a survey technique that involves generating an electrical field in the water. The sample area at each site was around 200 sq m. As fish pass through the electrical field they are temporarily stunned and collected with a dip net. They are then placed in a live well to be counted and identified before they are returned to the stream unharmed. The survey followed standard acceptable methodology (CEN, 2003).

It should be noted that the importance of following a comprehensive approach to studying diversity in Albanian freshwater ichthyofauna was highlighted in a recent investigation of Albanian Barbus phylogeography, where samples were taken from all hydrological systems in the country (Marková, et al., 2010). The study revealed the presence of 5 different lineages of Barbus in Albania, contrary to previous perceptions that there were only 2 (Economidis, et al., 2003; Economidis & Daoulas, 2003; Kottelat & Freyhof, 2007).

To evaluate the importance of fish species, IUCN categories were used at both an International and National level and Albanian legal protection was referred to, where known. This technique is fully expanded in *Section 6.7.2* (See also *Annex 6.2.2 for Fish Species List*.).

5.1.6.3 Protected and Designated Areas

During the Albania Route Alternatives Appraisal exercise performed in 2009-2010, a study area was defined within a 2 km buffer along the length of the route and Compressor Station locations. Within this area, a review of existing information was undertaken, and information on current and potential protected area sites was compiled. Additional data was also gathered on current and proposed protected areas within the national context which falls under the following categories (see *Annex 6* for further details):

Protected Areas:

- Nationally Protected Areas;
- Ramsar Sites; and
- Nature Monuments.

Designated Areas

- Candidate Emerald Network Sites (ASCIs): these can be considered as the equivalent to the candidate Natura 2000 sites for EU countries (formally the Natura 2000 sites in the EU are to be designated as part of the Emerald Network, which covers a wider area than the EU countries);
- CORINE biotopes (ACIs); and
- Important Bird Areas (IBAs) and Important Plant Areas (IPAs).

Protected areas located within or in close proximity with the study area which may be impacted by Project activities were identified from the information gathered. Subsequently, more detailed information on the identified sites was gathered, especially pertaining to the condition of the area, flora and fauna species present and potential impacts arising from Project activities, whenever possible. This additional information was compiled from a combination of literature review and field observations.

Field Survey

Surveys of protected and designated areas were carried out as part of the wider surveys for terrestrial ecology in 2009, 2011 and 2012. However as part of the Habitats Directive Assessment (HDA) a dedicated survey of protected and designated areas was required. This survey was agreed following consultation with the MoEFWA (8th Feburary 2012) and concentrated on those protected and designated areas within the study area, which could be affected. The survey was undertaken between the 2nd and the 7th April 2012 and included a survey of several candidate Emerald sites (ASCIs), CORINE biotopes (ACIs) and Nature Monuments.

5.1.7 Onshore Socioeconomic Environment

5.1.7.1 Introduction

This section describes the methodology adopted to study socioeconomic baseline conditions in the communities along the 209 km Albanian section of the Trans-Adriatic Pipeline (TAP) from the Greek border in the region of Korça to the landfall site in the region of Fier.

5.1.7.2 Objectives of Socioeconomic Baseline Data Collection

The socioeconomic baseline was prepared in order to fulfil the following objectives:

- To understand the socioeconomic context of the study area, including socioeconomic, historical, political and economic conditions.
- To provide data that informs the impact assessment in order to predict and explain potential Project impacts as well as establish mitigation measures; and
- To understand the expectations and concerns of communities potentially affected with regard to the Project.

To meet these objectives, a variety of primary and secondary, qualitative and quantitative data collection methods were used, which were broadly divided into 3 key components: pre-fieldwork activities; consultation and primary socioeconomic survey. Further detail on these components is provided in *Box 5.1-1*.

Box 5.1-1 Methods of Data Collection

Pre-fieldwork activities

- ***Desktop Study*** included a ***mapping exercise*** to confirm settlements within the study area and sites of 'socioeconomic' interest to be visited, which may be impacted by the Project, such as cemeteries, buildings, agricultural land, local water supply points, transmission lines, etc. A ***baseline gap analysis*** was also conducted using data collected from the previous phases of the Project (route selection and scoping) and other secondary sources to identify primary data needs.
- ***Field planning and development of field tools*** designed to capture information required for the study.
- ***Workshop*** to brief local and international consultants on field activities.

Consultation

- ***Settlement level consultation*** meetings were held in every settlement within the 2 km corridor to inform the settlement about the Project and to discuss impacts and mitigation measures.
- ***Focus group discussions*** to gain information from specific groups otherwise difficult to access and to have targeted discussions on issues of concern with regard to the Project.

Survey

- ***Settlement level survey*** to collect quantitative and qualitative settlement information.
- ***Household survey*** to collect quantitative and quantitative household level information.
- ***Key informant interviews*** to gain detailed information that is otherwise difficult to obtain, such as maps showing protected areas, tourism development plans and statistics.
- ***Field observations / ground truthing survey*** to verify sites of interest identified during the pre-fieldwork mapping exercise.

Field data collection activities (consultation and surveys) took place in 5 stages:

- Stage 1 was conducted in June 2011 along the whole route, including a section in Korca where the routing has subsequently changed.
- Stage 2 was carried out in September 2011 along the new section of the route in Korca.
- Stage 3 was carried out in February 2012 and involved only meetings in Tirana with traffic authorities and representatives of the Ministry of Environment, two environmental NGOs and the Albanian Archaeological Services.
- Stage 4 was carried out in July 2012 along the new Potom Route and related access roads.
- Stage 5 was conducted in July and September 2012 and involved visiting the location of the main pipe yard in Synej commune (Tirana region), the grid connections for CS02 and CS03 and a sample of 6 new roads including the new access roads in Durres municipality and Rrashbull commune (Durres region) (AR1).

5.1.7.2.1 Pre-Fieldwork Activities

Desk-Based Study

The desk-based study was the initial step to field planning and baseline development. Work during the ESIA phase included a re-examination of relevant data collected for the route appraisal exercise performed in 2009 and 2010 and the ESIA Scoping process. The desk-based study was used to define information gaps at regional and local levels required to further understand the key issues identified during the ESIA Scoping Stage. The study was composed of 2 elements: A mapping exercise and a baseline gap analysis as described below.

GIS Mapping Exercise

Prior to field work activities, a GIS mapping exercise was conducted to identify key features and sensitivities within the study area. The socioeconomic study area for primary data collection was delineated as a 2 km corridor study area along the pipeline route (1 km on either side of the pipeline centreline) and around permanent and temporary facilities and access roads. Major settlements or other significant features that are near but outside of the 2 km corridor were also considered. In addition, a more detailed identification of key sensitivities was undertaken within a 60 m corridor (30 m either side of the centreline).

The mapping exercise was revised in June 2012 to include additional information on the areas affected by the new Potom Route and its related roads (AR6 and AR7), the main pipe yard south of Durres, the grid connections for CS02 (Bilisht Qender commune, Korça region) and CS03 (Dermenas commune. Fier region), and a sample of 6 access roads (AR1,2,3,4,5 and AR8). *Section 2* provides the details on the location of these project features.

Table 5.1-13 shows regions and the number of communes/municipalities and settlements located within the study area.

Table 5.1-13 Regions, Communes and Settlements within the Study Area

	Korça Region		***Berat Region***		***Fier Region***		***Tirana Region***	***Durres Region***	
Districts	Korça	Devoll	Skrapar	Berat	Fier	Lushnje	Kavaje	Durres	Total
Communes & Municipalities*	6	4	6	9	9	1	1	2	38
Settlements	18	9	18	29	16	1	1	3	95
**Includes 5 communes with only land within the 2 km corridor of the pipeline route*									

Source: ERM (2012)

Areas of 'socioeconomic' interest and sensitivity which may be impacted by the Project, such as cemeteries, schools, water sources, transmission lines, agricultural land, buildings, etc., were identified during the mapping exercise so that they could be visited during primary data gathering, where possible.

Baseline Gap Analysis

Using data gathered during previous phases of the Project, namely route refinement and scoping, a baseline gap analysis was prepared. The key information gaps identified were as a result of:

- Information that was previously unavailable or inconsistent;
- New issues reported during the scoping disclosure process;
- Updated Project planning in terms of the location of Project-related infrastructure (compressor stations, campsites and storage yards);
- Economic activities, especially at the landfall site and offshore (*e.g.* fisheries); and
- Impacts to existing features such as rivers, road crossings and irrigation channels.

This exercise fed into further review of available secondary sources of information and the development of the field plan (identification of stakeholders and key informants to be met with and focus groups to be held) and design of field tools designed to capture the information as described below (field planning and field tools).

Further secondary data was gathered when available from both national and international sources. These sources included national and international non-governmental organisations, academic texts, government ministries and departments, in particular the Albanian National Statistical Institute (INSTAT) and reports from international organisations such as the World Bank, United Nations Development Program (UNDP), European Bank of Reconstruction and Development (EBRD) and the International Organisation for Migration (IMO). References to applicable documents are made throughout the baseline.

Field Planning and Field Tools

Based on the information collected from the desk study, primary data collection needs were identified for each region within the study area. The following field planning activities were carried out in preparation for the consultation and surveys:

- Preparing a list of stakeholders to be consulted including key informants and types of focus groups;
- Preparing a communications package for consultation activities as detailed in *Table 5.1-14*;
- Contacting national, regional and local level heads to arrange community meetings, focus groups and key informant interviews; and
- Working with the Albanian branch of the DDB international advertising agency to implement the media campaign involving dissemination of newspaper, television and radio adverts.
- Developing field tools to capture the relevant information required for the ESIA.

Table 5.1-14 Communications Package

Material	*Description*	*Purpose*
Presentation	Presentation of the ESIA process, Project description, Project progress to date, future Project plans, timeframes, expected impacts and mitigation measures	Consult on impacts and disclosure of mitigation measures.
Leaflet	Two-page leaflet in Albanian summarising the Project, the ESIA process and future Project plans. Also provides contact details for TAP.	Allow stakeholders to take information home and have TAP contact details for later comments or questions.
Q&A	A double-sided sheet in Albanian of frequently asked Project questions.	A guide for consistently providing stakeholders with additional Project information.
Television and Radio Ads	A short television and radio advertisement on local television/radio channels informing consultants of the date, time and location of consultation meetings.	Informing the general public (not only stakeholders) and advertising in advance of the arranged meetings hoping for a reasonable turn-out from the general public
Posters / Survey Reports	Posters and/or Survey Reports informing the general public on the issues discussed questions and answers provided, and outcome of the presentation.	Provide feedback concerning the quality of information shared, and the outcome of the presentation (satisfied customers).

Source: ERM (2011)

The field tools were designed to enable teams to record information clearly and concisely whilst in the field. The tools used are outlined in *Table 5.1-15*.

Table 5.1-15 Field Tools

Name of Tool	**Description**
Settlement Fact Sheet	• Quantitative information on the commune and settlement, including demographics, economics and livelihoods, infrastructure and skills. • Information on each of the communal and settlement meetings including a list of participants. • Settlement level observations.
Stakeholder Consultation Log	• Records of consultations, stakeholders, issues and actions. • Records key actions/issues emanating from key informant interviews at a regional level.
Focus Group Records	• Record of who was met, what was discussed and discussion of key issues/points.
Waypoint and Photo Logbook	• Record of waypoints visited and photos for ground truthing within 500 m corridor. • Records of field observations such as visits to compressor stations, proposed campsites and storage yards and existing infrastructure.
Household Survey Questionnaire	• Information gathered during household survey.

Source: ERM (2011)

Workshops

Workshops were held on the 3rd through the 5th of June 2011 with ERM Team Leaders, local consultants and the household survey team, which involved training and briefing discussions. Topics included:

- Health and safety;
- TAP Code of Conduct training;
- Project description;
- GPS training;
- Discussion of the tools; and
- Field schedule.

Training specific for the household survey took place over a full day and provided the background and objectives to the household survey, detail on the methodology and action steps, and concluded with detailed review and role play on conducting the interviews.

5.1.7.2.2 Consultation Activities

Community Consultation Meetings

Meetings were conducted with settlements within the study area. The primary purpose of the meetings was to inform the community about the Project. The meetings also allowed for discussions with the community about local conditions and provided a platform to express concerns/issues related to the Project and to identify potential mitigation measures to be considered in the ESIA.

The format of the meetings involved a presentation of the Project as detailed in *Table 5.1-14* followed by a question and answer session. Details of the meeting were recorded and transferred to the stakeholder consultation log to maintain a record of issues raised and actions noted.

Meetings were held in a variety of locations such as municipality and commune offices, coffee shops, community socioeconomic areas, general stores and in some cases outside in the middle of the village.

During Stage 1, attendance at some of the community meetings was low. As elections had been recently held in some areas, Heads of Community were in some cases in transition and reluctant to organise or inform the communities of the meetings. In addition, some of the meetings were held during the day when people were working in the fields or otherwise away from the settlement. In order to improve attendance during Stage 2 of consultation, a more intense media campaign was organised. An increased number of advertisements were placed in the local media prior to the meetings, and consultation posters were distributed by the household survey team

throughout the settlement 3 days in advance of meetings. Meetings were also held in the mornings and evenings(1).

Box 5.1-2 Community Consultation Meetings

A series of media announcements were placed in the national and local press. Once the date, time and location of each consultation meeting were confirmed, a press release was prepared in Albanian and broadcasted as follows:

- Publication of media announcement in 7 national newspapers 7 days prior to each of the planned meetings;
- An announcement on local television stations 5 and 2 days before each meeting.

The local culture resulted in few women attending open consultation meetings. A discussion was held with the head of the village, along with key female figures within the community (teachers, midwives, etc.) in advance of all women's focus groups in order to ensure that meetings were held at a convenient time for women. Additionally, leaflets were distributed in advance to key female figures (e.g. nurses and teachers) to disseminate to women and encourage their participation in the public meetings. However, the local culture still remained a barrier to obtaining good representation of women at the meetings. This was addressed in part through an increased number of women's focus groups, particularly during Stage 2 of the consultation.

Stages 4 and 5 did not include any community meetings, however it is envisaged that new communities affected as result of rerouting and changes to the project footprint will be consulted during ESIA disclosure process. Disclosure consultation will also involve settlements affected by the road access program that are outside of the 2 km corridor and not surveyed to date and those currently within the 2 km corridor as a result of minor re-routings undertaken during ESIA preparation.

Focus Group Discussions

Box 5.1-3 Focus Group Discussions

A focus group is a form of group interview wherein are several participants (including the facilitator); there is an emphasis in the questioning on a particular defined topic; and the accent is upon interaction within the group and the joint construction of meaning. The interaction within groups is an area of interest and is more focused than a group interview.

Source: Bryman .A. (2008) Social Research Methods (3rd Edition). Oxford University Press.

Focus groups were held during Stages 1 and 2 with the following groups:

(1) For health and safety reasons it was not always possible to conduct meetings in the evening due to the distances and the quality of the roads. Evening meetings were concentrated in the settlements close to Korça.

- Groups that may be significantly impacted or represent an impacted group in order to understand information with regard to the group in more detail and to explore diversity. Such groups included subsistence agricultural producers, olive growers, fishermen and fruit growers. A health focus group and a local development focus group were also carried out to gain a range of perspectives about issues relating to the topic area.
- Groups that may be vulnerable to the impacts of the Project and therefore potentially more susceptible to negative impacts or have a limited ability to take advantage of positive impacts. Such groups included women, the elderly, and ethnic minorities. Focus groups aimed to understand more about the group and how they may be affected by the Project. They also provide a mechanism to provide information directly to some individuals within these groups and to capture their opinions and concerns.

The number and type of focus groups was tailored for the region in which it was taken place based on information collected from the desk study and local knowledge of the area from ERM's local consultants. In total, 36 focus groups were held in the study area. *Table 5.1-16* presents a summary of the types and number of discussions held.

Table 5.1-16 Focus Group Discussions Held (Stage 1 and 2)

Women	*Elderly*	*Ethnic Minorities (Roma, Macedonian, Serbian)*	*Farmers/ Landowners*	*Fruit*	*Fishing*	*Local Development*	*Health*
12	4	3	11	4	1	1	1

Source: ERM (2011)

The approach to holding focus groups was consistent across the study areas so that issues raised could be compared. During the focus groups, participants were asked a series of open-ended questions on topics specifically related to the group of individuals. All information collected was recorded on a focus group records form (see below). Participants were provided with a Project leaflet to take away with them should they require additional information or need to contact TAP at a later date.

Although a broad range of discussions were held, ethnic minority focus groups proved problematic to organise, particularly the Roma community. Although the Roma community is the most prominent ethnic minority in Albania, it proved extremely difficult to convene a focus group meeting. Instead, a Roma leader was interviewed.

5.1.7.2.3 Surveys

Settlement Level Survey

The Settlement Factsheet was a protocol designed to gather local level information from the Head of Commune or Village about the commune or settlement which could not otherwise be obtained. Information collected included demographics, economics and livelihoods, infrastructure and skills.

In addition to collecting quantitative information, the factsheets served as a tool to trigger in-depth discussion about potential developments in the area, reasons for migration, any changes in the community and other issues. Detailed information on each of the 69 settlements surveyed is presented in *Annex 4.5.0* detailed maps.

During Stage 1 and 2, a total, 69 Settlement Factsheets were completed for 100% of the settlements in the study area, as shown in *Table 5.1-17*.

Table 5.1-17 Settlement Factsheets Completed (Stage 1 and 2)

Korça Region		***Berat Region***		***Fier Region***		
Devoll	Korça	Skrapar	Berat	Fier	Lushnje	Total
7	11	15	24	12	0	69

Source: ERM (2011)

During Stages 4 and 5 a total of additional 14 settlement factsheets were completed.

Table 5.1-18 Settlement Factsheets Completed (Stage 4 and 5)

Korça Region		***Berat Region***		***Fier Region***		***Tirana Region***	***Tirana Region***	
Devoll	Korça	Skrapar	Berat	Fier	Lushnje	Kavaje	Durres	Total
1	1	3	0	6	0	1	2	14

Source: ERM (2012)

Household Surveys

Box 5.1-4 Household Surveys

Household: A household is defined as a group of persons living together in one dwelling who have a joint economy. Therefore, household members should be present or absent for less than 12 months but expected to return before an absence of more than 12 months. **1**

Household Survey: A quantitative study to gain household level information in areas including demographics, education, health, infrastructure and economic activities.

The objective of the household survey was to gain a broadly representative snapshot of the socioeconomic context of households in the socioeconomic study area and to understand differences in household level socioeconomic conditions both between households and along the pipeline corridor. The household survey was only undertaken as part of Stage 1 and 2.

The questionnaire was developed in line with international best practice and taking into account Albanian survey norms. The questionnaire was tested in a pilot exercise prior to commencing data collection fieldwork.

1 Institute of Statistics Albania (Instat)

Digitisation of settlements within the study area provided the sampling framework for the household survey. For the original routing in Stage 1, the total number of digitised households in the corridor was 2,047 resulting in an agreed sample size of 400 households. During Stage 2 of the survey, carried out in September 2011, a further 1,849 households were digitised in the 2 km corridor along the new section of the route. An additional sample of 153 households was agreed for the new routing in Korça.

A non-probability sampling method was used to select the number of households with target numbers of households to be surveyed in each settlement predetermined as a percentage of the population. Enumerators were requested to select every second household for settlements within or intersected by the 500 m corridor and every tenth household for settlements within or intersected by the 2 km corridor. This sampling is non-probability sampling, so results cannot be extrapolated for the entire population but reflect the profile of the 2,290 household members included in the survey. *Table 5.1-19* shows the total number of household surveys by Region.

Table 5.1-19 Household Surveys Conducted

	Korça Region		***Berat Region***		***Fier Region***		
	Korça	Devoll	Skrapar	Berat	Fier	Lushnje	Total
District totals	77	82	82	261	51	0	553

Source: ERM (2011)

Key Informant Interviews

Box 5.1-5 Key Informant Interviews (KII)

Key informants are select individuals who have knowledge of a specific subject or are informed members of the community. They include government representatives, lawyers, local leaders, religious leaders, school teachers, healthcare professionals, NGOs, etc.

The objective of these interviews all organised during Stage 1 and 2 was to gather information from individuals with in-depth knowledge or information of a specific subject or topic area.

As with the focus group discussions, meeting types were tailored to the region using data collected during the desktop study and through local knowledge. In total, 23 Key Informative Interviews were held with both regional and local level key informants. *Table 5.1-20* shows the types and numbers of interviews in each region.

Table 5.1-20 Key Informative Interviews Held (Stage 1 and 2)

KII Type									
Urban Planning/ Development/ Tourism	***Agronomy***	***Ethnic Minorities (Roma)***	***Flooding***	***Forests***	***Roads***	***Education***	***Health***	***Labour***	***Fishing***
7	1	1	2	2	1	3	3	2	1

Source: ERM (2011)

Interviews were conducted by both the ERM and local consultant. Notes from interviews with key informants were recorded on the settlement factsheet (see section below). Any actions that may influence Project decisions based on pipeline routing, for example, were recorded in the Stakeholder Engagement Log in order to be input into the Stakeholder Database.

Field Observations and Ground Truthing

Box 5.1-6 Field Observations and Ground Truthing

Field observations involve visiting sites of interest which may be impacted by the Project. Observations also include assessing the environment where those affected by the Project live in terms of infrastructure, quality of life etc.

Sites of interest are areas that are particularly sensitive from a socioeconomic point of view. They include areas where the pipeline passes near residential or commercial buildings, clusters of houses, crosses roads and irrigation systems as well as areas in agricultural use. They also include locations for associated facilities such as compressor stations, construction camps and pipe yards.

Field observations provided the opportunity to understand how those living or working in and around the Project site, such as land users, interact with areas potentially impacted by the Project. In addition, observations allowed for an assessment of the environment/context within settlements to evaluate potential sensitivity to impacts.

GPS waypoints were taken at each site in order to ground truth key receptors to be mapped on the GIS for inclusion in the ESIA. The field team also completed a waypoint and photo log to record the name of site, location, description of surroundings, key receptors and significance to the Project.

5.1.8 Onshore Cultural Heritage

The cultural heritage team identified cultural heritage sites within a 2 km wide corridor centred on the base case route as a means of determining cultural heritage constraints for the Project. This corridor provided a relevant and manageable study unit with opportunities to recognize both constraints and constraint-free areas on either side of the centreline. Baseline data collection took place in two phases: desk study and fieldwork. Investigations focused on three general categories of cultural heritage: archaeological sites, monuments, and sites with intangible cultural heritage value. The team also assessed the likely quality/importance level of each site as high,

medium or low. It should be noted, however, that establishing the definitive cultural and scientific value of sites is the prerogative of the Ministry of Culture, Sports and Tourism, and local stakeholders.

5.1.8.1 Cultural Heritage Baseline Methodology

Table 5.1-21 lists the types of heritage sites considered, their characteristics and aspects of their quality and importance.

Table 5.1-21 Characteristics of Cultural Heritage Sites

Type of Heritage Site	***Definition/Examples***	***Quality/Importance***
Archaeological Site	Ruined and/or buried occupation sites, fortifications, mosques and churches, prehistoric refuse or storage pits, villages and ancient burials. .	Sites contain scientific, cultural and historic information which also has public value as the information base and public validation of national history and identity. Value should be formally recognized and validated by government authorities
Historic Monument	Standing structure with historic aesthetic or monumental value. Examples are castles, fortifications, churches and graveyards.	Sites contain cultural, artistic, historical and aesthetic value based on their appearance and contribution to the *look and feel* of a particular location. Value should be recognized formally and validated by government authorities.
Site with Intangible Cultural Heritage Value	A structure, place or landscape feature with special, often unexpected importance to a community or larger stakeholder group. (example: informal or modern place of worship; location or landscape feature associated with an important event; informal accident shrine; informal marked and unmarked burials and reputed burial locations).	Sites embody the local cultural and historical traditions contributing to community and local group identity and cohesion. Value may not be validated or recognized but. as with archaeological sites and monuments, is recognized by international academic and heritage preservation standards.

Source: ERM (2011)

5.1.8.2 Desk Review

Desk-based research was carried out to identify both cultural heritage sites and areas of archaeological potential within and near the base case corridor, as well as to ascertain the treatment of cultural heritage under Albanian national legislation. The desk study involved the collection and analysis of relevant data from government agencies, databases, archaeological and historical literature, historic and topographic maps as well as consultation with experts and other knowledgeable individuals in Albania and internationally. The data from previous routing study surveys were also incorporated into the desk review and were used to plan further field work.

5.1.8.3 Field Survey Methodology

The field investigations in September 2011 and July 2012 involved field confirmation of known sites and selective pedestrian reconnaissance to identify additional sites. The survey was conducted in teams led by professional Albanian archaeologists and consisted of vehicle-assisted pedestrian survey along the base case route and associated Project elements such as access roads, pipe yards, compressor stations, etc. No intrusive methods were used, but some artefacts were collected from the surface as a part of the surveys.

During the survey of both 2011 and 2012 in order to execute an effective survey in a relatively short time, field teams drew upon previous desk and field research to select specific areas for survey. The selection of target areas was based not only on the presence of known cultural heritage sites, but also on an area's potential to contain undiscovered sites. Field activities were most intensive in the Korça region of the base case route due to the region's high archaeological importance. Using this approach, approximately 65% of the TAP base case route was covered by a field survey team of 3 to 4 archaeologists walking parallel transects approximately 15 m apart, along an approximately 60 m wide area centred on the route alignment.

In July 2012 the field survey was related to specific Project elements such as access roads, pipe yards, and compressor stations, The entire footprint of the Project area was surveyed through a combination of pedestrian and vehicle survey.

5.2 Impact Assessment Methodology

5.2.1 Introduction

The general principles that underpin the approach to the impact assessment can be found in *Section 5*, whilst this Annex details the topic-specific methodologies utilised for each of the environmental, socioeconomic and cultural resources assessed in *Section 8*. A number of the assessments should also be read in conjunction with Annex 8 Impact Assessment Data which contains further technical information – references are made in the text as required.

The following topic-specific assessment methodologies for determining impact, or where applicable risk, significance criteria are detailed:

- Physical Environment (*Section 5.2.2*)
    - Ambient Air Quality (*Section 5.2.2.1*);
    - Noise (*Section 5.2.2.2*);
    - Water Resources (*Section 5.2.2.3*);
    - Geology, Geomorphology and Soil Quality (*Section 5.2.2.4*);
    - Landscape and Visual Amenity (*Section 5.2.2.5*);
- Biological Environment (*Section 5.2.3*)
    - Ecology – Habitats and Species (*Sections 5.2.3.1* and *5.2.3.2*);
- Socioeconomic Environment (*Section 5.2.4*);
- Cultural Heritage (*Section 5.2.5*).

Where standards were not available or provide sufficient information on their own to allow grading of impact significance, significance has been evaluated taking into account the magnitude of the impact and the value or sensitivity of the affected resource or receptor.

The magnitude of impact is determined based on the combination of a number of characteristics such as nature, scale, duration or frequency and likelihood (for unplanned events).

Given the differences inherent between resources/receptors (and in many cases between different types of impacts to a given resource/receptor), the definitions of the magnitude designations (i.e. the methodologies used to combine the various impact characteristics and conclude a magnitude designation) are defined differently according to the resource/receptor (or the type of impact in question). These are based upon ERM experience and professional judgement where required.

If the magnitude of impact is not specifically defined in *Section 8* the definitions given in *Table 5.2-1* have been used.

Table 5.2-1 Definition of Factors Determining Magnitude of Impact

Factor contributing to determination of magnitude	*Generic Definition*
Nature / Type	• *Negative* – an impact that is an adverse change from the baseline, or introduces an undesirable element into the baseline; • *Positive* – an impact that is considered to represent an improvement to the baseline or to introduce a new desirable factor; • *Direct* – impacts resulting from a direct interaction between a Project activity and a resource/receptor; and • *Indirect* – impacts resulting from non-Project activities that occur as a consequence of the Project.
Scale	• *Local* - impacts that affect local resources or that are restricted to the area of influence; • *Regional* - impacts that affect regionally important resources or that are felt at a regional scale; • *National* - impacts that affect nationally important resources or that are felt at a national scale; and • *International* - impacts that affect internationally important resources or that are felt at an international scale (e.g. areas protected by International Conventions) including trans-boundary effects on society and health.
Duration	• *Temporary* - impacts predicted to be of duration shorter than the length of construction and/or of an intermittent/occasional nature; • *Short-term* - impacts predicted to last only during construction; • *Medium-term* – impacts predicted to last for an intermediate period extending beyond the end of construction; • *Long-term* - impacts predicted to continue over an extended period beyond the end of construction; and • *Permanent* - impacts that will arise from irreversible changes in conditions such as the removal of features

The value or sensitivity of a resource or receptor is taken into account, for example, it's local, regional, national or international designation, its importance to the local or wider community, its ecosystem function or its economic value, as described in *Section 6 Environmental, Socioeconomic and Cultural Baseline*.

Further, where applicable, the evaluation of the impact takes into consideration reversibility of an impact. This applies mainly for removal of vegetation, where for example the loss of meadow vegetation through establishing the construction strip is largely reversible by appropriate habitat reinstatement once the pipeline is laid, whilst the loss of old growth forest habitat is not reversible, since the 8 m wide pipeline protection strip (PPS) does not allow replanting of trees, and where trees can be replanted outside of the PPS, they will take decades to mature.

Besides actual anticipated impacts, the ESIA in accordance with EBRD and international requirements also reports on risks, *i.e.* events, which if they occur might impact on environmental, socioeconomic or cultural heritage receptors. Regarding the evaluation of risks from non-routine events during operation, the ESIA is informed by dedicated risk assessment studies. These contain and discuss hazard identification and relevant scenarios, probabilities and risk evaluation. The ESIA Report in *Section 8* provides a summary of the relevant aspects (qualitative or where available quantitative). Risks during construction (*e.g.* pollution of soil and water from accidental spills or social frictions amongst local population and construction workers) are addressed qualitative by providing adequate prevention and response plans.

5.2.2 Physical Environment

In this section the Impact Assessment Methodology will be presented for the following components:

- Air Quality;
- Noise;
- Water Resources (Surface and Groundwater, Marine);
- Geology, Geomorphology, Soil Quality and Seabed; and
- Landscape and Visual Amenity.

5.2.2.1 Air Quality

5.2.2.1.1 General Considerations

The impacts of the TAP Project phases on air quality have been assessed in accordance with internationally accepted methodologies and on the base of international air quality standards and guidelines.

All the emission sources connected to the project construction and operation phases have been identified and where possible Internationally recognised EPA emission factors and modelling system have been used to quantitatively define the project contribution to the local air quality; this contribution has been compared against in force National guidelines and International air quality standards such as World Bank/ IFC guidelines and World Health Organisation (WHO) guidelines. Moreover, the background condition has been considered in order to assess cumulative impacts.

The magnitude of the impact has been evaluated throughout:

- comparison with air quality standards;
- spatial coverage of the impact; and
- distance from receptors.

This section sets the main criteria used for the assessment of the Project impact on air quality, focusing separately on the construction and operation phases.

5.2.2.1.2 Background Air Quality

The knowledge of background air quality conditions is useful to assess the Project's impact on air quality and to estimate cumulative impacts produced by the Project plus the background air quality level.

All atmospheric pollutant concentrations monitored during the performed ambient air sampling are below the corresponding analytical method detection limit or far below the background level for ecosystems set up by the EU. This result reflects the characteristics of the areas in which the air samples were collected, as these are rural areas without significant sources of air pollution.

5.2.2.1.3 Potential Impacts

Air emissions will result from a number of sources during construction and operation.

During project construction, the potential impacts to atmospheric quality are related to the following activities:

- Temporary dust emissions from earth movements, excavation, vehicles movement, stockpiles, unpaved surfaces, etc. along the working strip, access roads, yards and camps.
- Temporary emissions of flue gases to the atmosphere from machinery and vehicles (i.e. generators, excavators, bulldozers, side booms, trucks, cars, compressors for hydrotest etc.) and marine vessels.

During operation phase potential emissions will be produced by the compressor stations, whereas negligible fugitive emissions will be produced by the block valve station and by the vehicular traffic associated with the general pipeline operational maintenance.

The main air pollutants that generated during the both project phases are: nitrogen dioxide (NO_2), particulate matter (PM10) (only construction phase) and carbon monoxide (CO). These emissions are of concern because of their negative effect on human health and vegetation.

Receptors consist mainly of residential population of nearby settlements and workers, fauna and flora species, cultural, historic, water quality, etc.

In addition, there will be greenhouse gas (GHG) emissions such as carbon dioxide (CO_2) and methane (CH_4); these emissions are of concern since they may contribute to climate change.

5.2.2.1.4 Sensitivity of Resource/Receptor

In line with the best practices regarding impact assessment on local air quality, the assessment of the impacts on the air quality has to be performed on the most sensitive receptor (human beings). As a consequence the value of the receptor is always considered as high.

5.2.2.1.5 Magnitude of Impact

The magnitude of the impacts induced by the Project on local air quality have been determined by comparing the expected ground level concentration of atmospheric pollutants induced by the project (during both construction and operation phases) against normative guidelines. The background concentration have been taken into account in order to estimate cumulative impacts.

The methodology used is presented in the following paragraphs:

- Assessment of air emission during construction;
- Assessment of air emission during operation; and
- Comparison with air quality Standard.

Assessment of Air Emission during Construction

The main sources of emissions during site preparation and construction will consist of dust generating activities, vehicle/ vessel exhaust emissions and emissions from sources such as generators at construction sites and work camps. As explained in *Section 8*, emissions from non-dust sources have not be subjected to detailed assessment.

The estimate of dust production and related impacts was performed using EPA emission factors and atmospheric dispersion modelling tools.

A quantitative assessment of dust production has been performed using the EPA AP-42 methodology on Aggregate Handling and storage Piles. Following this methodology, dust emissions from the construction phase, including dust emissions due to wind and vehicles' transit resuspension have been calculated on the base of the following inputs:

- construction site area dimensions;
- quantity of soil being moved;
- number of working days;
- average wind speed; and
- number of vehicle/day and average distance covered by the single vehicle.

The identified value of emitted dust has subsequently been used as input for a dust dispersion modelling study, carried out with the EPA modelling system CALMET-CALPUFF (presented in the following part of this Section). The dispersion study simulated the dust ground level concentration at receptors, enabling the assessment of the construction phase impacts on local air quality due to dust emissions.

It should be underlined that this evaluation method does not take into account mitigation measures aimed at reducing dust emissions from the construction phase. Thus, the adopted approach is absolutely conservative.

Assessment of Air Emission during Operation

Fugitive and vehicular traffic emissions are minor if compared with the compressor station emissions, therefore emissions from these sources have not to be subjected to detailed assessment whereas two dedicate air dispersion modelling studies have been carried out in order to quantify and evaluate the ground level concentrations of macro-pollutants, produced by the operation of the CS02 and CS03.

CS02 and CS03 atmospheric emissions will be produced by gas turbines; fuelled with low- gas and their activity will not emit particulate matter or any substantial concentrations SO_2 in the atmosphere. Therefore CO and NO_x are the only air quality pollutant emitted and consequently considered in these modelling studies. The compliance of the CS02 and CS03 emissions with applicable emission limits (International guidelines (IFC) and Albanian national limits regulate emissions for small combustion plants) has been ensured prior to carrying out the modelling studies (refer to *Annex 8 - Section 8.1*).

The atmospheric dispersion of emissions produced by dust generating activities (as explained before) and engine driven machinery was modelled through two dedicated modelling studies. Air quality simulations were performed using the CALMET– CALPUFF modelling system (version 5.8)[1], adopted and recommended by US-EPA. The chosen modelling system is non-steady-state meteorological and air quality modelling system representing the state-of-the–art in Lagrangian puff modelling for assessing impacts of the long-range transport of certain air pollutants[2].

The modelling system consists of three main components, including a set of pre-processing and post-processing programs (which are further detailed in *Box 5.2-1*): The meteorological pre-processor CALMET produces the three-dimensional fields for the main meteorological variables (temperature, wind speed and direction), over the simulation domain. The CALPUFF processor is a non-steady-state Lagrangian Gaussian puff model containing modules for complex terrain effects, overwater transport, coastal interaction effects, building downwash, wet and dry removal, and simple chemical transformation.[3] The post-processor CALPOST statistically analyses CALPUFF output data and produces datasets suitable for further analysis.

The model system requires the following input data:

- meteorological variables' surface data and height profile, to build the three-dimensional wind field (with CALMET); and
- source characteristics and emission data, to simulate the pollutants atmospheric dispersion (with CALPUFF).

1 http://www.epa.gov/ttn/scram/dispersion_prefrec.htm#calpuff
2 Peer Review Of The Calmet/Calpuff Modeling System, Allwine, Dabberdt, Simmons, 1998.
3 A User's Guide for the CALPUFF Dispersion Model (Version 5), Scire, Strimaitis, Yamartino 2000

Post-processed CALPUFF outputs consist of matrices of concentration values. Receptors in the simulation domain can be discrete or gridded. The values calculated at each receptor could be referred to one or more sources.

The results can be processed by any GIS software, creating iso-concentration maps.

Box 5.2-1 Features of the Modelling System Components

CALMET is a diagnostic meteorological pre-processor able to reproduce three-dimensional fields of temperature, wind speed and direction along with two-dimensional fields of other parameters representative of atmospheric turbulence. CALMET is able to simulate wind fields in complex orography domains characterized by different types of land use. The final wind field is obtained through consecutive steps, starting from an initial wind field often derived from geostrophic wind. The wind field is linked to the orography, since the model interpolates the monitoring station values and applies specific algorithms to simulate the interaction between ground and flow lines. The module contains a micro-meteorological module determining thermal and mechanical structures (turbulence) of lower atmospheric layers.
CALPUFF is a hybrid dispersion model (commonly defined 'puff model'). It is a multi-layer and non-steady-state model. It simulates transport, dispersion, transformation and deposition of pollutants, in meteorological conditions varying in space and time. CALPUFF uses the meteorological fields produced by CALMET, but for simple simulations an external steady wind field, with constant values of wind speed and direction over the simulation domain, can be used as input. The module contains different algorithms to simulate different processes, such as: buildings downwash and stack-tip downwash; wind vertical shear; dry and wet deposition; atmospheric chemical transformations; complex orography and seaboard.1 Besides, CALPUFF allows the selection of the source geometry (point, linear or areal), improving in this way the accuracy of the emission input. Point sources simulate emissions coming from a small area while areal sources describe a diffuse emission coming from a wider area; emissions from linear sources are distributed along a main direction (i.e. roads).
CALPOST processes CALPUFF outputs producing an outputs' format suitable for further analysis. In particular, enables the calculation of statistical parameters to compare against in force air quality standards (percentile of hourly concentrations, annual average concentrations, etc.). CALPOST outputs consist of matrices of concentration values calculated at points called receptors. Receptor can be defined by mean of a regular grid or discrete.

Study Conservative Approach

The study has followed a conservative approach characterised by the following main aspects:

- Simulated NO_x have been considered as NO_2, but in reality only a part of NO_x converts to NO_2 depending on different factors (e.g. solar radiation, temperature, hydrocarbon atmospheric concentration). Hence, NO_2 simulated concentrations resulted overestimated;
- The model does not account for dry and wet deposition or photochemical reactions of the pollutants which in reality takes place and would reduce the concentrations of NO_x and CO in the atmosphere. Thus results are overestimating the likely actual contribution of the sources. The approach again is on the safe side of assumptions and gives a conservative picture maximise pollutants modelled concentration values over the simulation domain.

1 In marine coastal areas, CALPUFF considers breeze phenomena in order to model efficiently the Thermal Internal Boundary Layer (TIBL) as in case of coastal sources, the TIBL causes a quick fall of pollutants to the ground.

- The assessment of air quality impacts did not take into account the effect of mitigation measures aimed to reduce atmospheric emissions.

Comparison with Air Quality Standard

The importance of impacts induced by the project on local air quality conditions has been evaluated by comparing expected pollutant ground level concentrations against air quality standards; the latter are set at international and national level in order to guarantee clean air conditions and avoid harmful effects on flora fauna and human receptors deriving from short term and long term exposure to polluted air.

At a national level the Albanian Decision No. 803 issued on the 4th of December 2003, based on article 5 of Law nr.8897 issued on the 16th of May 2002, establishes the limit values for atmospheric pollutants. At the international level, air quality standards are defined by the Environmental Health and Safety Guidelines: General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality; the latter refers to Air Quality Guidelines published by World Health Organization (WHO). At the European level the Directive 2008/50/EC on ambient air quality and cleaner air for Europe establishes a common framework for air quality, defining air quality standard.

The following tables *Table 5.2-2*, *Table 5.2-3*, *Table 5.2-4*, *Table 5.2-5* and *Table 5.2-6* summarise the normative limit concentration values at international, European and national level for SO_2, NO_2, NO_x, PM, CO.

Table 5.2-2 SO_2 Air Quality Standard (IFC, EU and Albanian Legislation)

Averaging Period	***IFC***		***EU Directive 2008/50/EC***		***Albanian Decision No. 803***	
	Value [µg/m³]	***Type*** [1]	***Value [µg/m³]***	***Type***	***Value [µg/m³]***	***Type***
Ten minutes	500	guideline	-	-	-	-
One hour	-		350	Not to be exceeded more than 24 times per calendar year	360	-
three consecutive hours			500	Alert threshold	-	-
24-hours [3]	125	interim target 1	125	Not to be exceeded more than 3 times per calendar year	120	-
	50	interim target 2	-		-	
	25	guideline	-		-	
Calendar year and Winter (1 October - 31 March)	-		20 [2]	-	35 [2]	-

Notes:
(1) Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

(2) Protection of Vegetation and natural Ecosystem
(3)24 hour/8 hour values should not be exceeded during 98% of the year. However, in the remaining 2% they may exceed these values (a total 7 day / year , but not two successive days)

Source: ERM (2011)

Table 5.2-3 NO_2 Air Quality Standard (IFC, EU and Albanian Legislation)

Averaging Period	***IFC***		***EU Directive 2008/50/EC***		***Albanian Decision No. 803***	
	Value [µg/m³]	***Type***	***Value [µg/m³]***	***Type***	***Value [µg/m³]***	***Type***
One hour	200	guideline	200	Not to be exceeded more than 18 times per calendar year	250	-
Three consecutive hours	-	-	400	Alert threshold		-
Four consecutive hours	-	-	-	-	95	-
Calendar year [1]	40	guideline	40	-	60	-

Note:
(1)Calendar year: arithmetic mean of minimum 183 and maximum of 365 measurements per year, from 24 hours each (covering 50 to 100 percent of the year)

Source: ERM (2011)

Table 5.2-4 NO_x Air Quality Standard (IFC, EU and Albanian Legislation)

Averaging Period	*IFC*		*EU Directive 2008/50/EC*		*Albanian Decision No. 803*	
	Value [µg/m³]	*Type)*	*Value [µg/m³]*	*Type*	*Value [µg/m³]*	*Type*
Calendar year (2)	-		30 (1)	-		-

Note:
(1) Protection of Vegetation and natural Ecosystem

(2)Calendar year: arithmetic mean of minimum 183 and maximum of 365 measurements per year, from 24 hours each (covering 50 to 100 percent of the year)

Source: ERM (2011)

Table 5.2-5 PM10 (IFC, EU and Albanian Legislation)

Averaging Period	*IFC*		*EU Directive 2008/50/EC*		*Albanian Decision No. 803*	
	Value [µg/m³]	*Type (1)*	*Value [µg/m³]*	*Type*	*Value [µg/m³]*	*Type*
24-hours (2)	150	interim target 1	50	Not to be exceeded more than 35 times per calendar year	150	-
	100	interim target 2	-			
	75	interim target 3	-			
	50	guideline	-			
Calendar year (3)	70	interim target 1	40	-	60	-
	50	interim target 2	-			
	30	interim target 3	-			
	20	guideline	-			

Notes:
(1) Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

(2)Calendar year: arithmetic mean of minimum 183 and maximum of 365 measurements per year, from 24 hours each (covering 50 to 100 percent of the year)(3)24 hour/8 hour values should not be exceeded during 98% of the year. However, in the remaining 2% they may exceed these values (a total 7 day / year , but not two successive days)

Source: ERM (2011)

Table 5.2-6 CO (IFC, EU and Albanian Legislation)

Averaging Period	*IFC*		*EU Directive 2008/50/EC*		*Albanian Decision No. 803*	
	Value [mg/m³]	*Type*	*Value [mg/m³]*	*Type*	*Value [mg/m³]*	*Type*
1 hour	-	-	-	-	40	-
8-hours (1)	-	-	10	8-hours daily maximum	10	8-hours daily maximum
24 hours (2)	-	-	10	-	2	-

Notes:
(1) 24 hour/8 hour values should not be exceeded during 98% of the year. However, in the remaining 2% they may exceed these values (a total 7 day / year , but not two successive days)

(2) Should not be higher in 98% of the time during the year. Nevertheless, in 2% of the time they can be higher (7 days/year), but not in two consecutive days

Source: ERM (2011)

Modelled pollutants ground concentrations have been compared against in force International, European and national air quality standards for the modelled macro- pollutants CO and NO_2 showed in the previous *Table 5.2-6* and *Table 5.2-3* respectively.

The magnitude of potential air quality impacts of the project associated with predicted short-term (1 hour, 8 hours and 24 hours) and long-term (annual) ground level concentrations (GLCs here after) have been assessed by reference to the International assessment criteria. The magnitude criteria are presented in the next Tables for short-term and long-term impacts.

As a general rule, project emissions should not contribute significantly to the attainment of relevant air quality guidelines or standards. The IFC General EHS Guidelines for Air Emissions and Ambient Air Quality suggests that only 25% of the applicable air quality standards pollutants should be emitted to allow additional, future sustainable development in the same 'airshed'. As a result, 25% of the criterion was used as the threshold below which short-term impacts are defined as being not significant. For short-term releases, differences in spatial and temporal variations usually mean that the incremental GLCs, rather than the background air concentration, would dominate at the point of greatest impact over one hour.

Small, medium and large impacts are categorized as follows:

- A *Small Impact* generally requires no mitigation.
- A *Medium Impact* should be looked into, as some additional mitigation measures may be necessary.
- A *Large Impact* is considered unacceptable assuming that current mitigation measures are insufficient; further mitigation measures would be required to decrease the level of impact.

Table 5.2-7 Significance Criteria for Assessing Short-term Air Quality Impacts

Not Significant	*Significant – Small Impact*	*Significant – Medium Impact*	*Significant – Large Impact*
Predicted short-term incremental GLCs are < = 25% of the assessment criterion (*see Annex 8 Section 8.1*)	Predicted short-term incremental GLCs > 25% but < = 50% of the assessment criterion	Predicted short-term incremental GLCs > 50% but < = 75% of the assessment criterion	1. Predicted short-term incremental GLCs > 75% of the assessment criterion OR 2. When added to existing baseline concentrations, the total concentration exceeds the assessment criterion

Table 5.2-8 Significance Criteria for Assessing Long-term Air Quality Impacts

Not Significant	*Significant – Small Impact*	*Significant – Medium Impact*	*Significant – Large Impact*
Predicted long-term incremental GLCs are < = 1% of the assessment criterion (*see Annex 8 Section 8.1*	1. Predicted long-term incremental GLCs > 1% but < = 25% of the assessment criterion OR 2. When added to existing baseline concentration, the total concentration is < 50% of the assessment criterion	1. Predicted long-term incremental GLCs > 25% but < = 50% of the assessment criterion OR 2. When added to existing baseline concentration, the total concentration is > 50% but < 100 % of the assessment criterion	1. Predicted long-term incremental GLCs > 50%of the assessment Criterion OR 2. When added to existing baseline concentration, the total concentration exceeds the assessment criterion

Greenhouse Gas Emissions

Greenhouse gas emissions have been quantified accordingly to the EU Emission trading normative therefore only the fix sources, thus the compressor stations, have been considered.

The total GHG emission forecast is presented as tonnes of CO_2 equivalent (CO_2-e), according to the methodology of the UN Framework Convention on Climate Change (UNFCCC). The IFC Performance Standard 3 for Pollution Prevention and Abatement, as well as the EBRD Performance Requirement 3 for Pollution Prevention and Abatement, states that the significance threshold is 100,000 tonnes CO_2-equivalent per year for a single project or development.

5.2.2.1.6 Assessment of Impact (Ranking)

As presented in *Section 5.2.5.4* the air quality impact assessment assumes the most sensitive receptor by default. As a consequence, applying the philosophy presented in *Figure 5.7-1 of Section 5 - ESIA Approach and Methodology*, and the methodology described in the present section, the evaluation of impact significance is defined as summarised in the following Table.

Table 5.2-9 Evaluation of Impact Significance for Air Quality

		Magnitude			
		Not significant	**Small**	**Medium**	**Large**
Sensitivity	High	Not Significant	Minor	Moderate	Major

ERM (2011)

It has to be noted that for impacts on local air quality, the impacts' magnitude classification provides an additional level of magnitude ("not significant").

5.2.2.2 Acoustic Environment

5.2.2.2.1 General Considerations

The potential noise impact due to the TAP Project has been assessed in accordance with national regulations as well as relevant and recognised international standards (e.g. World Bank/IFC and World Health Organisation).

The Project contribution to the local acoustic environment has been estimated through qualitative and quantitative analysis, identifying all the potential noise sources involved during the project construction and operation phases. The magnitude of the noise impact has been evaluated and compared with in force international noise quality standards (IFC and WHO).

The baseline and background noise conditions, estimated during a noise survey at sensitive receptors identified along the route, have been considered in order to assess cumulative impacts. This section aims to set the main criteria used for the assessment of the Project impact on noise quality, focusing on the construction and operation phases.

5.2.2.2.2 Background Acoustic Environment Quality

The knowledge of background noise levels is necessary to assess the project's impact on noise quality.

Information on background noise levels is useful to estimate cumulative impacts (impacts produced by the Project plus the background level); furthermore, background noise levels might highlight existing criticalities over the study area not directly related to the project.

In order to evaluate the acoustic environment a noise survey has been performed at the compressor stations locations and at sensitive receptors located in their proximity and along the pipeline route (please refer also to *Section 5.1.5.2*).

Offshore noise background conditions were not measured but estimated according to existing literature.

The acoustic environment is a consequence of the territorial characteristics of the areas in which the noise samples were collected (mainly rural areas without significant sources of noise pollution). Higher noise levels have been monitored nearby settlements and roads.

5.2.2.2.3 Potential Impacts

Potential impacts will arise from a number of different sources during construction and operation phases.

Construction Phase

To estimate the impacts due to the Construction Phase, a noise qualitative assessment has been performed, considering all the potential noise sources involved in this specific project's phase. During project construction for the realization of onshore pipe yards, worker's camps, and compressor stations, the potential impacts to acoustic environment quality are related to the activities of machinery and vehicles, such as generators, excavators, loaders, side-booms, trucks, pumps and compressors, and vessel movements and marine construction activities for the offshore.

Based on the sound power levels of the identified noise sources (both fixed and mobile), the noise levels at the monitored receptors have been estimated through a semi-spherical omni-directional free field propagation model. All the equipments have been assumed to operate at the same time and be localized in the barycentre of the area.

Operation Phase

A noise quantitative assessment has been performed in order to estimate the impact during the Operation Phase. All the potential noise sources have been assessed. Noise emissions are likely to be deriving from the Compressor Stations and Block Valve stations. All the equipment have been conservatively assumed to operate continuously for 24 hours.

Based on the sound power levels of the identified noise sources, the noise levels at the monitored receptors and in the environment have been estimated through a noise propagation model. In the noise model sources are simulated as surfaces, lines or points; the resulting acoustic field depends on the topography and absorptions and reflections characteristics of all existent obstacles between the source and the receptor, and it takes into account all the sound attenuation due to atmospheric conditions, ground effect, screens effect, etc.

5.2.2.2.4 Sensitivity of Resource/Receptor

The acoustic environment quality can be assessed by comparing observed, estimated or simulated noise levels against limits established by international standards, set in order to avoid harmful effects on human receptors deriving from short term and long term exposures to high noise levels.

The importance of the impacts induced by the project on local acoustic environment quality conditions has been evaluated through the comparison of expected noise levels with in force normative quality standards.

As a consequence of the absence of Albanian legislation regulating noise pollution, International Standards (IFC, 2007) can be used. IFC sets two levels of sensitivity of the area where the project will be implemented:

- Industrial and commercial;
- Residential, Institutional and educational.

The standards for impact on marine fauna are 180 dB 1 uPascal (USA National Marine Fisheries Service & Southall 2007).

Sensitivity of onshore receptors is considered high as they are mainly localized in residential areas.

5.2.2.2.5 Magnitude of Impact

Noise levels have been predicted at nearest receptor locations according to internationally recognised methods and standards (e.g. ISO 9613-2: 1996 ([1]), BS 5228: 2009 ([2])). The background noise levels have been taken into account in order to estimate the cumulative impacts and particular attention has been given to receptors such as houses, etc.

The methodology used is presented in the following paragraphs:

- Assessment of noise emission during construction;
- Assessment of noise emission during operation;
- Comparison with noise quality Standard;

Criteria Assessment of Noise during Construction

Construction noise is generally characterised by a variable and short-term duration. The noise levels at the monitored receptors have been estimated through a qualitative analysis, applying a semi-spherical omni-directional free field propagation model.

The World Bank does not specify noise limits related to construction phase, just recommending practical methods of noise reduction that should be adopted in order to limit the associated impact. It is common European/UK practice to adopt a daytime criterion of LA_{eq}, period 70/75 dB outside of dwellings and commercial buildings. Thus, daytime construction phase significance can be defined by absolute limits qualified by specified hours of working. In rural areas, where disturbance is lower, 70dB level is appropriate; in urban areas or near to main roads and other noise sources where construction noise impacts are more significant, a noise limit equal to 75 dB is used.

(1) ISO 9613-2:1996. Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation
(2) BS 5228-2: 2009 'Code of practice for noise and vibration control on Construction and open sites - Part 2: Vibration' BSI.

Construction activities during night time can cause sleep disturbance, which is considered a major environmental impact, unless over a very brief period. The WHO (World Health Organisation) recommends a cautious noise level of LA_{eq} equal to 45 dB outside dwellings with open windows to avoid sleep disturbance.

Taking into consideration the guidance explained above, the construction noise impact significance criteria used in this ESIA can summarised as in the table below.

Table 5.2-10 Significance Criteria for Assessing Noise Impacts during Construction

Period	*Group*	*Minor*	*Moderate*	*Major*
Day-time (07:00 -23:00)	Residential Industrial	and LAeq, period < 70dB	LAeq, period > 70dB Duration < 4 week	LAeq, period > 70dB(1) Duration > 4 week
Night-time (23:00- 07:00)	Industrial	LAeq, period < 55dB	LAeq, period > 55dB Duration < 1 week	LAeq, period > 55dB Duration > 1 week
	Residential	LAeq, period < 45dB	LAeq, period > 45dB Duration < 1 week	LAeq, period > 45dB Duration > 1 week

1. By virtue of their temporary nature Major construction noise impacts during daytime will not always be deemed as unacceptable, but the main focus for mitigation and monitoring actions will be on where they may potentially occur.

2. Night is the period in which most people are asleep

Source: IFC 2007

In terms of offshore, a qualitative impact assessment has been performed based on comparison with generally accepted standards, such as the mentioned 180 dB 1 uPascal (USA National Marine Fisheries Service & Southall 2007) for marine mammals

Assessment of Noise during Operation

Operation noise is generally characterised by sources in continuous activity. The noise levels at the monitored receptors have been estimated through a quantitative analysis through a noise propagation model. According to the World Bank guidance, noise abatement for an operating facility should achieve either the levels specified in *Table 5.2-11* or a maximum increase in the ambient noise level of 3dB(A) (this is generally interpreted as the level measured outside the property in a free field location).

Taking the above IFC standards into consideration the below impact assessment criteria for Operational Noise have been developed. The next Table does not report the limit values for the daytime, because, considering the operation phase noise emissions continuous during the entire day (24 hours), the compliance with the night time limits involve consequentially the respect of the day time ones.

Table 5.2-11 Significance Criteria for Assessing Noise Impacts during Operation

	Minor	***Moderate***	***Major***
Operational phase (assumed 24 hrs) – noise levels at receptor	Leq (one hour) <45 dB(A) and <3dB(A) above ambient – no project action required	Leq (one hour) <45 dB(A) and >3dB(A) above ambient – impacts to be reduced the greater they are above ambient	Leq (one hour) >45 dB(A), or if ambient is already above 45dB(A) then >3dB(A) above ambient – impacts to be mitigated (1)

1. For industrial and commercial receptors a Leq (one hour) of 70dB(A) is allowed.

ERM 2011

5.2.2.2.6 Assessment of Impact (Ranking)

As presented in *Section 5.2.2.2.4* IFC presents two different groups with specific sensitivities: 1) Industrial and Commercial, and 2) Residential, Institutional and Educational. The significance of the impacts is assessed using the table presented in *Figure 5.7-1 of Section 5 - ESIA Approach and Methodology*. The criteria presented in the previous *Section 5.2.2.2.5* represent already the ranking of the impact as summarized in the following Table.

Table 5.2-12 Evaluation of Impact Significance for Noise

		Magnitude		
		Small	**Medium**	**Large**
Sensitivity	Industrial and commercial	Minor	Moderate	Major
	Residential, institutional and educational	Minor	Moderate	Major

ERM (2011)

5.2.2.3 Water Resources (Freshwater - Surface and Groundwater, and Marine)

5.2.2.3.1 General Considerations

Impact significance for water resources is derived as a function of the following main factors:

- Nature of the impact: Impacts defined as positive have a beneficial impact on freshwater resources. Impacts defined as negative have a non-beneficial impact on freshwater resources.
- Type of impact: Impacts are defined as direct (caused by activities within the scope of the Project) or indirect (caused by activities out of the scope of the Project).
- The magnitude of change to the freshwater resources with respect to freshwater resources properties and media function. Magnitude of the impact results from the following factors: Scale, Duration, and Intensity. *Section 5.2.2.3.4* describes in detail the determination of magnitude, and
- The sensitivity of the freshwater resources to Project activities. *Section 5.2.2.3.3* describes in detail the determination of sensitivity.

The assessment of TAP Project impacts on water resources is based upon site-specific hydrological and hydrogeological characteristics, along with experience and professional judgement. The significance of impacts on water resources also feeds into the assessment of secondary impacts on water users, dependent species and habitats.

5.2.2.3.2 Potential Impacts

Two main mechanisms were identified that have the potential to significantly impact the quality of freshwater resource:

- Degradation of water chemical quality;
- By physical processes.

These are discussed below.

Water Pollution / Degradation of Physical-Chemical Water Quality

A number of activities will occur during the different Project phases that may impact the physical-chemical quality of water sources (surface water, groundwater and marine water).

Key activities for fresh surface water will be river crossings where physical-chemical quality may be affected by increases in suspended particulate load, nutrient or heavy metals release from sediments, remobilization of contaminants and the pollution of water bodies and aquifers by spills such as fuels, oils, lubricants, or solvents.

Groundwater can also be affected by accidental spills during the construction and decommissioning phases due to the operation of a high number of trucks and machinery etc.

Spill risks during operation also exist during the operation phase as fuels, oils, lubricants, or solvents are stored and handled in the Compressor stations and are also used during the maintenance of Block Valve stations. However, both construction and Operation & Maintenance spill prevention (designated storage spaces and containers, handling procedures) and spill response plans for clean-up will be in place.

Physical Effects on Water Bodies

The pipeline route passes relatively few surface water bodies along its path through Albania. However, where such water bodies are located within the vicinity of the pipeline corridor, the water environment is vulnerable to impacts relating to the Project's construction phases and associated excavation, diversion or dewatering activities which may, under some circumstances, have potential local sub-catchment or catchment-level effects (such as at Trestenik where the CS02 will be located).

5.2.2.3.3 Sensitivity of Resource/Receptor

The following set of evaluation criteria (*Table 5.2-13*) was created to provide a standardised way to characterise the importance and sensitivity of the various water features within the study area, especially those crossed by the pipeline route. In the onshore context, these criteria should be looked at in conjunction with those for Terrestrial Ecology (*Section 5.1.6.1*) for species and habitats associated with surface water.

Table 5.2-13 Evaluation Criteria for Water Importance and Sensitivity

Measure	*Low*	*Medium*	*High*
The extent to which the water resource plays a supporting role in maintaining soil characteristics and quality.	The water resource plays little or no role in maintaining soil quality or is effectively isolated from surrounding soils.	The water resource plays some role in maintaining local soil quality (*e.g.* through periodic spilling into the floodplain).	The water resource is critical to the maintenance of structure and quality of surrounding soils.
The extent to which the water resource plays an ecosystem role in terms of supporting flora and fauna. This includes its role as a migration route or in supporting a lifecycle stage.	The water resource, for whatever reason, is poor in flora and fauna interest.	The water resource supports populations of flora and fauna.	The water resource supports important (*e.g.* protected, high provisioning importance, large populations, etc.) of flora and fauna.
The extent to which the water resource provides a provisioning service (drinking water, washing and other domestic or industrial uses) to local communities and businesses, or is important in terms of national resource protection (objectives, targets)	The water resource has little or no role in terms of provisioning services for the local community.	The water resource has a local importance in terms of provisioning services, but there is ample capacity and/or adequate opportunity for alternative sources.	The water resource is wholly relied upon locally, with no suitable alternatives, or is important at a regional or transboundary level for provisioning services.
The extent to which the water resource provides a physical regulating service in the hydrologic cycle. This includes its flood plain.	The water resource plays little or no, or at most a highly localised, regulating role in the hydrologic cycle.	The water resource plays a local regulating role in the hydrologic cycle in terms of storage, flows and flood alleviation.	The water resource plays a regional regulating role in the hydrologic cycle in terms of storage, flows and flood alleviation, and one which may have transboundary (international) influences.
The extent to which the water resource provides cultural services, (*e.g.* in terms of recreation and amenity)	The water resource plays little or no role in terms of such matters as amenity or recreational use.	The water resource plays a small or occasional role in terms of such matters as amenity or recreational use.	The water resource is formally recognised as being important in an amenity use or recreational context.

Source: ERM (2011)

Assessment of impact to water quality should be judged in the first instance against local, Albanian environmental quality standards for surface waters (drains, streams and lakes), according to general EBRD principles. If the water body has additional receptors; i.e. is a fishery or sensitive habitat, or the surface is used for domestic water supply, specific Albanian standards should also be applied in determining significance.

In the case where a compound is not included in the standards list, the following international standards should also be considered (reference values are included in *Section 6.5.3* of the main Report):

- For groundwater, although there is a EU specific framework for it, (2006/118/CE) there are no values for compounds established by the Directive. Only Annex I of that directive sets concentration limits for Nitrates and pesticides. Is responsibility of each country set a list of contaminants and concentration limit values for them. There is no specific legislation in Albania for most of the compounds, due to that, ERM decided to use the Dutch standards (widely accepted in Europe as a benchmark) as long as aquifers are not used for producing drinking water. If aquifers are used for producing drinking water, WHO drinking water standards must be used as the main reference supporting local standards.
- For surface water,
    - Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.
    - Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006, concerning the management of bathing water quality and repealing Directive 76/160/EEC.
    - Directive 76/160 of the European Parliament and of the Council of 8 December 1975 concerning the quality of bathing water; for reference values for Bacteriological Streptococcus concentrations, since in Directive 2006/7/EC is established that reference values established in Directive 76/160 can be considered equivalent to reference values established in Directive 2006/7/EC (Article 13).Directive 2006/44/EC of the European Parliament and of the Council of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish live.
    - Classification of Quality Status for Nutrients and General Parameters in Rivers, according to European Environment Agency (1995). According to this classification river quality is classified as follows:
        - Good quality: nutrient poor water, low levels of organic matter, saturated with O_2, rich invertebrate fauna, suitable spawning ground for salmonid fish.
        - Fair quality: moderate nutrient content and organic pollution, good O_2 conditions, rich flora and fauna, large fish population.
        - Poor quality: water with heavy organic pollution, low O_2 concentration, sediment locally anaerobic, small or absent fish population, occasional blooming of organisms insensitive to O_2 depletion.
        - Bad quality: water with excessive organic pollution, prolonged periods of very low O_2 or total deoxygenation, anaerobic sediment, severe toxic input, devoid of fish.

- NIVA-1997 (Norwegian environmental research institute that works to monitor and protect water resources), providing a classification of the quality status for nutrients and general parameters in rivers.
- Classification of the Quality Statues for Heavy Metals in Water, Sediment and Fish of Norwegian Water Institute (NIVA); providing a classification of the quality status for heavy metals in water, sediment and fish.
- Guidelines on River Water Categorization Based on their Quality Indicators of United Nations Economic Commission for Europe (UNECE).

Where no published standards exist for a specific contaminating compound, the principle of using best available practice and best available technology should be applied to mitigate contamination.

- For sediments: in order to assess the quality of sediment samples, given the lack of environmental quality standards for sediments in the Albanian legislation or in the EU results of chemical analyses for the TAP Project were compared with the following international standards:
  - Norwegian environmental research institute that works to monitor and protect water resources (NIVA) classification, 1997.
  - Consensus - Based Sediment Quality Guidelines Recommendations for Use & Application, Wisconsin, 2003, USA (WDNR).
  - Ontario Ministry of Environment and Energy Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, 1993, Canada (OMEE).

5.2.2.3.4 Magnitude of Impacts

Magnitude is determined by the combination of:

- scale;
- duration; and
- intensity of an impact.

In line with *Figure 5.7-1* of *Section 5 - ESIA Approach and Methodology*, the magnitude can be classified as low, medium or high.

Scale

The scale of impact[1] has been defined according to ERM experience as:

[1] Note: the definition of "scale" is different from impacts occurring on a soil matrix due to the differing mobilization characteristics between water and soil mediums (see *Section 5.2.2.4.5* for comparison).

- Local: refers to those impacts affecting an extension within 5 km of the Project boundary or the activity that caused the impact.
- Regional: refers to those impacts affecting an extension between 5 and 50 km of the Project boundary or the activity that caused the impact.
- National: refers to those impacts which affect an extension of more than 50 km of the Project boundary or the activity that caused the impact, but being within the limits of Albania.
- International: referred to those impacts affecting an area outside the limits of Albania.

Duration

Duration of the impact has been defined as:

- Short: duration of the impact is shorter than the duration of the activity that causes it.
- Medium: duration of the impact is the same as the duration of the activity that causes it.
- Long: duration of the impact is longer than the duration of the activity that causes it.

Intensity

Intensity of impact has been defined in relation to the following criteria:

- Low,
  - Referring to chemical substances in groundwater with a concentration below the respective Dutch Target Value or 50% of the US EPA Region 3 value for those chemical compounds for those a Dutch Value is not defined.
  - Referring to chemical substances in surface water, qualitative criteria used in Directive 2000/60/EC.
- Medium,
  - Referring to chemical substances in groundwater with a concentration between the corresponding Dutch Target Value and Dutch Intervention Value, or between 50 and 100% of the US EPA Region 3 value for those chemical compounds for those a Dutch Value is not defined.
  - Referring to chemical substances in surface water, qualitative criteria used in Directive 2000/60/EC.

- High,
    - Referring to chemical substances in groundwater with a concentration above the respective Dutch Intervention Value, or above 100% of the US EPA Region 3 value for those chemical compounds for those a Dutch Value is not defined.
    - Referring to chemical substances in surface water, qualitative criteria used in Directive 2000/60/EC.

In the absence of quantitative criteria (as is the case for most surface water parameters), intensity is defined by the following narrative descriptions:

- Low, referring to those impacts from which freshwater resources recover their original conditions within a short term (about one week or less) once the origin of the impact ceases.
- Medium, referring to those impacts from which freshwater resources recover their original conditions within a medium term (between some period of more than one week and one month) once the origin of the impact ceases.
- High, referring to those impacts from which freshwater resources cannot recover their original conditions or they are recovered just after a time longer than one month.

For assessing marine water quality intensity, in particular to what refers to sediment suspension in the water column a mathematical model has been used. The modelling study has been performed using the MIKEbyDHI software package, developed by DHI – Danish Hydraulic Institute - developed to simulate the suspension and sedimentation of cohesive and mixed sediments under hydrodynamic forces and external actions.

According to the description given of the previous factors, the magnitude of the impact has been defined as follows:

Table 5.2-14 Magnitude Criteria for Assessing Freshwater Resources Impacts

		Scale					
		Local	**Regional**	**National**	**International**		
	Short term	Small	Small	Small	Small	**Low**	***Intensity***
		Small	Medium	Medium	Medium	**Medium**	
		Large	Large	Large	Large	**High**	
	Medium term	Small	Small	Small	Small	**Low**	***Intensity***
		Small	Medium	Medium	Medium	**Medium**	
		Large	Large	Large	Large	**High**	
	Long term	Small	Small	Small	Small	**Low**	***Intensity***
		Small	Medium	Large	Large	**Medium**	
		Large	Large	Large	Large	**High**	

Notes: yellow magnitude of impact defined as small; orange magnitude of impact defined as medium; red magnitude of impact defined as large.

As shown in the table, low intensity impacts are always described as small magnitude impacts. High intensity impacts are always described as large magnitude impacts. Medium intensity impacts has been described as small, medium or large magnitude, according to the scale and/or duration of the impact:

5.2.2.3.5 Assessment of Impact (ranking)

The above criteria are combined for freshwater affected by Project activities to determine the significance of the impact, which depends on the following considerations:

- The degree of sensitivity of the receiving environment (*see Section 5.2.2.3.3).*
- The magnitude of the impact causing changes to the environment (*Section 5.2.2.3.4).*

The value of impact significance obtained is classified as described in *Figure 5.7-1 of Section 5 - ESIA Approach and Methodology*.

5.2.2.4 Geology, Geomorphology, Soil and Seabed Quality

5.2.2.4.1 General Considerations

According to the Project description, excavation works will reach a maximum depth of 5 m inland and varying depths offshore. As a result of this, significance of impacts from the Project works to Geology, Geomorphology and Soil Quality will mainly affect Soil and Seabed Quality.

Impact significance for soil and seabed quality is derived as a function of the following main factors:

- Nature of the impact: Impacts defined as positive have a beneficial impact to the geology, geomorphology and soil and seabed quality. Impacts defined as negative have a non-beneficial impact to the geology, geomorphology and soil quality.
- Type of impact: Impacts are defined as direct (caused by activities within the scope of the project) or indirect (caused by activities out of the scope of the project).

- The magnitude of change to the soil with respect to soil and seabed properties and media function. Magnitude of the impact results from the following factors: scale, duration, and intensity. *Section 5.2.2.4.5* describes in detail the determination of magnitude.
- The soil and seabed sensitivity to Project activities. *Section 5.2.2.4.4* describes in detail the determination of sensitivity.

The assessment of the TAP Project impact on soils is based upon the location-specific characteristics of soil profiles that were taken as representative samples for the soils along the route, and professional judgement and experience regarding Project activities.

5.2.2.4.2 Background Geology, Geomorphology and Soil/Seabed Quality

The knowledge of background conditions over the study area is necessary to assess the Project's impact on existing environment and has been assessed in line with the specification presented in *Section 5.1.5.4* and *Section 5.1.5.5*.

5.2.2.4.3 Potential Impacts

The mechanisms that were identified as having the potential to significantly impact the quality of soils are the following:

- Disturbance and degradation of soil due to erosion, compaction, storage and replacement, modification of morphology during construction;
- Accidental pollution of soils/seabed during construction;
- Land take and surface sealing;

5.2.2.4.4 Sensitivity of Resource/Receptor

The EU Commission recognises soil as a non-renewable resource that performs many vital functions: food and other biomass production, storage, filtration and transformation of many substances including water, carbon, and nitrogen. Soil has a role as a habitat and serves as a platform for human activities, landscape and heritage and acts as a provider of raw materials. These functions are worthy of protection because of their socioeconomic as well as environmental importance (http://ec.europa.eu/environment/soil/index_en.htm).

The following guidelines are used to assess soil quality, including importance and sensitivity:

- Guidelines for Soil Quality Assessment in Conservation Planning (United States Department of Agriculture – 2001)[1] and

The following guidelines are used to examine agricultural use of land:

1 http://soils.usda.gov/sqi/assessment/files/sq_assessment_cp.pdf

- Thematic Strategy for Soil Protection; which consists of a Communication from the Commission to the other European Institutions, a proposal for a framework Directive (a European law), and an Impact Assessment;[1]
- Land use planning guidelines in the context of article 12 of the Seveso II Directive – 105/2003/EC Albanian Law on Environment Protection – article: Rural Space Planning Use.

The evaluation criteria used assessing the importance and Sensitivity of soil quality is shown in *Table 5.2-15*.

Table 5.2-15 Evaluation Criteria for Soil Importance and Sensitivity

Criteria / Measure	*Low*	*Medium*	*High*
Soil structure and sensitivity	Robust to physical disturbance and/or impermeable to contamination.	Vulnerable to physical disturbance but able to reinstate by mitigation measures. Moderately leachable.	Highly vulnerable to physical disturbance, structurally prone to compaction or erosion. Highly leachable and amenable to contamination.
Ecosystem function – Supporting service - flora and fauna	The soil constitutes no particular favourable substrate for the development of floral habitats, invertebrates and other fauna.	The soil provides a substrate that has the physical qualities and degree of productivity to support the development of species of flora and fauna in some abundance and levels of diversity.	The soil provides a substrate that has the physical qualities and/or degree of productivity to support the development of important (in terms of nature conservation or concentration of biomass) or specialist species of flora and fauna. It must be noted that a number of protected and Natura habitats rely on marginal land with either poor soil substrate or groundwater influenced soils.
Resource importance in terms of agricultural productivity or alternative 'provisioning' use	The soil has little or no importance for agricultural production or as a resource in its own right.	The soil has a moderate importance for agricultural production or potential use importance or a high importance in its own right.	The soil is a highly important resource with a high agricultural value and number of potential alternative beneficial uses.
Ecosystem function – regulating service – water regulation	The soil plays little or no role in the hydrological cycle or regulation of water.	The soil has some capacity for water retention and regulation and plays some role in the hydrological cycle in terms of a degree of water regulation and as a substrate for channelling run-off.	The soil is intrinsically linked to the hydrological cycle; water is fundamental to its own structure; and the soil plays a key ecosystem role in water regulation.
Ecosystem function – regulating service – carbon sequestration	The soil plays little or no role in carbon sequestration.	The soil plays some quantifiable role in carbon sequestration.	The soil plays an important, quantifiable role in carbon sequestration.

Compiled ERM (2011)

No local standards exist in Albania with regard to soil pollution and mobilising legacy soil contamination. Therefore, international guidance is considered. The so-called "Dutch Intervention

1 http://ec.europa.eu/environment/soil/three_en.htm

Values or New Dutch List" is widely accepted in Europe as a benchmark for soil pollution and remediation (Annex A of the 2009 Soil Remediation Circular: "Target Values, Soil Remediation Intervention Values and Indicative Levels for Serious Contamination").For those chemical compounds for which the Dutch standards do not provide a value, using the IFC approach, which show preference for a risk-based methodology, the US EPA Region 3 Criteria[1], which are defined according to such risk-based methodology, have been used.

Marine sediments are also non-renewable resource that performs vital functions in the marine ecosystem: support for the marine food chain, physical habitat for benthic organisms, marine geochemical sink, provider of raw materials, etc. Criteria used to assess importance and sensitivity are based on generally accepted practice in the scientific and technical community, and focused on the seabed as a support for marine biota.

5.2.2.4.5 Magnitude of Impacts

Magnitude is determined by the combination of scale, duration, and intensity of an impact being classified as being low, medium or high.

Scale

The scale of impact[2] has been defined according to ERM experience as:

- Local, referring to those impacts affecting the project footprint and buffer area of 1 km to each side;
- Regional, referring to those impacts affecting an extension between 1 and 10 km of the Project boundary or the activity that caused the impact.
- National, referring to those impacts which affect an extension of more than 10 km of the Project boundary or the activity that caused the impact, but being within the limits of Albania.
- International, referring to those impacts affecting an area outside the limits of Albania.

Duration

Duration of the impact has been defined as:

- Short: duration of the impact is shorter than the duration of the activity that causes it.
- Medium: duration of the impact is the same as the duration of the activity that causes it.
- Long: duration of the impact is longer than the duration of the activity that causes it.

[1] http://www.epa.gov/reg3hwmd/risk/human/index.htm, http://www.epa.gov/superfund/health/conmedia/soil/index.htm
[2] Note: the definition of "scale" is different from impacts occurring on a water matrix due to the differing mobilization characteristics between soil and water mediums (see *Section 5.2.2.3.4* for comparison).

Intensity

Intensity of impact has been defined in relation to the limit criteria considered:

- Low, referring to chemical substances in soil with a concentration below the respective Dutch Target Value or 50% of the US EPA Region 3 value for those chemical compounds for which a Dutch Value is not defined.
- Medium, referring to chemical substances in soil with a concentration between the corresponding Dutch Target Value and Dutch Intervention Value, or between 50 and 100% of the US EPA Region 3 value for those chemical compounds for which a Dutch Value is not defined.
- High, referring to chemical substances in soil with a concentration above the respective Dutch Intervention Value, or above 100% of the US EPA Region 3 value for those chemical compounds for which a Dutch Value is not defined.

In the absence of quantitative criteria, intensity is defined by the following narrative descriptions:

- Low, referring to those impacts from which soil recovers its original conditions within a short term (about one year or less) once the origin of the impact ceases.
- Medium, referring to those impacts from which soil recovers its original conditions within a medium term (between one year and three years) once the origin of the impact ceases.
- High, referring to those impacts from which soil cannot recover its original conditions or they are recovered just after a time longer than three years.

According to the description given to each impact for the previous factors, the magnitude of the impact has been defined as follows:

Table 5.2-16 Summary of Magnitude of Impacts

		Scale					
		Local	**Regional**	**National**	**International**		
	Short term	Small	Small	Small	Small	**Low**	***Intensity***
		Small	Medium	Medium	Medium	**Medium**	
		Medium	Medium	Large	Large	**High**	
	Medium term	Small	Small	Small	Medium	**Low**	***Intensity***
		Small	Medium	Medium	Medium	**Medium**	
		Medium	Medium	Large	Large	**High**	
	Long term	Medium	Medium	Large	Large	**Low**	***Intensity***
		Medium	Large	Large	Large	**Medium**	
		Medium	Large	Large	Large	**High**	

ERM (2011)

As can be concluded from the table above, low intensity impacts are always described as small magnitude impacts. High intensity impacts are always described as large magnitude impacts. Medium intensity impacts have been described as small, medium or large magnitude, according to the scale and/or duration of the impact.

5.2.2.4.6 Assessment of Impact (Ranking)

The above criteria are combined for the soils affected by Project activities to determine the significance of the impact that depends on the following considerations:

- The degree of sensitivity of the receiving environment (*see Section 5.2.2.4.4*).
- The magnitude of the impact causing changes to the environment (*Section 5.2.2.4.5*).

The value of impact significance obtained is classified as described in *Section 5 - ESIA Approach and Methodology* (see *Figure 5.7-1*).

5.2.2.5 Landscape and Visual Amenity

5.2.2.5.1 General Considerations

The assessment of impacts of the TAP on landscape and visual amenity was undertaken in accordance with accepted methodologies derived from best practice guidelines. The approach took into account the general principles for landscape protection set out in the European Landscape Convention[1].

In the absence of published guidelines on landscape and visual impact assessment in Greece and Albania, the assessment was conducted with reference to the Guidelines for Landscape and Visual Impact Assessment[2] (UK) which is similarly applied in other EU countries.

Some principles governing the landscape and visual impact assessment process are presented below. Impact significance for landscape and visual amenity is generally arrived at on the basis of the following main factors:

- The quality/importance of the landscape/visual amenity as a resource/function that is potentially affected;
- The sensitivity of the landscape/visual amenity towards Project activities;
- The magnitude of change to the receiving landscape and visual amenity as a result of the Project.

The assessment of the TAP Project impact on landscape and visual amenity is based upon professional judgement and experience regarding Project activities.

5.2.2.5.2 Background Landscape and Visual Amenity

The knowledge of background conditions over the study area is necessary to assess the Project's impact on existing environment and has been assessed in line with the specification presented in *Section 5.1.5.6*.

5.2.2.5.3 Potential Impacts

Potential impacts on the landscape fall into two broad categories. Direct impacts relate to the physical changes that will arise as a result of the proposal. These include the loss of landscape elements, such as vegetation and land cover, including habitat loss required to accommodate the proposal and the physical introduction of new structures into the receiving landscape.

Indirect impacts on the landscape relate to the changes in landscape character that will arise as a result of the visibility of the new structures associated with the proposal.

1 http://www.coe.int/t/dg4/cultureheritage/heritage/Landscape/default_en.asp
2 The Landscape Institute and the Institute of Environmental Assessors (Second Edition) 2002. Guidelines for Landscape and Visual Impact Assessment.

Visual impacts will arise from the pipeline works in the early years of operation as the landscape is reinstated but not yet established in terms of vegetation and land cover. Visual impacts will also arise from the visibility of the permanent structures, such as the compressor stations and block valve stations, together with new access roads.

Visual impacts will occur as a result of changes to the mountain skyline due to the ridge modifications.

5.2.2.5.4 Sensitivity of Resource/Receptor

Landscape quality relates to the condition, intactness and physical state of a landscape whilst landscape value is concerned with the importance attached to a landscape and the basis for its designation. These terms were defined in the baseline methodology. Landscape quality and importance are key factors in determining sensitivity of a landscape to the proposed change.

The sensitivity of a landscape is judged based on the extent to which it can accept change of a particular type and scale without adverse effects on its character. Sensitivity varies according to the type of development proposed and the nature of the landscape such as its individual elements, key characteristics (land use, pattern and scale of landscape, enclosure/openness), inherent quality, condition, presence of detracting elements (e.g. pylons), value and capacity to accommodate change, and any specific values, such as designations, that apply. Grades of sensitivity can be defined as low, medium and high and are defined as follows:

- Low - A landscape of low value, or where its character, land use, pattern and scale has the capacity to accommodate the type of change envisaged;
- Medium - A moderately valued landscape, perhaps a locally important landscape, or where its character, land use, pattern and scale may have the capacity to accommodate a degree of the type of change envisaged; and
- High - A landscape protected by a regional (structure plan) or national designation and/ or widely acknowledged for its quality and value; a landscape with distinctive character and low capacity to accommodate the type of change envisaged.

Viewpoint sensitivity depends on a number of factors including the context of the viewpoint, the current occupation (residents, recreational visitors, passersby, workers) and viewing opportunity of the groups of people being considered, and the number of people affected. The sensitivity of a viewpoint depends upon the extent to which the viewers it represents are affected by changes in their view together with the quality of the existing view. It takes into account the quality of the existing view and the viewer type. Grades of sensitivity can be defined as low, medium and high and are defined as follows:

- Low - Small numbers of visitors with interest in their surroundings. Viewers with a passing interest not specifically focussed on the landscape, *e.g.* workers, commuters. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being low;

- Medium - Small numbers of residents and moderate numbers of visitors with an interest in their environment. Larger numbers of recreational road users. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being medium; and
- High - Larger numbers of viewers and/or those with proprietary interest and prolonged viewing opportunities such as residents and users of attractive and well-used recreational facilities. The quality of the existing view, as likely to be perceived by the viewer, is assessed as being high.

The grades of landscape and viewpoint sensitivity are presented above as a guide. The descriptions of levels of sensitivity are indicative only. Each case is assessed on its own merits using professional judgement and experience, and there is no defined boundary between levels of impacts.

5.2.2.5.5 Magnitude of Impacts

The magnitude of impact (Magnitude of Change) is usually referred to as magnitude of change in landscape and visual terms. The magnitude of change affecting landscape or visual receptors depends on the nature, scale and duration of the particular change that is envisaged in the landscape and the overall effect on a particular view. In a landscape, this will require consideration of the loss of or change in any important characteristic or feature of the landscape, the proportion of the landscape that is affected, and any change in the backdrop to, or outlook from, the landscape that affects its character.

The magnitude of change in views will depend on the scale of the development and the distance from the viewpoint, the angle of view occupied by the development, the extent of shielding by intervening features, the degree of obstruction of existing features, and the degree of contrast with the existing view, and the frequency or duration of visibility.

The magnitude of change caused by the proposal as experienced from a given viewpoint location is illustrated in photomontages.

Levels of magnitude of change are defined below for landscape as follows;

- Imperceptible - An imperceptible, barely or rarely perceptible change in landscape characteristics;
- Small – A small change in landscape characteristics over a wide area or a moderate change either over a restricted area or infrequently perceived;
- Medium - A moderate change in landscape characteristics, frequent or continuous and over a wide area or a clearly evident change either over a restricted area or infrequently perceived;
- Large - A clearly evident and frequent /continuous change in landscape characteristics affecting an extensive area.

And similarly, the magnitude of change in views is defines as follows:

- Imperceptible – Small - Change which is barely visible at very long distances, or visible for a very short duration, perhaps at an oblique angle, or which blends with the existing view;
- Small – Minor changes in views, at long distances, or visible for a short duration, perhaps at an oblique angle, or which blends to an extent with the existing view;
- Medium - Clearly perceptible changes in views at intermediate distances, resulting in either a distinct new element in a significant part of the view, or a more wide ranging, less concentrated change across a wider area;
- Large - Major changes in view at close distances, affecting a substantial part of the view, continuously visible for a long duration, or obstructing a substantial part or important elements of view.

5.2.2.5.6 Assessment of Impacts (Ranking)

The assessment of landscape and visual impacts is based on three stages:

- Classification of the sensitivity of the landscape or visual receptors to the type of development proposed;
- Prediction of the magnitude of change in the landscape or the view of the site resulting from the development, taking on board embedded and committed mitigation; and
- Evaluation of the significance of residual landscape and visual impacts depending on the sensitivity of the landscape or viewer to change and the magnitude of change.

The value of impact significance obtained is classified following the philosophy of *Figure 5.7-1 of Section 5 - ESIA Approach and Methodology*. In the case of Landscape, *Table 5.2-17* varies slightly due to the additional level of magnitude ("imperceptible") that is introduced for the purpose of distinguishing between effects which are barely visible and those which are imperceptible.

Table 5.2-17 Evaluation of Impact Significance for Landscape and Visual Amenity

		Magnitude							
		Imperceptible	**Small**		**Medium**		**Large**		
Sensitivity	**Low**	Not Significant	Not Significant		Minor		Minor	or Moderate	
	Medium	Not Significant	Minor		Moderate		Moderate	or Major	
	High	Not Significant	Minor	or Moderate	Moderate	or Major	Major		

ERM (2011)

Professional judgement and experience are applied on a case by case basis in order to identify broad levels of significance for each receptor. Each case is assessed on its own merits as factors unique to each circumstance need to be considered.

To support the landscape and visual impact assessment of TAP, a zone of theoretical visibility map (ZTV) was developed for elements of the proposal which may be expected to cause significant landscape and visual effects over a large area (see *Section 8.9 of Section 8 Assessment of Impacts and Mitigation Measures*). A zone of theoretical visibility (ZTV) maps the area within which a proposed development might have an influence or effect upon visual amenity and is used as a tool to select sensitive points for more detailed assessment. Areas of theoretical visibility were calculated using landform based on SRTM 90 m Digital Elevation Data[1].

Two important issues must be considered in interpreting the ZTVs:

- The ZTVs presented in this report are theoretical in that they do not take into account intervening vegetation, buildings or minor changes in topography, such as road cuttings. Where these features intervene between the viewer and the proposal, this local visual screening will reduce the visibility of the proposal; and
- The ZTV indicates where visibility might be possible anywhere within a 90 m grid square (GRID resolution is 90 m).

ZTVs were developed for the compressor stations, CS02 at the eastern end and for CS03 at the western end of the alignment. These will be present in the landscape as large scale structures, and therefore a study area for the ZTV was defined as a 15 km radius from the centre of each compressor station site in order to capture likely significant effects.

Similarly ZTVs were also developed for the locations where ridge modifications are proposed. This aspect of the proposal will occur along ridges at an altitude that could result in significant landscape and visual effects and therefore a 30 km radius area was selected for ZTV preparation. The ZTVs were therefore prepared for the following ridge modification locations: Kp 82-85; Kp 88-96; Kp 110-115; and Kp 119-125.

Viewpoints selected for the visual impact assessment of the compressor stations and ridge modifications were chosen using ZTV data. Some of these were selected for illustration as a photomontage to support the assessment. Photomontages were prepared for one viewpoint at each compressor station site and at three viewpoints showing the proposed ridge modifications. In interpreting the photomontages, two important aspects must be considered.

- There is an element of judgement inherent in the representation of changes shown in a photomontage. While the data sources are largely factual, or based on the judgement of independent professionals, the finished image is ultimately what the developer and consultant believe to be a reasonably accurate visual impression of the completed proposal in similar conditions.

1 Source: Digital Terrain USGS SRTM *(United States Geological Survey data from the NASA Shuttle Radar Topographic Mission)* - http://srtm.csi.cgiar.org/

- Each photomontage incorporates the lighting seen in the base photograph. It therefore only truly represents the appearance of the proposal as it would have appeared at that time on that day. The perceptibility of the changes and the visual character of elements of the proposal will undoubtedly be different under different weather or lighting conditions.

5.2.3 Biological Environment

In this section the Impact Assessment Methodology is presented for the following components:

- Ecology Habitats;
- Ecology Species.

5.2.3.1 Ecology – Habitats

5.2.3.1.1 General Considerations

This section summarises the main criteria used for the assessment of the impact on habitats, focusing separately on the construction and operation phases.

5.2.3.1.2 Background Ecology Quality

The knowledge of background conditions over the study area is necessary to assess the Project's impact on existing environment and has been assessed in line with the specification presented in *Section 5.1.6*.

5.2.3.1.3 Potential Impacts

Potential impacts to habitats will primarily stem from the temporary and permanent footprints of the Project. Further potential impacts in terms of habitat degradation may occur due to localised alteration of the hydrological cycle (onshore) and changes to coastal processes in the nearshore marine environment.

Potential impacts to habitats may also occur as a result of induced impacts resulting from the development of the road network enabling easier access to habitats for exploitation (for logging, farming or grazing livestock) as well as the potential introduction of alien species.

The significance of these potential impacts have been assessed according to the quality or importance of the habitat involved and the magnitude of the impacts it is predicted to experience.

5.2.3.1.4 Sensitivity of Resource/Receptor

Criteria were developed to determine the overall quality and / or importance of different habitats and species present (*Table 5.2-18*). The criteria have also been developed in recognition of the EBRD PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. The criteria have drawn upon a number of sources including:

- The 12 principles and 5 operating guidelines contained in the 'Ecosystem Approach' (EA), the 'primary framework' developed to implement the Convention on Biological Diversity (CBD) (which was ratified by Albania);
- Approaches and criteria advocated in the Energy and Biodiversity Initiative, a collaboration between members of the energy industry and international nature conservation bodies (Conservation International and the World Conservation Union – IUCN) on approaches to biodiversity protection and management; and
- The Interpretation Manual of European Union Habitats (European Commission DG Environment, 2007) which provides a guide to identify European Priority Habitats which are those habitats in danger of disappearance and whose natural range falls within European territory.

The evaluation for each criterion of *Table 5.2-18* presents descriptions of what would constitute low, medium and high quality/importance.

The habitat quality or importance for each criterion has been evaluated based on factual baseline data, scientific knowledge, professional judgement and stakeholder perspective. Based on this evaluation low, medium or high has been allocated for that criterion and highlighted accordingly with additional information and brief rationale for the decision.

In the absence of data, insufficient data or where there is significant uncertainty, a conservative approach has been adopted. The ratings for each criterion have also been used where appropriate to focus mitigation. For example where a habitat is awarded an overall rating of low or medium, but where it is rated high against a particular criterion or more than one criterion, then specific and suitable mitigation has been developed where the magnitude of the impact warrants this.

The overall habitat evaluation (High, Medium or Low priority) has been based on an aggregate of the individual ratings for each criterion. This process involved an application of professional judgement in terms of weighting some criteria higher than others where appropriate and also notes whether a habitat is critical or not.

Table 5.2-18 Criteria to be used in Evaluation of Habitat Importance and Sensitivity

Criterion
Conservation and Protection Status
1. Protection Status The extent to which the habitat is protected: Protected Areas (PA); Conservation Priority Areas or Proposed Protected Areas not currently under legal protection (CPA); and Rest of World (RoW). • PA: those areas of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal and other effective means *e.g.* International - Ramsar, Natura 2000 sites and World Heritage Sites and National (Categories from IUCN) – Strict Nature Reserves (Cat I), National Parks (Cat II), Nature Monuments (Cat III), Managed Nature Reserves (Cat IV), Protected Landscape (Cat V) and Protected Area of Managed Resource (Cat VI). • CPA: those areas that are not currently under protected status but were identified by governments and/or the scientific or conservation community as having a high conservation priority, *e.g.* proposed Areas of Special Conservation Interest (Emerald Sites), Important Bird Areas, Areas of Conservation Interest (CORINE biotopes) and European Habitats. • RoW: the remaining areas not specifically included in PAs or CPAs, which may contain areas of high quality or importance that are yet to be identified or which are important at a local level for example. The extent to which the habitat is being actively managed with nature conservation in mind and with specific management objectives in place.
Ecosystem Structure and Functioning
2. Naturalness The 'naturalness' of the habitat must be assessed. Modified environments are environments in which human activity has modified the area's primary ecological functions, for example, through fishing or the introduction of alien species. Note: This determines the extent to which a habitat is 'natural' or 'modified', in accordance with EBRD's PR6.
3. Fragility The fragility and sensitivity of the habitat and its ability to recover (either naturally or with assistance) from disturbance, including invasion by alien species must be assessed.
4. Representativeness The extent to which the habitat is considered to be an excellent example of important natural or semi-natural vegetation types in terms of the flora communities (and their associated fauna) that it contains.

Criterion
5. Structure and Function The extent to which the habitat provides an important structure or serves an important function. This includes: • Comprising an ecological corridor between other isolated habitats of ecological importance; • Importance in the context of faunal migrations; or • Importance in the context of lifecycles (breeding, nursery or feeding grounds).
6. Species Association - Reliance The extent to which the habitat contains and is relied upon by concentrations of species that are: • Endemic or restricted range; • Nationally or locally rare (particularly Red Book species or those protected under national or international legislation or listed by IUCN (see *Table 5.2-21 The IUCN Red List Categories* for Species); • Keystone species, upon which other species may be reliant for their survival; • Suffering serious reduction nationally or locally; • At the edge of their ranges; • Present in notably large populations; • Unique assemblages of species associated with key evolutionary processes; or • Uncommon or threatened in a wider context. If the species were evaluated by IUCN, the following rankings should be applied. For Flora (Vangjeli, *et al*., 1995) and Fauna (REC, 1997; Misja, 2006) respective Albania Red Books were referred to for National status of species.
7. Diversity The diversity of the habitats and their individual species richness and diversity (including genetic diversity) are important. In general, the greater the total number of species recorded, the greater the conservation interest of the area.

Criterion
Ecosystem Services
8. Supporting Services
The extent to which the habitat provides supporting services such as primary production, soil formation and nutrient recycling.
9. Provisioning Services
The extent to which the habitat provides 'provisioning services,' (*i.e.* products or goods) such as food (from fishing, hunting or gathering), fibre, natural building materials, water and genetic resources.
10. Regulating Service
The extent to which the habitat is important to and/or provides regulating services (*i.e.* functions and regulatory processes) such as coastal protection, regulation of floods, drought, climate/micro-climate and disease.
11. Cultural Services
The extent to which the habitat provides cultural services (*i.e.* non-material benefits) such as recreational (including ecotourism), culturally important landscape, spiritual and religious benefits. The research interest and education potential of the site or the recorded history of the site (*e.g.* surveys, scientific studies, published papers). The loss of an irreplaceable biological record would be particularly significant.
Overall Evaluation: High, Medium or Low priority, based on an aggregate of the individual ratings for each of the abovementioned criterion.

Source: ERM (2011) '

5.2.3.1.5 Sensitivity of Aquatic Resource / Receptors

To evaluate the importance or sensitivity of watercourses within the zone of influence of the TAP Project the same criteria set out above in *Table 5.2-18* have been used. As the overall habitat evaluation takes into account the importance of species this has provided a good overall assessment for watercourse importance and as with the terrestrial section three categories have been used; Minor, Moderate and Major watercourses corresponding to Low, Medium and High Sensitivity.

Due to the number of watercourses to be crossed, a specific protocol using a River Sensitivity Classification Matrix and a River Crossing Decision Tree Matrix has been developed and guide the crossing technique decision process for RV3 and RV4 classified watercourses(see *Annex 8.6*).

5.2.3.1.6 Magnitude of Impact

Magnitude of impact is a combination of several factors, including:

- The spatial extent over which the impact is experienced;
- The duration of the impact and/or the extent to which it is repeated;
- The degree to which habitat fragmentation occurs;
- Whether it is total loss to Project footprint or temporary occupation that can be remedied;
- Extent of other physical changes (*e.g.* to the hydrological cycle), the extent of the change; and
- The size of the footprint in the context of the wider area of habitat that exists.

Box 5.2-2 Magnitude Criteria for the Impact Assessment of Habitats/Ecosystems

Large Magnitude Impact: the Project (either on its own or together with other projects) may adversely affect the integrity of a habitat by substantially changing its ecological features, structures and functions in the long term, across all or most of its area, which enable it to sustain the habitat, complex of habitats and/or population levels of species that makes it important.

Medium Magnitude Impact: the habitat's integrity will not be adversely affected in the long term, but the effect is likely to be significant in the short or medium term to some, if not all, of its ecological features, structures and functions. The habitat may be able to recover, through natural regeneration and restoration, to its state at the time of the baseline study.

Small Magnitude Impact: neither of the above applies, but some minor impacts of limited extent, or to some elements of the habitat, are predicted but the habitat will readily recover through natural regeneration.

5.2.3.1.7 Assessment of Impact (ranking)

The above criteria are combined to determine the significance of the impact.

The value of impact significance obtained is classified as described in *Section 5 - ESIA Approach and Methodology*.

Table 5.2-19 Evaluation of Impact Significance for Ecology - Habitats

		Magnitude		
		Small	**Medium**	**Large**
Sensitivity	**Low**	Not significant	Minor	Moderate
	Medium	Minor	Moderate	Major
	High	Moderate	Major	Major

ERM (2011)

5.2.3.2 Ecology – Species

5.2.3.2.1 General Considerations

This section aims to set the main criteria used for the assessment of the Project impact on flora and fauna species, focusing separately on the construction and operation phases.

5.2.3.2.2 Background Ecology Quality

The knowledge of background conditions over the study area is necessary to assess the Project's impact on existing environment and has been assessed in line with the specification presented in *Section 5.1.6*.

5.2.3.2.3 Potential Impacts

Potential impacts to species of flora and fauna will include various degrees of disturbance as a result of construction and operation of the Project, including noise, people movements and the movements of vehicles and marine vessels and may also suffer direct physical harm.

Flora and fauna will also be affected by loss and fragmentation of habitat upon which they rely or use substantially and by the introduction of barriers to movement.

Flora and fauna will also be impacted by changes to their environment including:

- Noise, light and visual impacts (during construction and to a lesser degree operation);
- Water quality degradation;
- Soil degradation;
- Barrier effects (during construction)
- Fragmentation of habitat;

- Direct incidental loss of fauna species during construction (from road traffic accidents or other);
- Physical changes to soil structure and the local hydrological cycle; and
- Deposits of dust and exposure to atmospheric pollutants.

Secondary impacts may occur from increased accessibility (from road improvements) resulting in unsustainable harvesting of species or increased recreational disturbance or removal of habitat. Furthermore, the introduction of alien species and/or harmful pathogens may also have wider secondary impacts if these impacts occur.

The significance of these potential impacts has been assessed according to the importance of the species involved and the magnitude of the impacts it is predicted to experience.

5.2.3.2.4 Sensitivity of Resource/Receptor

Species importance is assessed according to accepted criteria such as rarity and the extent to which they are under threat. The importance of species to wider ecological communities and the ecosystem (e.g. predator/prey relationships) is also considered, and the degree of protection of species under Albanian and international legislation is also taken into account. *Table 5.2-20* presents some criteria for deciding on the importance of individual species. IUCN categorisation at a global and national level was used as the primary method to identify priority species where appropriate. For reference to IUCN status for species see *Table 5.2-21*.

Where regional Mediterranean IUCN Red Lists were available for fish (Smith, et al., 2006), mammals (Temple and Cuttelod, 2009), amphibians and reptiles (Cox, et al., 2006), these regional Red List categories were used as they give much more specific detail on the threat level to species within the Mediterranean and Eurasia. IUCN threat categories are fully adopted by Albanian law and are reflected in the national Red Data Book of animals (REC, 1997; Misja, 2006) and plant species (Vangjeli, et al., 1995).

Table 5.2-20 Species Evaluation Criteria

Importance:	***Low***	***Medium***	***High***
Criteria			
Protection status	Not protected or listed. Introduced or alien species.	• Listed as Vulnerable (VU), Conservation Dependant (CD), Near Threatened (NT) or Least Concern (LC) on Global IUCN Red List. • Nationally Protected Species • Annex III species listed on the Bern Convention • Listed as VU, NT, LC, in the Red Data Book of Albania. • Species either listed as Data Deficient (DD), or Not Evaluated NE) at a Global or National level for which Conservation is likely to be required.	• Listed as Critically Endangered (CR) or Endangered (EN) on either Global IUCN list or on National Red List; • Decreasing number of species listed as VU or lower in the Albanian Red Data Book. • Listed as Rare, Threatened or Endangered by IUCN. • Annex I, II species listed on the Bern Convention • Annex II, IV species listed on the EU Habitats Directive • Annex I listed species of the Birds Directive
Conservation Status	Common / abundant	• A species common globally but rare in this part of Albania. • Rare or population in decline. • Locally endemic or locally distinct subpopulations. • At the limits of its range. • Species subject to an active management programme. • Groups that were or are under active scientific study.	• Protected as above
Genetic Diversity	High Genetic Diversity as numerous in number with highly interconnected populations	• A species that has limited connectivity between populations. • A species that has only a moderate or small population size. • Species with low fecundity	• Species with limited or no connectivity between populations. • Populations are low in number • Species has very low fecundity and produces minimal number of young which remain dependant for a number of years.
Ecosystem Functioning:	Not critical to ecosystem functions.	One of several species playing a role in ecosystem functions.	Critical keystone species (1) or ecosystem engineer (2) to ecosystem functions.
Ecosystem Services – supporting services	No or minimal role in terms of being iconic, or important for recreational or other cultural reasons.	Culturally iconic species for local human populations; species playing an important role in recreational activities; species important for local culture; certain species or groups considered of specific value to the general public simply by virtue of their existence.	Culturally iconic species for indigenous, national and/or international human populations (*e.g.* certain birds of prey or brown bear); species essential to recreational activities and of national cultural importance.

Note:
(1) A keystone species is a species that plays a critical role in maintaining the structure of an ecological community and whose impact on the community is greater than would be expected based on its relative abundance or total biomass.
(2) A species that modifies the resource availability for other members of the community through modification of the habitat.

Source: ERM (2011)

Table 5.2-21 The IUCN Red List Categories

The International Union for the Conservation of Nature (IUCN) List of Threatened Species (the IUCN Red List) is a widely recognised, global approach for evaluating the conservation status of plant and animal species. It provides taxonomic, conservation status and distribution information on taxa that are facing a high risk of global extinction. Species are categorised as:

- *Critically Endangered **(CR)**: A taxon is Critically Endangered when it is considered to be facing an extremely high risk of extinction in the wild;
- *Endangered **(EN)**: A taxon is Endangered when it is considered to be facing a very high risk of extinction in the wild;
- *Vulnerable **(VU)**: A taxon is Vulnerable it is considered to be facing a high risk of extinction in the wild;
- Near Threatened **(NT)**: A taxon is Near Threatened when it was evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying or is likely to qualify for a threatened category in the near future;
- Least Concern **(LC)**: A taxon is Least Concern when it was evaluated against the criteria and does not qualify for the higher categories. Widespread and abundant taxa are included in this category;
- Other categories including Conservation Dependant **(CD)**, Data Deficient **(DD)** and Not Evaluated **(NE)** are also referred to although these categories are not of key importance when making evaluations of species for this Project .

Note: Sub-categories for CR, EN and VU have not been fully listed in this document and the IUCN Red List Categories and Criteria (Version 3.1) (IUCN, 2001) should be referred to for further details.
All *ed status (CR, EN, VU) are grouped as Threatened when referring to species (as given for all Species Richness tables in Section 6.7.1).

Source: IUCN Red List Categories and Criteria (Version 3.1) (2001)

In some cases both international and national threat status of the species are the same, but in most of cases, the international and national threat status differs from each other.

Protection of species of wild fauna and flora in the Republic of Albania is regulated by a number of laws, bylaws and regulations, some of the most important of which are:

- Law on the Protection of Biodiversity (no. 9587, dated 20.07.2006);
- Law on the Protection of Wild Fauna and Hunting (no. 7875, dated 23.11.1994) amended by the Law no. 9219, dated 08.04.2004 and
- Law no.9867, dated 31.01.2008 “On rules and procedures for International Trade of Endangered Species of Wild Fauna and Flora”.

As a country that is aiming to enter EU and being in compliance with the EU environmental regulations, the European protection status of the wild fauna species' standing in the Bern Convention is considered. Based on the philosophy of the Convention, protection of biodiversity needs to be based on 2 principles: (1) protection of target species of fauna or flora and (2) protection of complete habitats. Based on this approach a series of Annexes are integrated into the Convention:

- Annex 1: Species of flora strictly protected;
- Annex 2: Species of fauna strictly protected;
- Annex 3: Protected fauna species (which can be exploited if the population level permits); and

- Annex 4: Prohibited means and methods of killing, capture and other forms of exploitation.

For this study, note is made where species are listed in the above Annexes to the Bern Convention.

In addition, species protection in relation to the Habitats Directive (for mammals, reptiles, amphibians and invertebrates) and under the Birds Directive (for bird species) has also been given to be consistent with other sections of the pipeline route which pass through Italy and Greece.

Protection under the Habitats Directive is as follows:

- Annex II: Species of community interest whose conservation requires the designation of Special Areas of Conservation.
- Annex IV: Species of community interest in need of strict protection
- Annex V: Species of interest whose taking in the wild and exploitation may be subject to management measures.

Of these Annexes II and IV are the key in relation to species protection and in evaluating species in a European context.

Protection under the Birds Directive is as follows:

- Annex I: Birds which are the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. As appropriate, Special Protection Areas are to be established to assist conservation measures.
- Annex IIa: Birds which may potentially be hunted under national legislation within the geographical land and sea area to which the Directive applies.
- Annex IIb: Birds which may potentially be hunted under national legislation only within certain specified Member States.

Of these, Annexes I is the key one in relation to species protection and evaluation of species importance in a European context.

In summary, for species from all the above evaluation criteria in both the terrestrial and aquatic environment, and for the future impact assessment species have been classed as:

- High Priority Species - Species listed either nationally or internationally under (Critically Endangered or Endangered), listed under Annex 1 or 2 of the Bern Convention or on Habitats Directive (Annex II and IV) or the Birds Directive (Annex I)

- Medium Priority Species - Species listed as Vulnerable, Conservation Dependant, Near Threatened, Least Concern or Data Deficient or nationally protected, listed under Annex 3 of the Bern Convention or listed above under any national protection; and
- Low Priority Species – Those species not listed above under any of the previously listed criteria.

5.2.3.2.5 Magnitude of Impact

Magnitude of impact is a combination of several factors, including:

- The spatial extent over which the impact is experienced;
- The extent to which habitat relied upon by the species is impacted (as evaluated under 'Habitats' above);
- The population or proportion thereof affected;
- The duration of the impact and/or the extent to which it is repeated;
- The magnitude of the aspect (noise, light, number of vehicle movements);
- The size of the footprint in the context of the wider range over which a species lives;
- The scale of change induced, *e.g.* to water quality; and
- The extent to which a new physical or chemical feature is introduced to the environment, *e.g.* the size of a structure or the toxicity of a chemical.

Determining magnitude is typically a combination of quantifying the change and applying professional judgement and past experience. Criteria that were used to assess the magnitude of ecological impacts (based on Duinker and Beanlands, 1986) are presented in *Box 5.2-3* below:

Box 5.2-3 Magnitude Criteria

A **Large Magnitude Impact** affects an entire population or species in sufficient magnitude to cause a decline in abundance and /or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) will not return that population or species, or any population or species dependent upon it, to its former level within several generations*. A large magnitude impact to a species may also adversely affect the integrity of a site, habitat or ecosystem. A large magnitude secondary impact may also affect a subsistence or commercial resource use (*e.g.* fisheries) to the degree that the well-being of the user is affected over a long term.

A **Medium Magnitude Impact** affects a portion of a population and may bring about a change in abundance and / or distribution over one or more generations*, but does not threaten the integrity of that population or any population dependent on it. A medium magnitude impact may also affect the ecological functioning of a site, habitat or ecosystem but without adversely affecting its overall integrity. The size of the consequence is also important. A medium magnitude impact multiplied over a wide area will be regarded as large. A short term effect upon the well-being of resource users may also constitute a secondary medium impact.

A **Small Magnitude Impact** affects a specific group of localised individuals within a population over a short time period (one generation* or less), but does not affect other trophic levels or the population itself.

*These are generations of the animal/plant species under consideration not human generations

5.2.3.2.6 Assessment of Impact (ranking)

The above criteria are combined to determine the significance of the impact.

The value of impact significance obtained is classified as described in *Section 5 - ESIA Approach and Methodology*.

Table 5.2-22 Evaluation of Impact Significance for Ecology - Habitats

		Magnitude		
		Small	**Medium**	**Large**
Sensitivity	**Low**	Not significant	Minor	Moderate
	Medium	Minor	Moderate	Major
	High	Moderate	Major	Major

ERM (2011)

5.2.4 Socioeconomic Environment

5.2.4.1 General Considerations

This Section provides the methodology used to evaluate impacts to socioeconomic and health impacts to people and communities. It details the key stages in the evaluation, including:

- Determining the vulnerability of people, households or communities which is a central characteristic of their sensitivities to socioeconomic change;
- Determining the magnitude of impacts;
- Evaluating the significance of impacts.

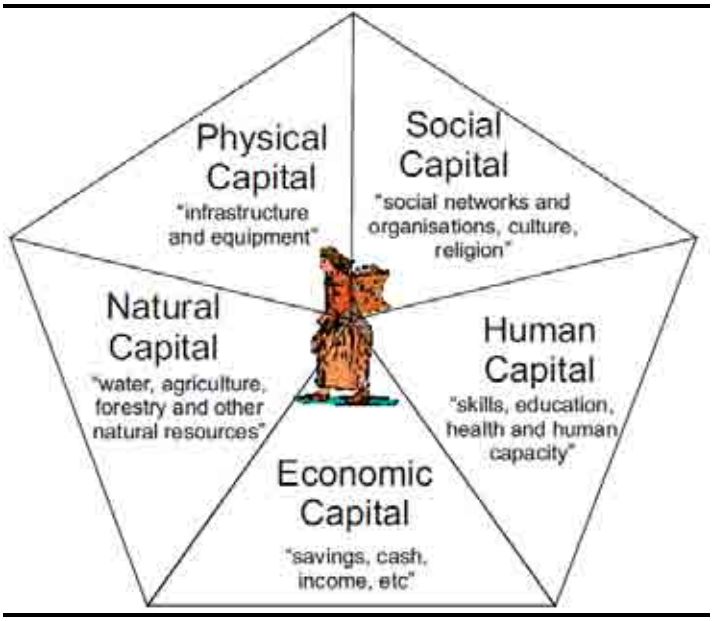
5.2.4.2 Background Socioeconomic Context

The characteristics of the socioeconomic context at a national, district, commune and settlement level in the Study area is established by the baseline that has been prepared through a combination of secondary data sources and focused fieldwork. This is presented in *Section 5.1.7*. The results of stakeholder engagement are also central to establishing the socioeconomic context, both in terms of the importance that stakeholders place on different aspects of the socioeconomic context and also in understanding how those directly affected are likely to perceive, be affected by and respond to changes resulting from the Project.

5.2.4.3 Potential Impact

Potential socioeconomic impacts may arise from any changes related to the Project that affect what is referred to as the livelihoods framework of individuals, households, communities or societies. This is shown in *Figure 5.2-1*.

Figure 5.2-1 Livelihoods Framework



Source: Livelihoods Vulnerability Framework, adapted by ERM for TAP Project in 2012

Impacts to people may be direct, indirect or induced as follows:

- Direct impacts result directly from project activities. An example is land take by the project removing agricultural land upon which a household depends. Commonly a project has significant control in terms of avoiding or otherwise mitigating direct impacts.
- Indirect socioeconomic impacts commonly occur when environmental quality is impacted by project activities which then cause impacts to people. For example, the health of those with pre-existing respiratory problems may worsen should air quality reduce as a result of dust caused by the construction. Indirect impacts to people are often taken account of in the evaluation criteria for the direct environmental impact (e.g. air quality, noise etc).
- Induced socioeconomic impacts are those that the project does not directly cause, but are encouraged or stimulated by the project. A potential example is in-migration by job-seekers into local communities hoping to gain employment on the project. Typically a project is unable to fully control induced impacts, although mitigation may be applied to reduce the likelihood and or scale of the impact.

Socioeconomic impacts may also be positive. Positive impacts will include potential employment, skills development, infrastructure improvements and economic contribution to the economy. It is important to identify and evaluate positive impacts and also to identify whether the project is able to take measures to enhance the positive nature of such impacts.

5.2.4.4 Sensitivity of Resource/Receptor/Vulnerability

Vulnerability of people to socioeconomic impacts is understood as their ability to adapt to socioeconomic/cultural or bio-physical change. Vulnerable individuals will tend to have an increased susceptibility to negative impacts or a limited ability to take advantage of positive impacts. It is a pre-existing status that is independent of the Project under consideration.

Heightened vulnerability may be reflected by an existing low level of access to key socioeconomic / cultural or environmental resources or a low status in certain socioeconomic / cultural indicators. *Table 5.2-23* identifies aspects that can be used as vulnerability indicators, if encountered in the socioeconomic setting of the communities along the pipeline route.

Table 5.2-23 Characteristics that Underpin Vulnerability

Access / Status	***Aspects to be considered***	***Sensitivity Indicators***
Human Receptors' (individuals, groups, households, communities etc) access to:		
Livelihoods	• Diversity of livelihoods; • Legality of livelihood; • Productivity of livelihood;	• Reliance on one principle livelihood • Principle livelihoods are relatively unproductive: • Principle livelihoods are unsustainable, fragile or illegal.
:Resources	• Water; • Non-Timber Forest Products; • Land;	• Access limited to few resources: • Resource shortages are frequent and serious; • Resources available are legally protected and use is illegal:
Services and Infrastructure	• Health; • Education; • Transport; • Recreation; • Savings and support networks; • Fair Policing and Security; • Utilities (drinking water, sewage, electricity, etc.);	• Minimal access to key services and infrastructure; • Provision of key services and infrastructure is poor.
Participation in Political and Civil Institutions and Decision Making	• Freedom of association; • Freedom from corruption;	• Minimal ability to participate in formal governance and decision making systems; • Subject to high levels of corruption; • Restrictions on rights of association, ability to participate freely in governance;
Community and Social Inclusion and Cohesion	• Security; • Freedom from inter and intra community cohesion;	• Subject to marginalisation and discrimination. • Subject to violence and conflict.
Human Receptors' (individuals, groups, households, communities, etc.) status:		
Health	• Health status including malnutrition, infectious diseases, disability, etc.	• Acute illness • Chronic illness • Maternal mortality • Child mortality.
Knowledge, Skills and Education	• Levels of knowledge skills and education; • Ability to participate in orthodox economic and social systems.	• Literacy • School attendance • Education levels achieved
Financial resources	• Income generation; • Savings;	• Income levels relative to expenditure • Ability to pay for food, key services, resources and infrastructure

Access / Status	*Aspects to be considered*	*Sensitivity Indicators*
Independent Cultural Identity	• Desire to maintain strong independent cultural identity. • Desire to avoid all socio-cultural change;	
Labour Rights	• Forced labour; • Child labour; • Right to association; • H&S standards; • Minimum wage, etc.	

Source: ERM (2011)

5.2.4.5 Magnitude of Impacts

The magnitude of socioeconomic impacts have been defined by estimating:

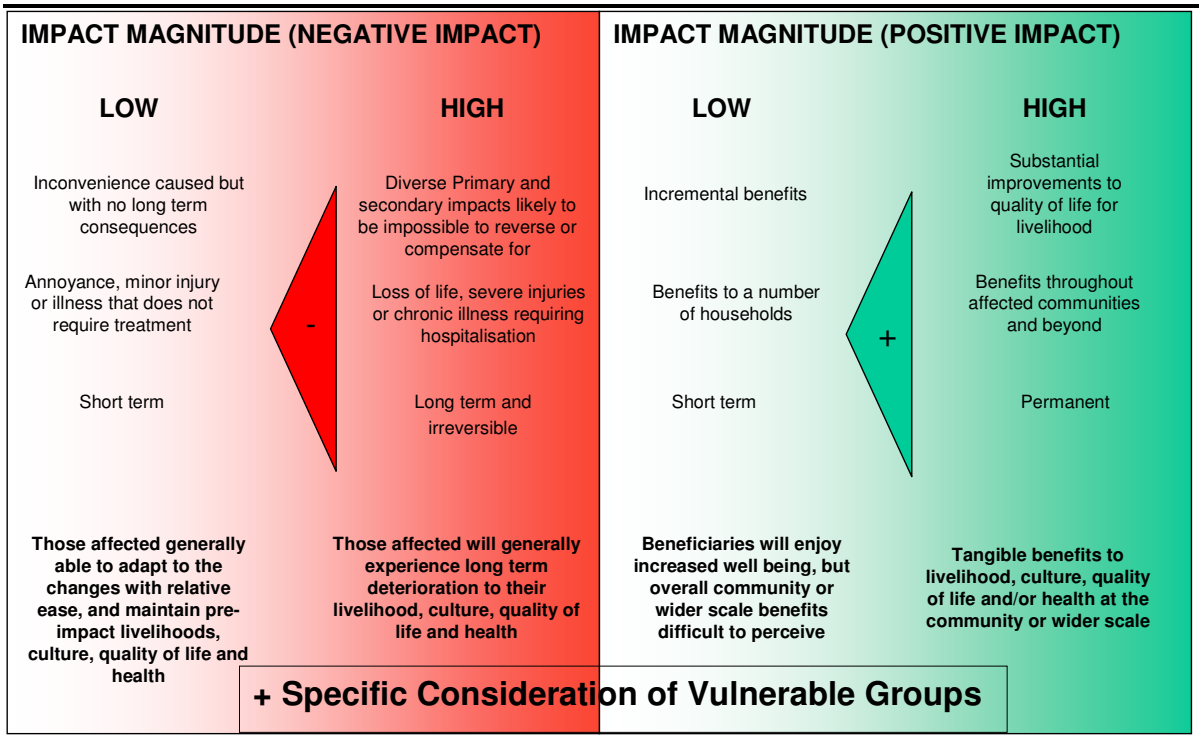
- The degree of change that will be experienced by affected individuals, households and societies;
- The extent to which initial impacts which result in further secondary or tertiary changes that may become unmanageable; and
- The temporal extent of the impact: its duration, frequency, reversibility, etc.

The number of people and geographic extent of the change are explained separately as impacts that may be severe for just a few households still requires a high level of attention from decision makers.

Determining the magnitude of each impact is undertaken using *Figure 5.2-2*. The key determinants of the impact magnitude are described and through a combination of quantifying the change and applying professional judgement, an impact magnitude is evaluated.

Initially the assessment of the impact is evaluated for the “general” population. The evaluation then takes into account whether any identified vulnerable groups will be impacted differentially. Where this is the case, the impact on this group is specifically considered.

Figure 5.2-2 Evaluating the Magnitude of Socioeconomic and Health Impacts



Source: ERM (2011)

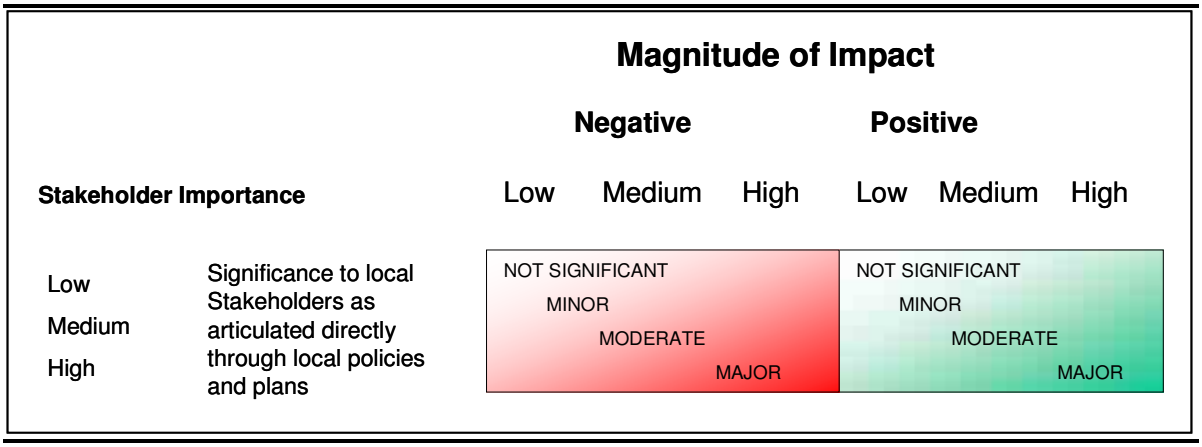
5.2.4.6 Assessment of Impact (Ranking)

In order to assess the significance of the impacts, the impact is reflected within the frame of reference of the local setting as articulated in stated policy or development objectives and / or the view of the local people. For example, communities with strong cultural norms may be more greatly disturbed by disturbance of a non-local workforce than people living in a cosmopolitan location.

In this way stakeholder views on impacts are explicitly brought into the evaluation, for example by referencing development policies and plans and / or reporting the results of stakeholder workshops, including quotes from consultation, etc.

The value of impact significance obtained is classified following the philosophy of *Figure 5.7-1* of *Section 5- ESIA Approach and Methodology*. However in the case of socioeconomic impacts, the significance of the impact is evaluated through consideration of the magnitude of the impact and the importance placed on the impact by stakeholders. This can be visualised in *Figure 5.2-3*.

Figure 5.2-3 Evaluating Significance of Socioeconomic Impacts



Source: ERM (2011)

As shown in *Figure 5.2-3*, the significance of positive impacts are evaluated taking into account similar factors as negative impacts, but with 'minor', 'moderate' and 'major' representing benefits to the socio-economic environment.

It is common for the public to have the perception that an impact is different (either lower or higher) than will actually be the case. This is commonly referred to as a perceived impact. Perceived impacts are captured, but clearly differentiated from impacts as evaluated above.

5.2.5 Cultural Heritage

5.2.5.1 General Considerations

Significance of impact to cultural heritage is measured as a product of the importance of a specific cultural heritage site and the magnitude of the impact on that site. Significance of impact, except for intangible heritage impacts, is judged based on international heritage preservation and academic standards and must be validated by the appropriate national authorities and by local community stakeholders. Direct physical impacts are typically irreversible and spatially discrete.

5.2.5.2 Potential Impacts

Cultural heritage sites are highly vulnerable and sensitive to Project activities, particularly construction activities. Project activities may produce impacts that affect the quality, character, function, or appearance of cultural heritage sites. Four mechanisms that have the potential to significantly impact cultural heritage sites are:

- Direct physical disturbance to sites during construction;

- Indirect physical impacts, such as vibration and pollution from 1) construction activities such as blasting or pile hammering, 2) the movement of heavy vehicles and equipment and 3) negative effects on the setting or ambience of cultural heritage sites during the operations phase (e.g. noise from compressor stations near a place of worship);
- Blockage of user access to sites; and
- Negative effects on setting and ambience of sites.

5.2.5.2.1 Direct Physical Impacts

Physical disturbance is most likely to occur as a result of earth-moving activities during construction. Such impacts are spatially discrete and typically irreversible. This type of impact could diminish or eliminate the scientific, cultural, or historical value of a site by disturbing structures and artefacts. Physical impacts will also compromise the integrity of spatial and/or stratigraphic relationships of artefacts, features and/or the landscape of the site. Such impacts could be caused by the inadvertent excavation or grading of the site or by the compression or distortion of the site associated with heavy vehicle traffic, especially under wet ground conditions. Artefacts from the disturbed portion of such a site, even if recovered intact, will be of greatly reduced scientific value. Damage to monuments or sites with ICH value could cause stakeholder and/or government approval issues.

5.2.5.2.2 Indirect Physical Impacts

This type of impact is applicable to sites with above-ground features or standing structures, such as walls, buildings or standing monuments. Indirect physical impacts, such as vibration and pollution, could diminish the scientific, historical or aesthetic value of a site by affecting the state of preservation and the quality of a site. Vibration and pollution may be caused by the movement of heavy vehicles and equipment and certain construction techniques such as blasting and pile hammering. For example, if heavy equipment and vehicle traffic occur too close to a site, the nearby vibration and pollution from equipment and vehicles could affect the quality, appearance and preservation of a site.

5.2.5.2.3 Blockage of User Access

This type of impact is applicable to sites with intangible heritage (ICH) value, monuments, and archaeological sites that receive public visitors. Project construction activities or logistic sites could potentially block pedestrian or vehicular access to cultural heritage sites that are important to local or international visitors.

5.2.5.2.4 Negative Effects on Site Setting and Ambience

This type of impact is applicable to sites with intangible cultural heritage (ICH) value, monuments, and archaeological sites that receive public visitors. Project construction activities or logistic sites could interfere with the character of the setting with noise, dust and the movement of vehicle,

equipment and personnel. The Project also has the potential to alter the physical appearance of the landscape around cultural heritage sites, which may detract from a site's value.

5.2.5.3 Determining the Importance of Cultural Heritage Sites

Criteria were developed to determine the overall value of different cultural heritage sites present in the Study area, represented with importance ratings. The importance ratings of cultural heritage sites in the Study area were developed as part of the baseline inventory of known heritage sites. Importance of sites is judged based on international heritage preservation and academic standards and must be validated by the appropriate national authorities and by local community stakeholders. The criteria are shown in *Table 5.2-24*.

Table 5.2-24 Cultural Heritage Site Importance Criteria

	Low	***Moderate***	***High***
Archaeological Site	Limited informational value and/or cultural significance based on content and condition of site.	Moderate informational value and/or cultural significance based on content and condition of site.	Outstanding informational value and/or cultural significance based on content and condition of site. Meets criteria as Critical Cultural Heritage[1] or Nonreplicable Cultural Heritage as defined by PS8[2].
Monument	Limited visual, commemorative or art historical interest based on architectural style or degree of preservation.	Moderate visual, commemorative or art historical interest based on architectural style or degree of preservation.	Outstanding visual, commemorative or art historical interest based architectural style or degree of preservation. Meets criteria as Critical Cultural Heritage or Nonreplicable Cultural Heritage as defined by PS8.
Site with Intangible Cultural Heritage (ICH) Value	Limited cultural or religious significance to site users based on user criteria.	Moderate cultural or religious significance to site users based on user criteria. Meets criteria as Critical Cultural Heritage as defined by PS8.	Outstanding cultural or religious significance to site users based on user criteria. Meets criteria as Critical Cultural Heritage as defined by PS8, and is either recognized regionally or nationally as an important symbol of culture and identity, or as a uniquely important site for a particular group (community, ethnic group, minority religious group, etc…)

Source: ERM (2012)

1 International Finance Corporation (IFC) Performance Standard 8 (PS8) defines Critical Cultural Heritage as one or both of the following: "(i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation"

2 International Finance Corporation (IFC) Performance Standard 8 (PS8) defines Nonreplicable Cultural Heritage as relating to "social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site."

5.2.5.4 Magnitude of Impacts

Magnitude of impacts to cultural heritage is determined in the following ways:

For physical damage to an archaeological site, the magnitude will be determined by the portion of the site that is disturbed in comparison with the area of the entire site. This will apply most often to physical impacts to cultural heritage sites from mechanical equipment. Artefacts recovered from a disturbed site will mitigate the damage only in a minor way since, once a site is disturbed, the artefacts will lack reliable archaeological context. It is not possible to restore a damaged archaeological site.

For physical damage to monuments and sites with ICH value, magnitude will be measured by the structural extent of the damage. Repair of a damaged historic monument is very challenging and expensive, if possible at all.

For non-physical impacts, including blockage of user access and affects on the setting and ambience of sites, the magnitude is determined by the severity and duration of the disturbance, and the degree to which the Project activities would interfere with a site's meaning, character and accessibility to its users.

5.2.5.5 Significance of Impacts

Significance of impacts on cultural heritage sites is measured as a product of the importance of a specific cultural heritage site and the magnitude of the impact on that site. Importance criteria are laid out in *Section 5.2.5.3* and impact magnitude is discussed in the previous *Section 5.2.5.4*. In the case where the impact is non-physical, then the significance has been measured as a product of the importance of the site and the duration and severity of the disturbance to the site's function and use.

The method used to calculate impacts on cultural heritage sites is summarized in *Table 5.2-25*.

Table 5.2-25 Significance of Impacts on Cultural Heritage

			Magnitude of impact			
			Negligible	Small	Medium	Large
		Definition	No change in the condition, accessibility or setting of the resource	Small part of resource is lost or damaged or access is hindered by increase in distance, or setting experiences temporary change that affects its perceived role/function	A notable portion of the resource is lost, or the entire resource is damaged, or the resource is no longer accessible to current users, or there is a long-term change in setting	Resource is wholly lost or setting is permanently altered to a degree that it loses its role/function
Value of cultural heritage resource	Negligible	Resource is not recognised by local people or external parties as being of value to community or for scientific or cultural research	Not significant	Not significant	Not significant	Not significant
	Low	Resource is recognised by people in the immediate area as of value for local tradition and culture or has minor interest for research	Not significant	Minor significance	Minor significance	Moderate significance
	Medium	Resource is important locally, recognised over wider area (regionally or nationally), or has moderate interest for research	Not significant	Minor significance	Moderate significance	Major significance
	High	Resource is essential to way of life or identity, or is of great interest for research	Not significant	Moderate significance	Major significance	Critical significance

Source: ERM (2012)

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